Publication

PISA 2022 Results

The State of Learning and Equity in Education

Volume I

OECD
BETTER POLICIES FOR BETTER LIVES

PISA 2022 Results (Volume I)

THE STATE OF LEARNING AND EQUITY IN EDUCATION

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BETTER POLICIES FOR BETTER LIVES

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Please cite this publication as:
OECD (2023), *PISA 2022 Results (Volume I): The State of Learning and Equity in Education*, PISA, OECD Publishing, Paris, https://doi.org/10.1787/53f23881-en.

ISBN 978-92-64-99796-7 (print)
ISBN 978-92-64-35128-8 (PDF)
ISBN 978-92-64-65419-8 (HTML)

PISA
ISSN 1990-8539 (print)
ISSN 1996-3777 (online)

Revised version, September 2025
Details of revisions available at: https://www.oecd.org/en/publications/support/corrigenda.html

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Corrigenda to OECD publications may be found at: https://www.oecd.org/en/publications/support/corrigenda.html.

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Preface

In 2022, as countries were still dealing with the lingering impacts of the COVID-19 pandemic, nearly 700 000 students from 81 OECD Member and partner economies, representing 29 million across the world, took the Programme for International Student Assessment (PISA) test.

It makes 2022 PISA the first large-scale study to collect data on student performance, well-being, and equity before and after the COVID-19 disruptions. The report finds that in spite of the challenging circumstances, 31 countries and economies managed to at least maintain their performance in mathematics since PISA 2018. Among these, Australia*, Japan, Korea, Singapore, and Switzerland maintained or further raised already high levels of student performance, with scores ranging from 487 to 575 points (OECD average 472). These systems showed common features including shorter school closures, fewer obstacles to remote learning, and continuing teachers' and parental support, which can further offer insights and indications of broader best practices to address future crises.

Many countries also made significant progress towards universal secondary education, key to enabling equality of opportunity and full participation in the economy. Among them, Cambodia, Colombia, Costa Rica, Indonesia, Morocco, Paraguay and Romania have rapidly expanded education to previously marginalised populations over the past decade.

Ten countries and economies saw a large share of all 15-year-olds with basic proficiency in maths, reading and science and achieve high levels of socio-economic fairness: Canada*, Denmark*, Finland, Hong Kong (China)*, Ireland*, Japan, Korea, Latvia*, Macao (China) and the United Kingdom*. While socioeconomic status remains a significant predictor of performance in these and other OECD countries and economies, education in these countries can be considered highly equitable.

At the same time, on average, the PISA 2022 assessment saw an unprecedented drop in performance across the OECD. Compared to 2018, mean performance fell by ten score points in reading and by almost 15 score points in mathematics, which is equivalent to three-quarters of a year's worth of learning. The decline in mathematics performance is three times greater than any previous consecutive change. In fact, one in four 15-year-old is now considered a low performer in mathematics, reading, and science on average across OECD countries. This means they can struggle to do tasks such as use basic algorithms or interpret simple texts. This trend is more pronounced in 18 countries and economies, where more than 60% of 15-year-olds are falling behind.

Yet the decline can only partially be attributed to the COVID-19 pandemic. Scores in reading and science had already been falling prior to the pandemic. For example, negative trends in maths performance were already apparent prior to 2018 in Belgium, Canada*, Czechia, Finland, France, Hungary, Iceland, the Netherlands*, New Zealand*, and the Slovak Republic.

The relationship between pandemic-induced school closures, often cited as the main cause of performance decline is not so direct. Across the OECD, around half of the students experienced closures for more than three months. However, PISA results show no clear difference in performance trends between education systems with limited school closures such as Iceland, Sweden and Chinese Taipei and systems that experienced longer school closures, such as Brazil, Ireland* and Jamaica*.

School closures also drove a global conversion to digitally enabled remote learning, adding to long-term challenges that had already emerged, such as the use of technology in classrooms. How education systems grapple with technological change and whether policymakers find the right balance between risks and opportunities, will be a defining feature of effective education systems.

According to our results, on average across OECD countries, around three quarters of students reported being confident using various technologies, including learning-management systems, school learning platforms and video communication programs. Students who spent up to one hour per day on digital devices for learning activities in school scored 14 points higher in mathematics than students who spent no time, even after accounting for students' and schools' socio-economic profile, and this positive relationship is observed in over half (45 countries and economies) of all systems with available data. Yet technology used for leisure rather than instruction, such as mobile phones, often seems to be associated with poorer results. Students who reported that they become distracted by other students who are using digital devices in at least some mathematics lessons scored 15 points lower than students who reported that this never or almost never happens, after accounting for students' and schools' socio-economic profile.

PISA data shows that teachers' support is particularly important in times of disruption, including by providing extra pedagogical and motivational support to students. The availability of teachers to help students in need had the strongest relationship to mathematics performance across the OECD, compared to other experiences linked to COVID-19 school closure. Mathematics score were 15 points higher on average in places where students agreed they had good access to teacher help. These students were also more confident than their peers to learn autonomously and remotely. Despite this, one in five students overall reported that they only received extra help from teachers in some mathematics lessons in 2022. Around eight percent never or almost never received additional support.

Overall, education systems with positive trends in parental engagement in student learning between 2018 and 2022 showed greater stability or improvement in mathematics performance. This was particularly true for disadvantaged students. These figures show that the level of active support that parents offer their children might have a decisive effect. Yet parental involvement in students' learning at school decreased substantially between 2018 and 2022. On average across OECD countries, the share of students in schools where most parents initiated discussions about their child's progress with a teacher dropped by ten percentage points.

Finally, we see a positive relationship between investment in education and average performance up to a threshold of USD 75 000 (PPP) in cumulative spending per student from age 6 to 15. For many OECD countries that spend more per student, there is no relationship between extra investment and student performance. Countries like Korea and Singapore have demonstrated that it is possible to establish a top-tier education system even when starting from a relatively low-income level, by prioritising the quality of teaching over the size of classes and funding mechanisms that align resources with needs.

To strengthen the role of education in empowering young people to succeed and ensuring merit-based equality of opportunity, the resilience of our education systems will be critical not only to improve learning outcomes measured through PISA, but to their long-term effectiveness. I'm pleased to share the PISA 2022 report with you, to provide policymakers across OECD Members and partner economies with evidence-based policy advice to design resilient and effective education systems that will help give our children and adolescents the best possible future.

Mathias Cormann,

OECD Secretary-General

Foreword

Up to the end of the 1990s, the OECD's comparisons of education outcomes were mainly based on measures of years of schooling, which don't necessarily reflect what people actually know and can do. The Programme for International Student Assessment (PISA) changed this. The idea behind PISA lay in testing the knowledge and skills of students directly, through a metric that was internationally agreed upon; linking that with data from students, teachers, schools and systems to understand performance differences; and then harnessing the power of collaboration to act on the data, both by creating shared points of reference and by leveraging peer pressure.

The aim with PISA was not to create another layer of top-down accountability, but to help schools and policy makers shift from looking upward within the education system towards looking outward to the next teacher, the next school, the next country. In essence, PISA counts what counts, and makes that information available to educators and policy makers so they can make more informed decisions.

The OECD countries that initiated PISA tried to make PISA different from traditional assessments in other ways too. In a world that rewards individuals increasingly not just for what they know, but for what they can do with what they know, PISA goes beyond assessing whether students can reproduce what they have learned in school. To do well in PISA, students have to be able to extrapolate from what they know, think across the boundaries of subject-matter disciplines, apply their knowledge creatively in novel situations and demonstrate effective learning strategies. For example, in the PISA mathematics assessment, students don't just have to demonstrate mathematical content knowledge, but also that they can think like a mathematician, translate real-world problems into the world of mathematics, reason mathematically, and interpret mathematical solutions in the original problem context. If all we do is teach our children what we know, they might remember enough to follow in our footsteps; but if they learn how to learn, and are able to think for themselves, and work with others, they can go anywhere they want.

Some people argue that the PISA tests are unfair, because they may confront students with problems they have not encountered in school. But then life is unfair, because the real test in life is not whether we can remember what we learned at school, but whether we will be able to solve problems that we can't possibly anticipate today.

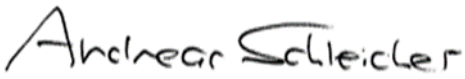
But the greatest strength of PISA lies in its working methods. Most assessments are centrally planned and then contracted to engineers who build them. That's how tests are created that are owned by an institution – but not by the people who are needed to change education. PISA turned that on its head. The idea of PISA attracted the world's best thinkers and mobilised hundreds of experts, educators and scientists from the participating countries to build a global assessment through a global expert community. Today, we would call that crowdsourcing; but whatever we call it, it created the ownership that was critical for success.

In a nutshell, PISA owes its success to a collaborative effort between the participating countries, the national and international experts and institutions working within the framework of the PISA Consortium, and the OECD. Subject-matter experts, practitioners and policy makers from the participating countries worked tirelessly to build agreement on which learning outcomes are important to measure and how to measure them best; to design and validate assessment tasks that can reflect those measures adequately and accurately across countries and cultures; and to find ways to compare the results meaningfully and reliably. The OECD co-ordinated this effort and worked with countries to make sense of the results and compile the reports.

PISA 2022 was the eighth round of the international assessment since the programme was launched in 2000, with an unprecedented number of countries taking part. Every PISA test assesses students' knowledge and skills in mathematics, science and reading; each assessment focuses on one of these subjects and provides a summary assessment of the other two. PISA 2022 also captures a wider range of cognitive, social and emotional student outcomes, captured in the new PISA Happy Life Dashboard.

Over the past two decades, PISA has become the world's premier yardstick for comparing quality, equity and efficiency in learning outcomes across countries, and an influential force for education reform. It has helped policy makers lower the cost of political action by backing difficult decisions with evidence – but it has also raised the political cost of inaction by exposing areas where policy and practice have been unsatisfactory.

These latest PISA results show that education systems can provide both high-quality instruction and equitable learning opportunities for all, and that they can support academic excellence not at the expense of student's well-being, but through students' well-being. At the same time, the results also show that many education systems are not up to this task. This publication provides many pointers as to what we can do to change this. Countries and economies that take part in PISA are culturally diverse and have attained different levels of economic development. Nevertheless, they face a common challenge--to support children and young people so they can reach their full potential as learners and human beings. PISA provides the evidence and the policy insights that countries need to address these matters. There is an urgent need to take action. The task for governments is to help education systems rise to this challenge.



Andreas Schleicher

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Acknowledgements

This report is the product of a collaborative effort between the countries and economies participating in PISA, the national and international experts and institutions working within the framework of the PISA Consortium, and the OECD Secretariat.

The development of this volume was guided by Andreas Schleicher and Yuri Belfali and managed by Miyako Ikeda. This volume was drafted by Daniel Salinas and Francesco Avvisati with the inputs from Rodrigo Castaneda Valle and edited by Clara Young. Statistical and analytical support was provided by Gwénaël Jacotin and Kartika Herscheid, with the help of Guillaume Bousquet and Giannina Rech. Choyi Whang led the development of system-level indicators. Charlotte Baer co-ordinated production and Fung Kwan Tam designed the tables and figures. Valeria Pelosi provided communication support. Administrative support was provided by Thomas Marwood and Ricardo Sanchez Torres. Marta Cignetti, Tiago Fragoso, David Garver, Zbigniew Marciniak and William Schmidt provided valuable feedback at various stages of the report and/or support in drafting. This volume also benefitted from the input and expertise of many more OECD staff members who worked on PISA 2022 at various stages of the project. Their names are listed in Annex E of this volume. Many reviewers provided feedback on earlier chapter drafts; their help in improving this volume is gratefully acknowledged.

To support the technical implementation of PISA, the OECD contracted an international consortium of institutions and experts, led by Irwin Kirsch, Claudia Tamassia, Ann Kennedy and Eugenio Gonzalez at the Educational Testing Service (ETS). Overall co-ordination of the PISA 2022 assessment, the computer-delivery platform, the development of instruments, scaling and analysis and all data products were managed by at ETS. The development of the cognitive assessment frameworks for mathematics and creative thinking and of the framework for questionnaires was carried out by the Research Triangle Institute (RTI), led by Kimberly O'Malley. The test development for the innovative domain was performed by ACT in collaboration with the OECD Secretariat, and led at ACT by Ken Kobell, Yigal Rosen, Gunter Maris, Kristin Stoeffler, Matthew Lumb and Alina von Davier. Sampling and weighting services were provided by Westat, led by Keith Rust. Linguistic quality control and the development of the French source version were under the responsibility of cApStAn, led by Steve Dept. The support for country preparation and implementation was managed by the Australian Council for Educational Research (ACER), led by Jeaniene Spink and Maurice Walker.

Joan Ferrini-Mundy, Zbigniew Marciniak and William Schmidt chaired the expert group that guided the preparation of the mathematics assessment framework and instruments. This group included Takuya Baba, Joan Ferrini-Mundy, Jenni Ingram, Julián Mariño, William Schmidt. Nina Jude chaired the expert group that guided the preparation of the questionnaire framework and instruments. This group included Hunter Gehlbach, Kit-Tai Hau, Therese Hopfenbeck, David Kaplan, Jihyun Lee, Richard Primi and Wilima Wadhwa. Leslie Rutkowski chaired the Technical Advisory Group, whose members include Maria Bolsinova, Eugenio Gonzalez, Kit-Tai Hau, Oliver Lüdtke, Sabine Meinck, Christian Monseur, Keith Rust, Kathleen Scalise, Kentaro Yamamoto. The creative thinking expert group included Baptiste Barbot; James Kaufman, Ido roll, Marlene Scardamalia, Valerie Shute, Lene Tanggaard and Nathan Zoanetti. The ICT Expert Group included Jepe Bundsgaard, Cindy Ong, Michael Trucano, Patricia Wastiau and Pat Yongpradit.

The development of the report was steered by the PISA Governing Board, chaired by Michele Bruniges (Australia), with Peggy Carr (United States), Akiko Ono (Japan) and Carmen Tovar Sánchez (Spain) as vice chairs. Annex E of this volume lists the members of the various PISA bodies, including Governing Board members and National Project Managers in participating countries and economies, the PISA Consortium and the individual experts and consultants who have contributed to PISA 2022.

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Reader's Guide

PISA in the pandemic

This edition of PISA includes data from 81 countries and economies. The test was originally planned to take place in 2021 but was delayed by one year due to the COVID-19 pandemic. The exceptional circumstances throughout this period, including lockdowns and school closures in many places, led to occasional difficulties in collecting some data. While the vast majority of countries and economies met PISA's technical standards (available on line), a small number did not. In prior PISA rounds, countries and economies that failed to comply with the standards, and which the PISA Adjudication Group judged to be consequential, could face exclusion from the main part of reporting. However, given the unprecedented situation caused by the pandemic, PISA 2022 results includes data from all participating education systems, including those where there were issues such as low response rates (see Annexes A2 and A4). The next section explains the potential limitations of data from countries not meeting specific technical standards. Readers are alerted to these limitations throughout the volume wherever appropriate.

It is important to note that the limitations and implications were assessed by the PISA Adjudication Group in June 2023. There may be a need for subsequent adjustments as new evidence on the quality and comparability of the data emerges. PISA will return to the standard ways of reporting for the 2025 assessment.

Adjudicated entities not meeting the sampling standards

The results of 13 adjudicated entities (i.e. countries, economies and regions within countries), listed below, will be reported with annotations. Caution is required when interpreting estimates for these countries/economies because one or more PISA sampling standards listed below were not met.

- **Overall exclusion rate. Standard 1.7**: The PISA Defined Target Population covers 95% or more of the PISA Desired Target Population. That is, school-level exclusions and within-school exclusions combined do not exceed 5%.
- **School response rate. Standard 1.11**: The final weighted school response rate is at least 85% of sampled schools. If a response rate is below 85% then an acceptable response rate can still be achieved through agreed upon use of replacement schools**.**
- **Student response rate. Standard 1.12**: The student response rate is at least 80% of all sampled students across responding schools.

The 13 entities can be grouped into two:

(i) Entities that submitted technically strong analyses, which indicated that more than minimal bias was most likely introduced in the estimates due to low response rates (falling below PISA standards): Canada, Ireland, New Zealand, the United Kingdom and Scotland.

(ii) Entities that did not meet one or more PISA sampling standards and it is not possible to exclude the possibility of more than minimal bias based on the information available at the time of data adjudication: Australia, Denmark, Hong Kong (China), Jamaica, Latvia, the Netherlands, Panama and the United States.

The Adjudication Group also noted that the bias associated with trend and cross-country comparisons might be smaller, if past data or data for other countries are biased in the same direction. Therefore, the deviations from the standards in PISA 2022 are compared with those in PISA 2018 where necessary.

(i) Entities that submitted technically strong analyses, which indicated that more than minimal bias was most likely introduced in the estimates due to low response rates (falling below PISA standards)

Canada

- **Overall exclusion rate: 5.8%.** Exclusions exceeded the acceptable rate by less than one percentage point; at the same time, the exclusion rates observed in 2022 remained relatively close to exclusion rates observed in 2018 (6.9%).
- **Student response rate: 77%. School response rates: 81% before replacement, 86% after replacement.** Student response rates decreased from 84% with respect to PISA 2018, and fell short of the target in 7 out of 10 provinces (all but New Brunswick, Prince Edward Island and Saskatchewan). A thorough non-response bias analysis was submitted, with analyses conducted separately for each province, using students' academic achievement data as auxiliary information. School response rates also fell short of the target, driven by low participation rates in two provinces (Alberta and Quebec). For these provinces, non-response bias was also examined at the school level. The analyses clearly indicate that school nonresponse has not led to any appreciable bias, but student nonresponse has given rise to a small upwards bias.

Ireland

- **Student response rate: 77%.** Student response rates decreased from 86% with respect to PISA 2018. A thorough non-response bias analysis was submitted, using external achievement data at student level as auxiliary information. The analysis provided evidence to suggest a residual upwards bias of about 0.1 standard deviations, after non-response adjustments are taken into account. On the PISA scale, considering that the standard deviation in Ireland ranged (in 2018) from 78 score points in mathematics to 91 score points in reading, this could translate in an estimated upwards bias of approximately 8 or 9 points.

New Zealand

- **Overall exclusion rate: 5.8%.** Exclusions exceeded the acceptable rate by less than one percentage point; at the same time, the exclusion rates observed in 2022 remained relatively close to exclusion rates observed in 2018 (6.8%).
- **Student response rate: 72%. School response rate: 61% before replacement, 72% after replacement.** Student response rates decreased from 83% with respect to PISA 2018. School response rates also fell short of the target. A thorough and detailed non-response bias analysis was submitted, using external achievement data at student level, but also information on chronic absenteeism, as auxiliary information, along with demographic characteristics. The analysis provided evidence to suggest a residual upwards bias of about 0.1 standard deviations, after non-response adjustments are taken into account, driven entirely by student non-response (school non-participation did not result in significant bias, in contrast). The analysis also suggested that chronically absent students are over-represented among non-respondents in PISA. On the PISA scale, considering that the standard deviation in New Zealand ranged (in 2018) from 93 score points in mathematics to 106 score points in reading, this could translate in an estimated upwards bias of approximately 10 points. The Adjudication Group also noted that the bias associated with trend and cross-country comparisons might be smaller, if past data or data for other countries are biased in the same direction. For more information, see educationcounts.govt.nz website.

The United Kingdom

The United Kingdom (excluding Scotland)

- **Student response rate: 75%. School response rates: 66% before replacement, 80% after replacement.** Student response rates decreased from 83% with respect to PISA 2018. School response rates also fell short of the target. An informative non-response bias analysis was submitted, using external achievement data at student level as auxiliary information, along with demographic characteristics; the analysis was limited to England as the largest subnational entity within the United Kingdom (excluding Scotland), and thus covered over 90% of the intended sample. The analysis provided evidence to suggest a small residual upwards bias of about 0.07 standard deviations for reading and 0.09 standard deviations for mathematics, after non-response adjustments are taken into account, driven entirely by student non-response (school non-participation did not result in significant bias, in contrast). On the PISA scale, considering that the standard deviation in England (in 2018) was about 101 score points in reading and 93 score points in mathematics, this could translate in an estimated upwards bias of approximately 7 or 8 points.

Scotland

- **Overall exclusion rate: 6.6%.** Exclusions exceeded the acceptable rate by a small margin; at the same time, the exclusion rates observed in 2022 remained relatively close to exclusion rates observed in 2018 (5.4%).
- **Student response rate: 79%.** Student response rates missed the standard by a small margin, but were otherwise similar to response rates in PISA 2018 (81%). A thorough non-response bias analysis was submitted, using several external achievement variables at student level as auxiliary information, along with demographic characteristics. The analysis provided evidence to suggest a residual upwards bias of about 0.1 standard deviations, after non-response adjustments are taken into account. On the PISA scale, considering that the standard deviation in Scotland (in 2018) was about 95 score points in reading and mathematics, this could translate in an estimated upwards bias of approximately 9 or 10 points. Given the similarity of response rates between 2018 and 2022, it cannot be excluded that a similar bias might be present in 2018 as well, and in many PISA 2022 participants whose response rates were similarly close to the target. For this reason, data were deemed to be comparable to previous cycles.

(ii) Entities that did not meet one or more PISA sampling standards and it is not possible to exclude the possibility of more than minimal bias based on the information available at the time of data adjudication.

Australia

- **Overall exclusion rate: 6.9%.** Exclusions exceeded the acceptable rate by a small margin; at the same time, the exclusion rates observed in 2022 remained relatively close to exclusion rates observed in 2018 (5.7%).
- **Student response rate: 76%.** Student response rates decreased from 85% with respect to PISA 2018. A technically sound non-response bias analysis was submitted; however, the strength of the evidence was limited by the fact that no external student-level achievement variables could be used in the analysis. Based on the available evidence, and on the experience of other countries participating in PISA, the Adjudication Group considered that while non-response adjustments likely limited the severity of non-response biases, a small residual upward bias could not be excluded.

Denmark

- **Overall exclusion rate**: **11.6%.** Exclusions exceeded the acceptable rate by a large margin and showed a marked increase, with respect to 2018 (5.7%). The Adjudication Group noted that high levels of student exclusions may bias performance results upwards. In Denmark, a major cause behind the rise appears to be the increased share of students with diagnosed dyslexia, and the fact that more of these students are using electronic assistive devices to help them read on the screen, including during exams. The lack of such an accommodation for students with diagnosed dyslexia in the PISA assessment led schools to exclude many

of these students. In order to reduce exclusion rates in the future, PISA may need to further accommodate dyslexic students, allowing the use of assistive devices.

Hong Kong (China)

- **Student response rate: 75%. School response rates: 60% before replacement, 80% after replacement.** Student response rates decreased from 85% with respect to PISA 2018. School response rates also fell short of the target (as they did in 2018). At the school level, the fact that a raw, but direct measure of school performance is used to assign schools to sampling strata (and therefore, differential non-response across strata is unlikely to cause bias), limits the risk of bias due to non-response. A non-response bias analysis was submitted; however, the strength of the evidence was limited by the fact that no external student-level achievement variables could be used in the analysis (only student grade information, already used in non-response adjustments, was available). The proxies for school and student achievement (school size and student grade) that were used in the analyses showed no or very limited relationship with participation rates. Nevertheless, based on the available evidence, and on the experience of other countries participating in PISA, the Adjudication Group considered that while non-response adjustments likely limited the severity of non-response biases, a small residual upward bias could not be excluded.

Jamaica

- **Student response rate: 68%.** Student response rates were substantially below the standard. A simple non-response bias analysis was submitted, analysing student response rates by school characteristics: this showed in particular lower response rates in rural schools and regions. A limited non-response bias analysis was also prepared by the Core C contractor, to compare respondent characteristics (both before and after nonresponse adjustment) to characteristics of the full eligible sample of students. This suggested that non-response was also related to students' grade level and gender (both variables are used in non-response adjustments). Based on the available information, it is not possible to exclude the possibility of bias; considering the analyses on student non-response conducted in other countries, the residual bias after non-response adjustments are taken into account is likely to correspond to an upward bias. The Adjudication Group also noted that a number of issues encountered during the main survey data collection could have been prevented, had Jamaica been able to do a full field trial. This was not possible because of COVID-related disruptions to schooling in 2021. In particular, enrolment information available to the national centre for school-level sampling often turned out to be imprecise; and low student participation rates could have been anticipated, had a regular field trial been conducted. As a result of inaccurate sampling frames and low student response rates, the achieved sample size for the main survey was well below target, and sampling errors for Jamaica are larger than desired. The Adjudication Group noted that apart from the challenges around sampling operations, the quality of the data met expectations for reporting.

Latvia

- **Overall exclusion rate: 7.9%.** Exclusions exceeded the acceptable rate by a large margin and showed a marked increase, with respect to 2018 (4.3%). Most of these students were excluded because they were attending school in remote or virtual mode. The Adjudication Group noted that high levels of student exclusions may bias performance results upwards.

The Netherlands

- **Overall exclusion rate: 8.4%.** Exclusions exceeded the acceptable rate by a large margin and showed a marked increase, with respect to 2018 (6.2%). Most of these students were excluded because they had a physical or intellectual disability and no adaptation was available for them. The Adjudication Group noted that high levels of student exclusions may bias performance results upwards.
- **School response rates: 66% before replacement, 90% after replacement.** A non-response bias analysis was submitted, analysing differences in performance and in other characteristics between responding schools and the total population of schools, as well as differences between replacement schools and originally

sampled, but non-responding schools. This supported the case that no large bias would result from non-response; furthermore, given the available evidence, there is no clear indication about the direction of any residual bias.

Panama

- **Student response rate: 77%.** In the challenging circumstances surrounding schooling in Panama in 2022 (teacher strikes, road blockades, and student absenteeism), student response rates decreased from 90% with respect to PISA 2018. No non-response bias analysis was submitted; the PISA national centre explained that non-response was potentially related to the agitated school climate the students found themselves when returning to their schools after the strikes. A limited non-response bias analysis was prepared by the Core C contractor, to compare respondent characteristics (both before and after nonresponse adjustment) to characteristics of the full eligible sample of students. This analysis suggested that (before non-response adjustments were taken into account), non-response was related to students' grade level, and to special needs status. Based on the available information, it is not possible to exclude the possibility of bias; considering the analyses on student non-response conducted in other countries, the residual bias after non-response adjustments are taken into account is likely to correspond to an upward bias.

The United States

- **Exclusion rates: 6.1%.** Exclusions exceeded the acceptable rate by a small margin but showed a marked increase, with respect to 2018 (3.8%), in exclusion rates for students with functional or intellectual disabilities. The Adjudication Group invited the national centres to investigate the reasons for this increase in exclusion rates and take remedial action for future cycles. It is expected that exclusion rates will fall again in the future, as a result.
- **School response rates: 51% before replacement, 63% after replacement.** School participation rates missed the standard by a substantial margin, and participation rates were particularly low among private schools (representing about 7% of the student population). A non-response bias analysis was submitted, indicating that, after replacement schools and non-response adjustments are taken into account, a number of characteristics (not including direct measures of school performance) are balanced across respondents and non-respondents. The Adjudication Group also noted that the response rate for students was only slightly above the target (80%). Based on the available information, it is not possible to exclude the possibility of bias, nor to determine its most likely direction.

Adjudication entity not reaching a strong level of comparability

The ability to compare PISA results with those of other countries, and over time, depends on the use of common test items and of standardised test-administration procedures. In addition, the common items must consistently indicate high, medium, or low proficiency, regardless of the country/economy or of the language of the test. When this condition is met, a common set of (international) parameters is used to convert students' correct, partially correct or incorrect responses into an estimated score on the PISA scale.

The PISA Technical Advisory Group issued a memo in December 2021 stating that, in each country and economy, over two-thirds of items are expected to use the international item parameters to ensure strong comparability of PISA scores across countries and economies. Where the proportion is lower, greater uncertainty (beyond the uncertainty of estimates reflected in standard errors) is associated with cross-country comparisons.

During the review of PISA 2022 results, invariance of item parameters with respect to the international ones was examined for each major language of assessment within a participating country/economy. For Viet Nam, 40% of the items were assigned unique parameters in reading (35 of 87). Viet Nam's reading results are, therefore, reported in this volume with an annotation indicating that a strong linkage to the international PISA scale could not be established.

Data underlying the figures

The data referred to in this volume are presented in Annex B and, in greater detail, including additional tables, on the PISA website (www.oecd.org/pisa). Five symbols are used to denote missing data:

- a The category does not apply in the country concerned or economy; data are therefore missing.
- c There were too few observations to provide reliable estimates (i.e. there were fewer than 30 students or fewer than 5 schools with valid data).
- m Data are not available. There was no observation in the sample; these data were not collected by the country or economy; or these data were collected but subsequently removed from the publication for technical reasons.
- w Results were withdrawn at the request of the country or economy concerned.
- x Data included in another category or column of the table (e.g. x(2) means that data are included in Column 2 of the table).

Coverage

This publication features data from 81 countries and economies, including all OECD Member countries except Luxembourg and 44 non-OECD Member countries and economies (see map of PISA countries and economies in "What is PISA?"). Specific territorial disclaimers and footnotes applicable to this publication are included in the copyright page (p.2).

The designation "Ukrainian regions (18 of 27)" refers to the 18 PISA-participating jurisdictions of Ukraine: Cherkasy Oblast, Kirovohrad Oblast, Poltava Oblast, Vinnytsia Oblast, Chernihiv Oblast, Kyiv Oblast, Sumy Oblast, the City of Kyiv, Zhytomyr Oblast, Odesa Oblast, Chernivtsi Oblast, Ivano-Frankivsk Oblast, Khmelnytskyi Oblast, Lviv Oblast, Rivne Oblast, Ternopil Oblast, Volyn Oblast and Zakarpattia Oblast. Due to Russia's large-scale aggression against Ukraine, the following nine jurisdictions were not covered: Dnipropetrovsk Oblast, Donetsk Oblast, Kharkiv Oblast, Luhansk Oblast, Zaporizhzhia Oblast, Kherson Oblast, Mykolaiv Oblast, the Autonomous Republic of Crimea and the city of Sevastopol.

Following OECD data regulations, a visual separation between countries and territories has been used in all charts to reduce the risk of data misinterpretation.

International averages

The OECD average corresponds to the arithmetic mean of the respective country estimates. It was calculated for most indicators presented in this report.

In this publication, the OECD average is generally used when the focus is on comparing performance across education systems. In the case of some countries, data may not be available for specific indicators, or specific categories may not apply. Readers should, therefore, keep in mind that the term "OECD average" refers to the OECD Member countries included in the respective comparisons. In cases where data are not available or do not apply for all sub-categories of a given population or indicator, the "OECD average" is not necessarily computed on a consistent set of countries across all columns of a table.

In analyses involving data from multiple years, the OECD average is always reported on consistent sets of OECD Member countries, and several averages may be reported in the same table. For instance, the "OECD average-35" includes only 35 OECD Member countries that have non-missing values across all the assessments for which this average itself is non-missing. This restriction allows for valid comparisons of the OECD average over time.

The number in the label used in figures and tables indicates the number of countries included in the average:

- OECD average: Arithmetic mean across all OECD Member countries except Luxembourg.
- OECD average-35: Arithmetic mean across all OECD Member countries excluding Costa Rica, Luxembourg and Spain.
- OECD average-26: Arithmetic mean across all OECD Member countries excluding Australia, Canada, Denmark, Ireland, Latvia, Luxembourg, the Netherlands, New Zealand, Portugal, Spain, the United Kingdom and the United States.
- OECD average-23: Arithmetic mean across all OECD Member countries excluding Austria, Chile, Colombia, Costa Rica, Estonia, Israel, Lithuania, Luxembourg, the Netherlands, the Slovak Republic, Slovenia, Spain, Türkiye, the United Kingdom and the United States.

Rounding figures

Because of rounding, some figures in tables may not add up exactly to the totals. Totals, differences and averages are always calculated on the basis of exact numbers and are rounded only after calculation.

All standard errors in this publication have been rounded to one or two decimal places. Where the value 0.0 or 0.00 is shown, this does not imply that the standard error is zero, but that it is smaller than 0.05 or 0.005, respectively.

Reporting student data

The report uses “15-year-olds” as shorthand for the PISA target population. PISA covers students who are aged between 15 years 3 months and 16 years 2 months at the time of assessment and who are enrolled in school and have completed at least 6 years of formal schooling, regardless of the type of institution in which they are enrolled, and whether they are in full-time or part-time education, whether they attend academic or vocational programmes, and whether they attend public or private schools or foreign schools within the country.

Reporting school data

The principals of the schools in which students were assessed provided information on their schools’ characteristics by completing a school questionnaire. Where responses from school principals are presented in this publication, they are weighted so that they are proportionate to the number of 15-year-olds enrolled in the school.

Focusing on statistically significant differences

This volume discusses only statistically significant differences or changes. These are denoted in darker colours in figures and in bold font in tables. Unless otherwise specified, the significance level is set to 5%. See Annex A3 for further information.

Abbreviations used in this report

ESCS	PISA index of economic, social, and cultural status
GDP	Gross domestic product
ICT	Information and communications technology
ISCED	International Standard Classification of Education
ISCO	International Standard Classification of Occupations
PPP	Purchasing power parity
Score dif.	Score-point difference
S.D.	Standard deviation
SDGs	Sustainable Development Goals
S.E.	Standard error
% dif.	Percentage-point difference

Box 1. Interpreting differences in PISA scores

PISA scores do not have a substantive meaning as they are not physical units such as metres or grams. Instead, they are set in relation to the variation in results observed across all test participants. There is, theoretically, no minimum or maximum score in PISA; rather, the results are scaled to fit approximately normal distributions (i.e. means around 500 score points, standard deviations around 100 score points). In statistical terms, a one-point difference on the PISA scale therefore corresponds to an effect size (Cohen's d) of 0.01; and a 10-point difference to an effect size of 0.10.

Interpreting large differences in scores: proficiency levels

PISA scales are divided into proficiency levels. For example, for PISA 2022, the range of difficulty of mathematics items is represented by eight levels of mathematics proficiency: the simplest items correspond to Level 1c; Levels 1b, 1a, 2, 3, 4, 5 and 6 correspond to increasingly difficult items. Individuals who are proficient within the range of Level 1c are likely to be able to complete Level 1c items but are unlikely to be able to complete items at higher levels. See Chapter 3 for a detailed description of proficiency levels in mathematics, reading, and science.

In mathematics, each proficiency level corresponds to a range of about 62 score points; in reading the difference between the cut points for each proficiency level is about 73 score points, and in science is about 75 score points. Hence, score-point differences of that magnitude can be interpreted as the difference in described skills and knowledge between successive proficiency levels.

Interpreting small differences in scores: statistical significance

Smaller differences in PISA scores cannot be expressed in terms of the difference in skills and knowledge between proficiency levels. However, they can still be compared with each other by means of verifying their "statistical significance".

A difference is called "statistically significant" if it is unlikely that such a difference can be observed in the estimates based on samples when, in fact, no true difference exists in the populations from which the samples are drawn. The results of the PISA assessments are "estimates" because they are obtained from samples of students rather than from a census of all students (i.e. which introduces a "sampling error"), and because they are obtained using a limited set of assessment tasks rather than the universe of all possible assessment tasks (i.e. which introduces a "measurement error").

It is possible to determine the magnitude of the uncertainty associated with the estimate and to represent it as a "confidence interval", i.e. a range defined in such a way that if the true value lies above its upper bound or below its lower bound, an estimate different from the reported estimate would be observed only with a small probability (typically less than 5%). The confidence interval needs to be taken into account when making comparisons between estimates so that differences that may arise simply due to the sampling error and measurement error are not interpreted as real differences.

Interpreting differences in scores across PISA assessments

To ensure the comparability of PISA results across different assessment years, "link errors" must be used. The link error represents uncertainty around scale values ("is a score of 432 in PISA 2022 the same as 432 in PISA 2018?") and is therefore independent of the size of the student sample. For comparisons between mathematics results in PISA 2022 and mathematics results in 2018, the link error corresponds to 2.24 score points. For detailed information, see Box I.5.3 in Chapter 5 and Annex A7.

Interpreting differences in scores in terms of learning gains over a year of schooling

Knowing the typical learning gain that students make as they progress from one grade-level to the next can be useful for interpreting differences in PISA results. 20 points represents the average annual pace of learning of 15-year-olds in countries that participate in PISA. Box I.5.1 in Chapter 5 explores this topic.

Further documentation

For further information on the PISA assessment instruments and the methods used in PISA, see the *PISA 2022 Assessment and Analytical Framework* (OECD, 2023[1]) and *PISA 2022 Technical Report* (OECD, forthcoming[2]).

StatLink

This report has StatLinks for tables and graphs at the end of the chapters. To download the matching Excel® spreadsheet, just type the link into your Internet browser, starting with the https://doi.org prefix, or click on the link from the e-book version.

References

OECD (2023), *PISA 2022 Assessment and Analytical Framework*, PISA, OECD Publishing, Paris, https://doi.org/10.1787/dfe0bf9c-en. [1]

OECD (forthcoming), *PISA 2022 Technical Report*, OECD Publishing, Paris. [2]

Executive Summary

PISA 2022 assesses reading, science, and, as its main subject, mathematics. Being proficient in mathematics today is more than the mere reproduction of routine mathematical procedures. Rather, PISA considers a mathematically proficient person to be someone who can mathematically reason their way through complex real-life problems and find solutions by formulating, employing and interpreting mathematics.

What students know and can do: student performance

In mathematics

- Singapore scored significantly higher than all other countries/economies in mathematics (575 points) and, along with Hong Kong (China)*, Japan, Korea, Macao (China), and Chinese Taipei, outperformed all other countries and economies in mathematics. Another 17 countries also performed above the OECD average (472 points), ranging from Estonia (510 points) to New Zealand* (479 points).
- An average of 69% of students are at least basically proficient in mathematics in OECD countries. This means they are beginning to demonstrate the ability and initiative to use mathematics in simple real-life situations.
- In 16 out of 81 countries/economies participating in PISA 2022, more than 10% of students attained Level 5 or 6 proficiency, meaning they are high-performing: they understand that a problem is quantitative in nature and can formulate complex mathematical models to solve it. By contrast, less than 5% of students are high-performing in 42 countries/economies.

In reading and science

- Singapore scored significantly higher than all other countries/economies in reading (543 points) and science (561 points). Behind Singapore, Ireland* performed as well as Estonia, Japan, Korea and Chinese Taipei while another 14 education systems performed above the OECD average in reading (476 points), ranging from Macao (China) (510 points) to Italy (482 points).
- In science, the highest-performing education systems are Singapore, Japan, Macao (China), and Chinese Taipei, Korea, Estonia, Hong Kong (China)* and Canada*. Finland performed as well as Canada* in science. In addition to these nine countries and economies, another 15 education systems also performed above the OECD average in science (485 points), ranging from Australia* (507 points) to Belgium (491 points).
- About three out of four students have achieved basic proficiency in reading and science in OECD countries.
- In reading and science, an OECD average of 7% of students attained the highest proficiency levels of 5 or 6. In 13 countries/economies, more than 10% of students are top performers in reading. In 14 countries/economies, more than 10% of students are top performers in science.

Trends in performance

- No change in the OECD average over consecutive PISA assessments up to 2018 has ever exceeded four points in mathematics and five points in reading: in PISA 2022, however, the OECD average dropped by almost 15 points in mathematics and about 10 score points in reading compared to PISA 2018. Mean performance in science, however, remained stable. The unprecedented drops in mathematics and reading point to the shock effect of COVID-19 on most countries.
- Only four countries and economies improved their performance between PISA 2018 and 2022 in all three subjects: Brunei Darussalam, Cambodia, the Dominican Republic and Chinese Taipei.
- Trend analysis of PISA results reveals a decades-long decline that began well before the pandemic. In reading and science, performances peaked in 2012 and 2009, respectively, before dipping while performance began a downward descent in mathematics before 2018 in Australia*, Belgium, Canada*, the Czech Republic, Finland, Hungary, Iceland, Korea, the Netherlands*, New Zealand*, the Slovak Republic and Switzerland.
- Four countries and economies are bucking this trend of long-term decline: Colombia, Macao (China), Peru, and Qatar. Their results have improved on average in all three subjects over the full period they have participated in PISA. Four other countries (Israel, Republic of Moldova, Singapore and Türkiye) have improved in two out of three subjects.

Equity in education

- Education systems in Canada*, Denmark*, Finland, Hong Kong (China)*, Ireland*, Japan, Korea, Latvia*, Macao (China) and the United Kingdom* are highly equitable by PISA's standard (combining high levels of inclusion and fairness).
- The percentage of 15-year-olds enrolled in school in Grade 7 or above in each country/economy ranges from 36% in Cambodia and 48% in Guatemala to 90% or more in 34 countries and economies.
- Socio-economically advantaged students scored 93 points more in mathematics than disadvantaged students on average across OECD countries. The performance gap attributed to students' socio-economic status is greater than 93 score points in 22 countries or economies and 50 points or fewer in 13 countries or economies.
- Boys outperformed girls in mathematics by nine score points and girls outperformed boys in reading by 24 score points on average across OECD countries. In science, the performance difference between boys and girls is not significant.
- Non-immigrant students scored 29 points more than immigrant students in mathematics on average across OECD countries but non-immigrant students scored only five points more than immigrant students once socio-economic status and language spoken at home had been accounted for.
- An average of 8% of students in the OECD area reported not eating at least once a week in the past 30 days because there was not enough money to buy food. In 18 countries/economies, more than 20% of students reported not being able to afford to eat at least once a week.

Trends in equity

- The socio-economic gap in mathematics performance did not change between 2018 and 2022 in 51 out of the 68 countries/economies with available PISA data; it widened in 12 countries/economies and narrowed in five (Argentina, Chile, the Philippines, Saudi Arabia and the United Arab Emirates).
- The gender gap in mathematics performance did not change between 2018 and 2022 in most countries/economies (57 out of the 72 with comparable data); it widened in 11 countries/economies and narrowed in four (Albania, Baku [Azerbaijan], Colombia and Montenegro).

Table I.1. Snapshot of performance in mathematics, reading and science [1/2]

Countries/economies with a mean performance/share of top performers **above** the OECD average
Countries/economies with a share of low performers **below** the OECD average

Countries/economies with a mean performance/share of top performers/share of low performers **not significantly different** from the OECD average

Countries/economies with a mean performance/share of top performers **below** the OECD average
Countries/economies with a share of low performers **above** the OECD average

	Mean score in PISA 2022			Long-term trend: Average decenial trend			Short-term change in performance (PISA 2018 to PISA 2022)			Top-performing and low-performing students	
	Mathematics	Reading	Science	Mathematics	Reading	Science	Mathematics	Reading	Science	Share of top performers in at least one subject (Level 5 or 6)	Share of low performers in all three subjects (below Level 2)
	Mean	Mean	Mean	Score dif.	Score dif.	Score dif.	Score dif.	Score dif.	Score dif.	%	%
OECD average	472	476	485	**-7**	-4	-7	**-15**	**-10**	-2	13.7	16.4
Singapore	575	543	561	6	**12**	**12**	6	**-7**	**10**	44.5	4.2
Japan	536	516	547	2	2	4	9	**12**	**17**	28.7	5.3
Korea	527	515	528	-13	**-11**	-4	1	1	9	29.7	7.3
Estonia	510	511	526	1	**11**	-3	**-13**	**-12**	-4	20.0	5.2
Switzerland	508	483	503	-12	-7	**-11**	-7	-1	7	19.4	12.4
Canada*	497	507	515	-17	**-9**	**-12**	**-15**	**-13**	-3	22.7	8.1
Netherlands*	493	459	488	-20	**-25**	**-23**	**-27**	**-26**	**-15**	19.0	20.2
Ireland*	492	516	504	-2	-1	-7	**-8**	-2	**8**	14.7	7.5
Belgium	489	479	491	-18	**-11**	**-11**	**-19**	**-14**	**-8**	15.5	15.2
Denmark*	489	489	494	-9	0	-3	**-20**	**-12**	1	12.8	10.3
United Kingdom*	489	494	500	-1	2	**-10**	**-13**	**-10**	-5	17.9	12.0
Poland	489	489	499	5	5	-1	**-27**	**-23**	**-12**	15.3	11.9
Austria	487	480	491	-9	-5	**-14**	**-12**	-4	1	14.6	15.5
Australia*	487	498	507	-21	**-14**	**-16**	-4	-5	4	20.7	12.1
Czech Republic	487	489	498	-12	1	-9	**-12**	-2	1	15.5	12.2
Slovenia	485	469	500	-7	-7	**-10**	**-24**	**-27**	**-7**	13.0	12.0
Finland	484	490	511	-34	**-23**	**-34**	**-23**	**-30**	**-11**	17.9	11.5
Latvia*	483	475	494	2	3	-1	**-13**	-4	**7**	9.7	10.6
Sweden	482	487	494	-9	**-11**	-2	**-21**	**-19**	-6	17.0	15.2
New Zealand*	479	501	504	-24	**-12**	**-18**	**-15**	-5	-4	19.5	13.7
Lithuania	475	472	484	-4	2	-6	-6	-4	2	10.4	14.4
Germany	475	480	492	-12	2	**-17**	**-25**	**-18**	**-11**	14.6	16.7
France	474	474	487	-14	-8	-6	**-21**	**-19**	-6	12.9	16.8
Spain	473	474	485	-4	-1	-2	m	m	m	10.6	12.9
Hungary	473	473	486	-10	-5	**-15**	**-8**	-3	5	11.2	16.5
Portugal	472	477	484	8	7	5	**-21**	**-15**	-7	10.1	13.8
Italy	471	482	477	8	1	-6	**-15**	5	**9**	10.7	12.9
Viet Nam**	469	462	472	m	m	m	m	m	m	6.3	12.2
Norway	468	477	478	-7	-5	-7	**-33**	**-23**	**-12**	13.8	17.5
Malta	466	445	466	3	3	2	-6	-3	**9**	10.7	21.6
United States*	465	504	499	-8	2	5	**-13**	-1	-3	18.1	14.8
Slovak Republic	464	447	462	-16	**-13**	**-20**	**-22**	**-11**	-2	9.5	22.2
Croatia	463	475	483	-1	0	**-10**	-1	-3	**10**	9.7	13.6
Iceland	459	436	447	-24	**-24**	**-27**	**-36**	**-38**	**-28**	6.8	23.3
Israel	458	474	465	11	**13**	7	-5	3	3	15.1	21.3
Türkiye	453	456	476	14	5	**24**	0	**-10**	**8**	7.3	18.5
Brunei Darussalam	442	429	446	m	m	m	**12**	**21**	**15**	4.5	30.0
Serbia	440	440	447	3	**16**	4	-8	1	8	5.0	24.5
United Arab Emirates	431	417	432	7	**-12**	-8	-4	**-14**	-2	8.8	33.9
Greece	430	438	441	-9	**-12**	**-21**	**-21**	**-19**	**-11**	3.9	25.7
Romania	428	428	428	6	**15**	3	-2	1	2	5.0	33.2
Kazakhstan	425	386	423	10	-4	6	2	-1	**26**	2.2	32.8
Mongolia	425	378	412	m	m	m	m	m	m	2.3	39.9

Notes: Values that are statistically significant are marked in bold (see Annex A3). * Caution is required when interpreting estimates because one or more PISA sampling standards were not met (see Reader's Guide, Annexes A2 and A4). Long-term trends are reported for the longest available period since PISA 2003 for mathematics, PISA 2000 for reading and PISA 2006 for science. The OECD average does not include Costa Rica and Spain for short-term change in performance. *Countries and economies are ranked in descending order of the mean mathematics score in PISA 2022*. Source: OECD, PISA 2022 Database, Tables I.B1.2.1, I.B1.2.2, I.B1.2.3, I.B1.4.42, I.B1.4.43, I.B1.5.4, I.B1.5.5 and I.B1.5.6:

Table I.1. Snapshot of performance in mathematics, reading and science [2/2]

Countries/economies with a mean performance/share of top performers **above** the OECD average
Countries/economies with a share of low performers **below** the OECD average

Countries/economies with a mean performance/share of top performers/share of low performers **not significantly different** from the OECD average

Countries/economies with a mean performance/share of top performers **below** the OECD average
Countries/economies with a share of low performers **above** the OECD average

	Mean score in PISA 2022			Long-term trend: Average decenial trend			Short-term change in performance (PISA 2018 to PISA 2022)			Top-performing and low-performing students	
	Mathematics	Reading	Science	Mathematics	Reading	Science	Mathematics	Reading	Science	Share of top performers in at least one subject (Level 5 or 6)	Share of low performers in all three subjects (below Level 2)
	Mean	Mean	Mean	Score dif.	Score dif.	Score dif.	Score dif.	Score dif.	Score dif.	%	%
Bulgaria	417	404	421	3	-5	-11	**-19**	**-16**	-3	4.6	38.3
Moldova	414	411	417	14	**20**	5	-6	**-13**	**-12**	1.7	37.1
Qatar	414	419	432	58	**59**	**51**	0	**12**	**13**	5.2	34.2
Chile	412	448	444	-1	**16**	2	-6	-4	0	3.6	24.8
Uruguay	409	430	435	-8	3	5	**-9**	3	**10**	3.4	30.6
Malaysia	409	388	416	7	-12	1	**-32**	**-27**	**-21**	1.3	40.6
Montenegro	406	405	403	10	9	0	**-24**	**-16**	**-12**	1.5	41.3
Mexico	395	415	410	2	4	1	**-14**	-5	**-9**	0.7	38.4
Thailand	394	379	409	-8	**-20**	-8	**-25**	**-14**	**-17**	1.3	46.3
Peru	391	408	408	26	**38**	**33**	**-9**	8	4	1.3	40.8
Georgia	390	374	384	8	-2	6	-8	-6	1	1.3	51.1
Saudi Arabia	389	383	390	m	m	m	**16**	**-17**	4	0.3	48.6
North Macedonia	389	359	380	m	-2	m	**-6**	**-34**	**-33**	0.7	55.8
Costa Rica	385	415	411	-17	**-21**	**-16**	**-18**	**-11**	-5	1.1	38.1
Colombia	383	409	411	9	**12**	**15**	-8	-4	-2	1.5	40.7
Brazil	379	410	403	10	7	5	-5	-3	-1	2.6	42.2
Argentina	378	401	406	-5	-2	7	-2	-1	2	1.5	42.7
Jamaica*	377	410	403	m	m	m	m	m	m	1.7	43.5
Albania	368	358	376	4	**12**	-5	**-69**	**-47**	**-41**	0.8	56.2
Indonesia	366	359	383	0	-5	0	**-13**	**-12**	**-13**	0.1	59.0
Morocco	365	339	365	m	m	m	-3	**-20**	**-11**	0.0	68.5
Uzbekistan	364	336	355	m	m	m	m	m	m	0.1	71.4
Jordan	361	342	375	**-8**	m	m	**-39**	m	m	0.0	62.9
Panama*	357	392	388	-4	15	5	4	**15**	**23**	1.2	50.4
Philippines	355	347	356	m	m	m	2	7	-1	0.2	71.3
Guatemala	344	374	373	m	m	m	**10**	5	**8**	0.1	63.8
El Salvador	343	365	373	m	m	m	m	m	m	0.2	62.8
Dominican Republic	339	351	360	m	m	m	**14**	**10**	**25**	0.1	68.4
Paraguay	338	373	368	m	m	m	**11**	3	**10**	0.1	61.1
Cambodia	336	329	347	m	m	m	**12**	**8**	**17**	0.0	82.2
Macao (China)	552	510	543	**18**	**14**	**24**	**-6**	**-15**	0	31.1	4.1
Chinese Taipei	547	515	537	-6	8	2	**16**	**13**	**22**	34.8	7.9
Hong Kong (China)*	540	500	520	-3	-5	**-21**	**-11**	**-25**	4	29.7	7.2
Ukrainian regions (18 of 27)	441	428	450	m	m	m	m	m	m	4.6	25.3
Cyprus	418	381	411	m	m	m	**-32**	**-43**	**-28**	5.3	40.3
Baku (Azerbaijan)	397	365	380	m	m	m	**-23**	**-24**	**-18**	0.9	50.9
Palestinian Authority	366	349	369	m	m	m	m	m	m	0.1	63.5
Kosovo	355	342	357	m	m	m	**-11**	**-11**	**-8**	0.0	72.9

Notes: Values that are statistically significant are marked in bold (see Annex A3). * Caution is required when interpreting estimates because one or more PISA sampling standards were not met (see Reader's Guide, Annexes A2 and A4). Long-term trends are reported for the longest available period since PISA 2003 for mathematics, PISA 2000 for reading and PISA 2006 for science. The OECD average does not include Costa Rica and Spain for short-term change in performance. *Countries and economies are ranked in descending order of the mean mathematics score in PISA 2022.* Source: OECD, PISA 2022 Database, Tables I.B1.2.1, I.B1.2.2, I.B1.2.3, I.B1.4.42, I.B1.4.43, I.B1.5.4, I.B1.5.5 and I.B1.5.6

Table I.2. Snapshot of socio-economic disparities in academic performance [1/2]

Countries/economies with a strength of socio-economic gradient **below** the OECD average
Countries/economies with a share of resilient students **above** the OECD average

Countries/economies with a strength of socio-economic gradient/share of resilient students **not significantly different** from the OECD average

Countries/economies with a strength of socio-economic gradient **above** the OECD average
Countries/economies with a share of resilient students **below** the OECD average

	Coverage Index 3: Coverage of 15-year-old population	Strength: Percentage of variance in mathematics performance explained by ESCS[1]	Percentage of disadvantaged students who are academically resilient[2]	Difference between advantaged[3] and disadvantaged students in mathematics	Short-term change in performance in mathematics, by socio-economic background (PISA 2018 to PISA 2022)		
					Difference between advantaged and disadvantaged students[4]	Disadvantaged students[5]	Advantaged students[5]
		%	%	Score dif.	Score dif.	Score dif.	Score dif.
OECD average		15.5	10.2	**93**	**7**	**-17**	**-10**
Cambodia	0.36	1.9	18.2	**21**	m	m	m
Uzbekistan	0.88	2.0	19.6	**22**	m	m	m
Kazakhstan	0.93	3.9	16.8	**41**	8	0	7
Albania	0.79	4.5	17.1	**49**	12	**-68**	**-57**
Philippines	0.83	4.8	11.6	**36**	**-38**	**20**	**-18**
Jordan	0.94	5.2	14.5	**40**	-15	**-32**	**-47**
Indonesia	0.85	5.5	15.2	**34**	-17	-6	**-23**
United Arab Emirates	0.94	5.8	9.5	**68**	**-35**	7	**-28**
Jamaica*	0.58	6.1	15.2	**45**	m	m	m
Saudi Arabia	0.81	6.4	14.2	**47**	**-20**	**27**	7
Georgia	0.86	7.8	13.9	**65**	-12	-1	-13
Morocco	0.76	8.5	15.8	**43**	-8	1	-7
Iceland	0.94	9.3	11.3	**72**	2	**-36**	**-34**
Montenegro	0.93	9.5	14.0	**67**	10	**-29**	**-19**
Norway	0.91	9.6	12.6	**81**	12	**-31**	**-19**
Malta	0.93	10.0	12.7	**83**	-9	-1	-10
Dominican Republic	0.64	10.1	12.6	**45**	-11	**17**	6
Thailand	0.75	10.1	15.0	**61**	-10	**-22**	**-32**
Canada*	0.92	10.2	12.7	**76**	7	**-18**	**-11**
Mexico	0.64	10.4	11.8	**58**	-8	-9	**-17**
United Kingdom*	0.97	11.0	15.2	**86**	3	-7	-5
Paraguay	0.72	11.2	12.4	**66**	m	m	m
Qatar	0.94	11.7	7.6	**84**	-9	4	-5
Greece	0.91	11.8	12.0	**76**	-6	**-16**	**-21**
Japan	0.92	11.9	11.5	**81**	13	5	**18**
Guatemala	0.48	12.1	11.2	**60**	m	m	m
Denmark*	0.84	12.2	10.2	**74**	3	**-23**	**-19**
Finland	0.95	12.4	11.9	**83**	**10**	**-26**	**-16**
Chile	0.86	12.5	12.8	**69**	**-21**	7	**-14**
North Macedonia	0.91	12.5	12.3	**76**	-7	-5	**-12**
Türkiye	0.74	12.6	11.7	**82**	8	-8	0
Korea	1.00	12.6	10.9	**97**	9	-4	5
Ireland*	1.00	13.0	11.9	**74**	7	**-10**	-3
Croatia	0.89	13.0	10.7	**82**	12	-10	2
Latvia*	0.85	13.2	11.7	**75**	6	**-16**	**-10**
Serbia	0.87	13.4	12.3	**81**	5	**-15**	-10
Estonia	0.94	13.4	10.3	**81**	**18**	**-23**	-6
Italy	0.87	13.5	11.3	**85**	4	**-15**	-11
Viet Nam	0.68	13.8	12.7	**78**	m	m	m
Spain	0.90	14.2	11.7	**86**	m	m	m

1. ESCS refers to the PISA index of economic, social and cultural status. 2. Academically resilient students are disadvantaged students who scored in the top quarter of performance in reading amongst students in their own country/economy. 3. A socio-economically advantaged (disadvantaged) student is a student in the top (bottom) quarter of ESCS in his or her own country/economy. 4. A positive (negative) score difference indicates that the difference between advantaged and disadvantaged students in mathematics was larger (smaller) in PISA 2022 than in in PISA 2018. 5. A positive (negative) score difference indicates that performance improved (declined) among disadvantaged students or advantaged students between PISA 2018 and PISA 2022. Notes: Values that are statistically significant are marked in bold (see Annex A3). * Caution is required when interpreting estimates because one or more PISA sampling standards were not met (see Reader's Guide, Annexes A2 and A4). The OECD average does not include Costa Rica and Spain for short-term change in performance. *Countries and economies are ranked in ascending order of the percentage of variance in mathematics performance explained by ESCS*. Source: OECD, PISA 2022 Database, Tables I.B1.4.1, I.B1.4.3 and I.B1.5.19.:

Table I.2. Snapshot of socio-economic disparities in academic performance [2/2]

Countries/economies with a strength of socio-economic gradient **below** the OECD average
Countries/economies with a share of resilient students **above** the OECD average

Countries/economies with a strength of socio-economic gradient/share of resilient students **not significantly different** from the OECD average

Countries/economies with a strength of socio-economic gradient **above** the OECD average
Countries/economies with a share of resilient students **below** the OECD average

	Coverage Index 3: Coverage of 15-year-old population	Strength: Percentage of variance in mathematics performance explained by ESCS[1]	Percentage of disadvantaged students who are academically resilient[2]	Difference between advantaged[3] and disadvantaged students in mathematics	Short-term change in performance in mathematics, by socio-economic background (PISA 2018 to PISA 2022)		
					Difference between advantaged and disadvantaged students[4]	Disadvantaged students[5]	Advantaged students[5]
		%	%	Score dif.	Score dif.	Score dif.	Score dif.
El Salvador	0.61	14.4	10.2	**57**	m	m	m
Australia*	0.90	14.6	9.9	**101**	**20**	**-13**	7
Brazil	0.76	14.8	10.2	**77**	-13	0	**-13**
United States*	0.86	14.9	10.6	**102**	5	-12	-7
Sweden	0.89	15.0	9.9	**99**	**15**	**-24**	-9
Netherlands*	0.79	15.1	10.6	**106**	17	**-34**	**-18**
Argentina	0.84	15.4	10.2	**75**	**-21**	**12**	-9
Moldova	0.97	15.6	10.1	**82**	-16	3	-12
Slovenia	1.00	15.7	9.4	**91**	5	**-30**	**-25**
New Zealand*	0.90	15.8	8.6	**102**	**15**	**-23**	-9
Brunei Darussalam	0.98	16.0	10.9	**86**	0	**13**	**14**
Colombia	0.73	16.2	9.8	**79**	2	-7	-5
Poland	0.89	16.3	8.6	**96**	5	**-29**	**-24**
Lithuania	0.92	16.5	9.8	**92**	2	-4	-2
Singapore	0.95	17.0	10.2	**112**	**22**	-6	**16**
Bulgaria	0.80	17.2	7.4	**108**	5	**-21**	-16
Peru	0.86	17.3	7.4	**86**	-11	-2	**-13**
Uruguay	0.85	17.9	10.4	**91**	-1	-3	-4
Malaysia	0.75	18.1	9.3	**82**	-5	**-26**	**-31**
Mongolia	0.87	18.1	8.8	**94**	m	m	m
Portugal	0.93	18.2	9.4	**101**	-3	**-17**	**-20**
Germany	0.92	18.7	9.5	**111**	7	**-26**	**-18**
Austria	0.89	19.4	8.2	**106**	**14**	**-20**	-5
Israel	0.90	19.6	7.7	**124**	**17**	-11	7
Panama*	0.58	20.0	7.8	**77**	-5	7	2
Switzerland	0.91	20.8	8.2	**117**	**17**	**-15**	2
France	0.93	21.5	7.4	**113**	5	**-22**	**-16**
Belgium	0.99	21.8	8.2	**117**	1	**-19**	**-18**
Czech Republic	0.91	22.0	7.3	**116**	8	**-18**	-9
Hungary	0.86	25.1	8.2	**121**	7	**-12**	-5
Slovak Republic	0.96	25.7	6.1	**133**	16	**-32**	**-15**
Romania	0.76	25.8	6.6	**132**	**24**	-11	13
Costa Rica	0.78	m	m	m	m	m	m
Macao (China)	0.98	5.0	16.8	**55**	**20**	**-14**	6
Baku (Azerbaijan)	0.73	5.2	14.5	**54**	1	**-25**	**-25**
Kosovo	0.86	5.7	17.7	**39**	-4	-8	**-12**
Hong Kong (China)*	0.81	5.8	16.7	**65**	7	-13	-5
Palestinian Authority	0.78	7.4	12.3	**50**	m	m	m
Cyprus	0.94	10.9	11.6	**92**	**17**	**-35**	**-18**
Ukrainian regions (18 of 27)	0.42	13.8	10.5	**84**	m	m	m
Chinese Taipei	0.93	15.7	10.1	**119**	**27**	3	**30**

1. ESCS refers to the PISA index of economic, social and cultural status. 2. Academically resilient students are disadvantaged students who scored in the top quarter of performance in reading amongst students in their own country/economy. 3. A socio-economically advantaged (disadvantaged) student is a student in the top (bottom) quarter of ESCS in his or her own country/economy. 4. A positive (negative) score difference indicates that the difference between advantaged and disadvantaged students in mathematics was larger (smaller) in PISA 2022 than in in PISA 2018. 5. A positive (negative) score difference indicates that performance improved (declined) among disadvantaged students or advantaged students between PISA 2018 and PISA 2022. Notes: Values that are statistically significant are marked in bold (see Annex A3). * Caution is required when interpreting estimates because one or more PISA sampling standards were not met (see Reader's Guide, Annexes A2 and A4). The OECD average does not include Costa Rica and Spain for short-term change in performance. *Countries and economies are ranked in ascending order of the percentage of variance in mathematics performance explained by ESCS*. Source: OECD, PISA 2022 Database, Tables I.B1.4.1, I.B1.4.3 and I.B1.5.19.

Table I.3. Snapshot of gender gaps in performance [1/2]

Countries/economies with a mean score **above** the OECD average
Countries/economies with a mean score **not significantly different** from the OECD average
Countries/economies with a mean score **below** the OECD average

	Mathematics performance				Reading performance				Science performance			
	Girls	Boys	Difference between boys and girls	Short-term change in gender gap (PISA 2018 to PISA 2022) [1]	Girls	Boys	Difference between boys and girls	Short-term change in gender gap (PISA 2018 to PISA 2022) [1]	Girls	Boys	Difference between boys and girls	Short-term change in gender gap (PISA 2018 to PISA 2022) [1]
	Mean score	Mean score	Score dif.	Score dif.	Mean score	Mean score	Score dif.	Score dif.	Mean score	Mean score	Score dif.	Score dif.
OECD average	468	477	**9**	**4**	488	464	**-24**	**5**	485	485	0	**2**
Albania	378	359	**-19**	**-14**	379	339	**-40**	-2	391	362	**-28**	**-12**
Jordan	368	353	**-15**	-9	364	318	**-46**	m	390	358	**-33**	m
Philippines	362	348	**-14**	-3	364	329	**-35**	**-8**	363	349	**-15**	**-11**
Jamaica*	384	370	**-13**	m	426	391	**-35**	m	412	392	**-20**	m
Brunei Darussalam	448	437	**-11**	-4	447	413	**-34**	-4	452	440	**-12**	-5
Malaysia	414	403	**-10**	-4	404	373	**-31**	-5	423	410	**-13**	-7
Qatar	418	410	**-8**	**16**	440	399	**-40**	**25**	443	422	**-21**	**18**
United Arab Emirates	435	428	**-7**	2	440	396	**-45**	**12**	441	424	**-17**	**9**
Indonesia	369	362	**-6**	3	370	347	**-23**	2	385	380	-5	2
North Macedonia	392	386	**-6**	1	372	346	**-26**	**26**	388	373	**-15**	4
Thailand	397	391	-6	10	391	365	**-27**	**12**	414	404	**-10**	9
Bulgaria	420	415	-6	-4	422	389	**-33**	7	430	413	**-16**	-1
Mongolia	427	422	**-6**	m	391	366	**-25**	m	420	405	**-15**	m
Georgia	393	387	-5	-1	392	357	**-35**	3	391	377	**-14**	0
Finland	487	482	**-5**	1	513	468	**-45**	7	522	500	**-22**	2
Dominican Republic	341	337	**-4**	-1	367	333	**-34**	-3	367	353	**-13**	-4
Cambodia	338	334	-4	-5	338	318	**-20**	-4	351	342	**-9**	-5
Morocco	367	363	**-4**	-5	350	329	**-22**	4	370	361	**-9**	0
Slovenia	485	484	-2	-2	491	447	**-44**	-2	508	493	**-15**	-5
Norway	469	468	-1	6	498	456	**-42**	5	485	472	**-13**	-3
Montenegro	406	405	0	**-9**	423	388	**-36**	-5	407	399	**-8**	-3
Kazakhstan	426	425	0	-2	400	373	**-27**	-1	426	421	**-5**	2
Slovak Republic	463	465	1	-3	462	433	**-30**	5	466	459	-7	-1
Malta	465	467	1	**14**	465	426	**-39**	10	472	460	**-12**	**9**
Saudi Arabia	388	390	2	**15**	399	366	**-33**	**22**	398	383	**-15**	**13**
Sweden	481	483	2	3	506	469	**-37**	-2	498	489	**-8**	-1
Iceland	457	461	3	**13**	454	419	**-35**	5	454	440	**-13**	-5
Panama*	355	358	4	-4	401	382	**-19**	-5	387	389	2	1
Moldova	412	416	4	6	427	397	**-30**	**10**	421	413	**-8**	3
Romania	425	430	5	0	442	415	**-26**	7	428	427	-1	-1
Korea	525	530	5	1	533	499	**-34**	-11	530	526	-3	-7
Lithuania	473	478	**5**	8	487	456	**-31**	**8**	487	482	**-6**	0
Poland	486	492	6	4	503	475	**-29**	4	500	498	-2	-1
Türkiye	450	456	6	1	468	444	**-25**	0	478	473	-5	2
Greece	427	433	6	6	451	426	**-25**	**17**	446	436	**-10**	1
Uzbekistan	361	367	**6**	m	347	325	**-22**	m	357	353	-4	m
Estonia	507	513	**6**	-2	525	498	**-27**	4	528	524	-4	1
El Salvador	340	347	**6**	m	371	358	**-13**	m	372	374	2	m
Croatia	460	466	6	-2	493	459	**-34**	-1	488	477	**-11**	-7
Czech Republic	483	491	**7**	4	503	474	**-29**	4	499	497	-2	0
Belgium	486	493	8	-4	492	465	**-28**	-6	491	491	0	-5

1. A positive (negative) score difference indicates that the difference between boys and girls in mathematics was larger (smaller) in PISA 2022 than in in PISA 2018. Notes: Values that are statistically significant are marked in bold (see Annex A3). * Caution is required when interpreting estimates because one or more PISA sampling standards were not met (see Reader's Guide, Annexes A2 and A4). The OECD average does not include Costa Rica and Spain for short-term change in performance. *Countries and economies are ranked in descending order of the gender gap in mathematics performance*. Source: OECD, PISA 2022 Database, Tables I.B1.4.17, I.B1.4.18, I.B1.4.19, I.B1.5.40, I.B1.5.43 and I.B1.5.46.

Table I.3. Snapshot of gender gaps in performance [2/2]

Countries/economies with a mean score **above** the OECD average
Countries/economies with a mean score **not significantly different** from the OECD average
Countries/economies with a mean score **below** the OECD average

	Mathematics performance				Reading performance				Science performance			
	Girls	Boys	Difference between boys and girls	Short-term change in gender gap (PISA 2018 to PISA 2022)[1]	Girls	Boys	Difference between boys and girls	Short-term change in gender gap (PISA 2018 to PISA 2022)[1]	Girls	Boys	Difference between boys and girls	Short-term change in gender gap (PISA 2018 to PISA 2022)[1]
	Mean score	Mean score	Score dif.	Score dif.	Mean score	Mean score	Score dif.	Score dif.	Mean score	Mean score	Score dif.	Score dif.
Brazil	375	383	**8**	0	419	402	**-17**	**8**	400	406	**5**	**7**
Japan	531	540	**9**	-1	524	508	**-17**	4	546	548	2	-1
Colombia	378	387	**9**	**-11**	414	403	**-12**	-1	408	414	**6**	-6
Latvia*	478	488	**10**	3	488	461	**-28**	5	493	495	1	**10**
France	469	479	**10**	3	484	464	**-20**	5	488	487	-1	0
Spain	468	478	**10**	m	487	462	**-25**	m	482	487	**5**	m
Viet Nam**	464	475	**10**	m	471	453	**-18**	m	470	475	**6**	m
New Zealand*	474	484	**10**	2	514	488	**-26**	3	504	504	-1	-2
Portugal	467	477	**11**	2	487	466	**-21**	3	485	484	-2	-7
Netherlands*	487	498	**11**	**9**	473	447	**-26**	3	487	489	2	**11**
Switzerland	502	513	**11**	4	495	472	**-24**	7	502	503	0	1
Uruguay	403	414	**11**	3	438	423	**-15**	8	431	440	**9**	5
Serbia	434	445	**11**	8	453	428	**-26**	**10**	449	446	-4	1
Argentina	372	383	**11**	-4	408	394	**-14**	2	403	409	**6**	-4
Israel	452	463	**11**	**20**	486	462	**-23**	**25**	465	465	0	**19**
Australia*	481	493	**11**	5	509	487	**-22**	**10**	506	508	2	1
Germany	469	480	**11**	4	490	470	**-19**	6	492	493	0	1
Paraguay	332	343	**11**	-2	382	364	**-19**	-5	367	370	3	-2
Denmark*	483	495	**12**	8	499	479	**-21**	9	490	497	**7**	**9**
Mexico	389	401	**12**	0	419	411	**-8**	3	404	417	**14**	4
Singapore	568	581	**12**	**8**	553	533	**-20**	4	558	565	**7**	3
Canada*	491	503	**12**	**7**	519	495	**-24**	5	515	515	1	4
Guatemala	338	351	**12**	1	379	369	**-9**	2	370	376	**6**	1
Ireland*	485	498	**13**	7	525	507	**-18**	5	501	507	6	7
United States*	458	471	**13**	5	515	493	**-22**	2	496	503	7	6
United Kingdom*	482	496	**14**	2	503	486	**-16**	4	496	504	**8**	6
Hungary	465	480	**15**	6	481	465	**-17**	10	484	488	3	-3
Costa Rica	377	392	**15**	-3	417	414	-3	**12**	404	418	**15**	5
Peru	384	399	**15**	-1	412	404	**-8**	2	401	415	**14**	1
Chile	403	420	**16**	**9**	451	445	-7	**13**	436	450	**14**	**11**
Austria	478	497	**19**	6	491	470	**-20**	8	485	497	**11**	9
Italy	461	482	**21**	6	491	472	**-19**	6	474	481	7	3
Cyprus	426	411	**-16**	**-7**	409	355	**-54**	**-7**	426	397	**-29**	-8
Palestinian Authority	373	357	**-16**	m	371	322	**-49**	m	382	352	**-30**	m
Baku (Azerbaijan)	401	394	**-7**	**-15**	385	347	**-37**	**-12**	387	374	**-12**	**-7**
Kosovo	355	355	0	-4	355	330	**-25**	0	360	354	**-6**	0
Chinese Taipei	544	550	6	2	529	502	**-27**	-5	536	539	3	2
Hong Kong (China)*	536	544	**9**	**14**	512	489	**-23**	**12**	520	520	0	9
Ukrainian regions (18 of 27)	436	446	**10**	m	439	416	**-23**	m	450	450	-1	m
Macao (China)	544	559	**15**	**12**	518	503	**-14**	**8**	542	544	2	4

1. A positive (negative) score difference indicates that the difference between boys and girls in mathematics was larger (smaller) in PISA 2022 than in in PISA 2018. Notes: Values that are statistically significant are marked in bold (see Annex A3). * Caution is required when interpreting estimates because one or more PISA sampling standards were not met (see Reader's Guide, Annexes A2 and A4). The OECD average does not include Costa Rica and Spain for short-term change in performance. *Countries and economies are ranked in descending order of the gender gap in mathematics performance.* Source: OECD, PISA 2022 Database, Tables I.B1.4.17, I.B1.4.18, I.B1.4.19, I.B1.5.40, I.B1.5.43 and I.B1.5.46:

Table I.4. Snapshot of immigrant students [1/2]

Countries/economies with a mean score in mathematics or a share of immigrant students **above** the OECD average

Countries/economies with a mean score in mathematics or a share of immigrant students **not significantly different** from the OECD average

Countries/economies with a mean score in mathematics or a share of immigrant students **below** the OECD average

	Percentage of immigrant students	Performance in mathematics			Score-point difference in mathematics performance associated with immigrant background	
		Non-immigrant students	Second-generation immigrant students[1]	First-generation immigrant students[2]	After accounting for students' socio-economic status	After accounting for students' socio-economic status and language spoken at home
	%	Mean score	Mean score	Mean score	Score dif.	Score dif.
OECD average	12.9	479	459	435	**-15**	**-5**
Qatar	59.1	378	428	458	**66**	**61**
United Arab Emirates	52.9	390	466	489	**88**	**88**
Switzerland	34.9	528	477	472	**-19**	-5
Canada*	34.4	497	517	499	**16**	**15**
Australia*	29.3	483	509	506	**26**	**25**
Singapore	28.6	568	608	591	**15**	**19**
New Zealand*	28.5	479	500	482	**16**	**24**
Austria	26.6	505	451	439	**-25**	-5
Germany	25.8	495	457	398	**-32**	-8
United States*	23.7	470	466	441	**16**	**28**
Sweden	21.3	499	449	423	**-34**	**-27**
Belgium	20.5	504	452	439	**-25**	**-17**
United Kingdom*	20.1	494	507	483	**12**	**16**
Ireland*	17.4	495	489	484	0	0
France	16.5	485	438	425	**-17**	-9
Norway	15.9	479	448	436	**-9**	-11
Israel	15.1	467	468	410	1	**11**
Spain	15.1	481	459	433	**-7**	**-5**
Netherlands*	13.6	508	460	431	**-27**	-10
Greece	13.2	438	404	373	**-13**	-1
Costa Rica	12.5	387	373	367	m	m
Malta	11.9	469	451	484	6	5
Jordan	11.5	363	376	364	**10**	**10**
Portugal	11.3	477	461	434	**-25**	**-20**
Saudi Arabia	10.8	386	412	418	**27**	**27**
Denmark*	10.7	497	445	437	**-28**	**-21**
Serbia	10.7	441	448	445	2	3
Italy	10.7	476	453	430	-3	6
Slovenia	9.8	492	447	424	**-29**	-6
Croatia	8.8	466	451	459	-5	-1
Estonia	8.7	514	492	475	**-20**	**-18**
Brunei Darussalam	7.9	439	475	505	**47**	**40**
Iceland	7.4	464	436	419	**-15**	-2
Kazakhstan	7.4	426	430	431	**12**	**12**
Chile	6.9	417	435	381	**-18**	**-17**
Finland	6.8	491	442	413	**-42**	**-29**
Montenegro	6.2	407	417	402	-2	1
Argentina	5.3	380	375	365	4	**11**
Panama*	4.5	358	416	410	**42**	**48**
Dominican Republic	4.2	345	311	332	**-16**	**-12**
Czech Republic	4.1	489	484	443	**-13**	**22**

1. Second-generation immigrant students are those born in the country of assessment but whose parent(s) were born in another country. 2. First-generation students immigrant students are those born outside the country of assessment and whose parents were also born in another country. Notes: Values that are statistically significant are marked in bold (see Annex A3). * Caution is required when interpreting estimates because one or more PISA sampling standards were not met (see Reader's Guide, Annexes A2 and A4). *Countries and economies are ranked in descending order of the percentage of immigrant students.* Source: OECD, PISA 2022 Database, Tables I.B1.7.1, I.B1.7.17 and I.B1.7.53.

Table I.4. Snapshot of immigrant students [2/2]

Countries/economies with a mean score in mathematics or a share of immigrant students **above** the OECD average
Countries/economies with a mean score in mathematics or a share of immigrant students **not significantly different** from the OECD average
Countries/economies with a mean score in mathematics or a share of immigrant students **below** the OECD average

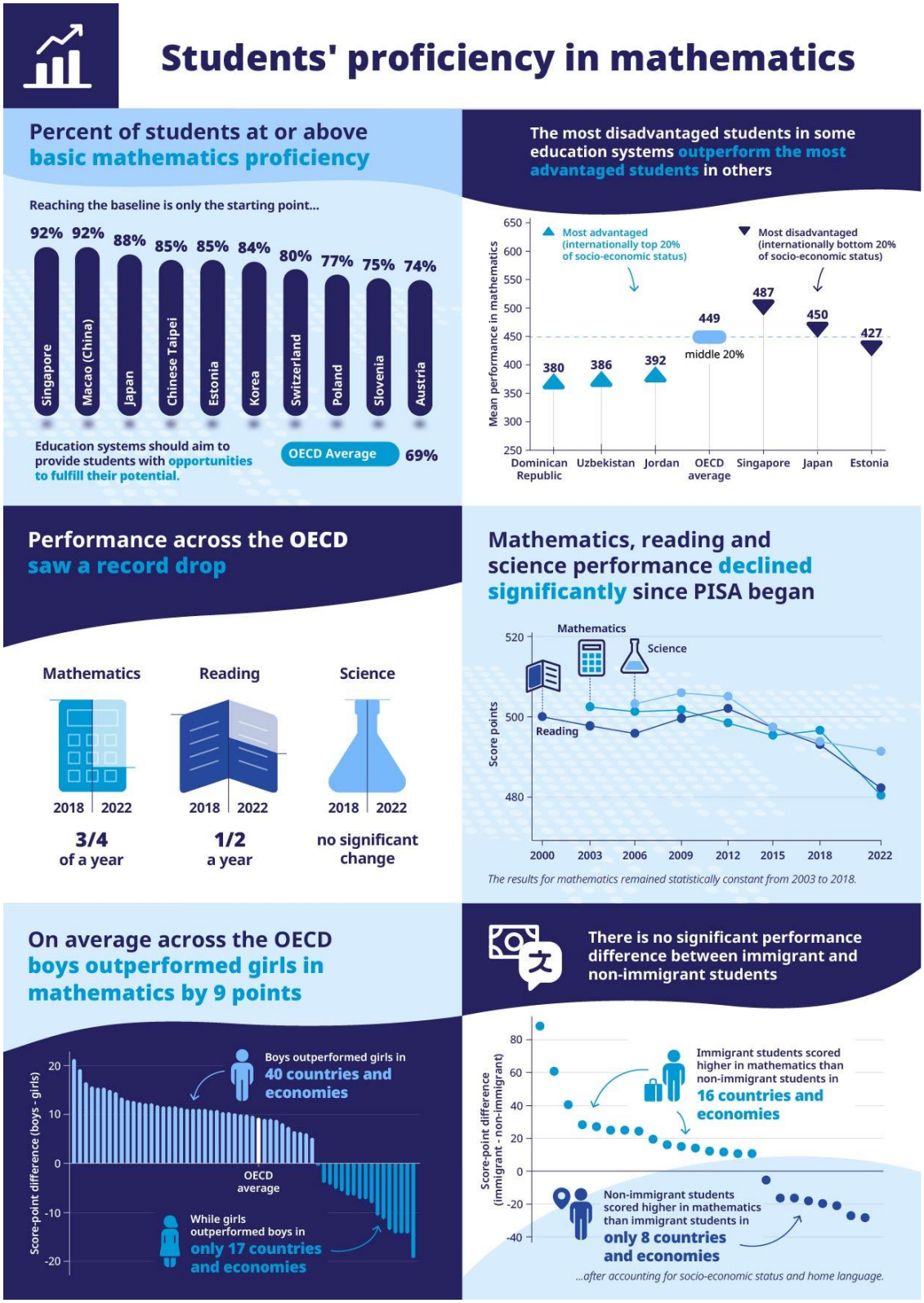
	Percentage of immigrant students	Performance in mathematics			Score-point difference in mathematics performance associated with immigrant background	
		Non-immigrant students	Second-generation immigrant students[1]	First-generation immigrant students[2]	After accounting for students' socio-economic status	After accounting for students' socio-economic status and language spoken at home
	%	Mean score	Mean score	Mean score	Score dif.	Score dif.
Latvia*	3.3	484	491	496	3	8
Colombia	2.9	387	c	366	**-22**	**-22**
Thailand	2.5	397	364	366	-12	-10
Hungary	2.2	474	499	462	7	12
Paraguay	2.1	342	352	363	10	19
Philippines	2.0	359	278	319	**-78**	**-74**
North Macedonia	2.0	393	341	366	**-44**	**-39**
Lithuania	1.8	477	453	479	-14	-5
Slovak Republic	1.8	467	459	454	-16	17
Moldova	1.8	416	418	378	**-18**	-17
Türkiye	1.7	455	c	410	**-55**	**-44**
Uruguay	1.6	411	c	425	-10	-7
Malaysia	1.5	411	387	c	-15	-16
Mexico	1.5	398	352	325	**-56**	**-52**
Jamaica*	1.2	383	c	c	**-38**	**-32**
Peru	1.2	394	c	388	**-31**	**-31**
Poland	1.2	492	c	435	**-45**	-30
Georgia	1.1	396	341	374	**-40**	-32
Bulgaria	1.1	424	c	413	-34	-22
Albania	1.1	375	c	c	**-52**	**-51**
Uzbekistan	1.0	365	336	c	**-30**	**-31**
Guatemala	0.8	350	c	c	-23	-21
Japan	0.7	537	c	c	-29	12
El Salvador	0.7	346	c	c	**-29**	**-25**
Morocco	0.7	367	c	324	**-59**	**-58**
Romania	0.6	431	c	c	**-44**	**-33**
Brazil	0.5	384	c	c	**-46**	**-31**
Indonesia	0.4	367	303	c	**-88**	**-89**
Korea	0.4	529	c	c	c	c
Cambodia	0.4	340	c	c	c	c
Mongolia	0.4	427	c	c	c	c
Viet Nam	0.1	471	c	c	c	c
Macao (China)	60.3	543	558	564	**26**	**25**
Hong Kong (China)*	39.5	547	542	527	**7**	**14**
Cyprus	19.5	424	419	439	**20**	**10**
Baku (Azerbaijan)	4.4	404	399	385	-11	-10
Palestinian Authority	2.2	368	359	329	**-32**	**-29**
Kosovo	1.4	358	340	c	**-17**	**-17**
Ukrainian regions (18 of 27)	0.9	439	c	c	-14	-18
Chinese Taipei	0.7	549	c	c	**-56**	**-47**

1. Second-generation immigrant students are those born in the country of assessment but whose parent(s) were born in another country. 2. First-generation students immigrant students are those born outside the country of assessment and whose parents were also born in another country. Notes: Values that are statistically significant are marked in bold (see Annex A3). * Caution is required when interpreting estimates because one or more PISA sampling standards were not met (see Reader's Guide, Annexes A2 and A4). *Countries and economies are ranked in descending order of the percentage of immigrant students.* Source: OECD, PISA 2022 Database, Tables I.B1.7.1, I.B1.7.17 and I.B1.7.53.

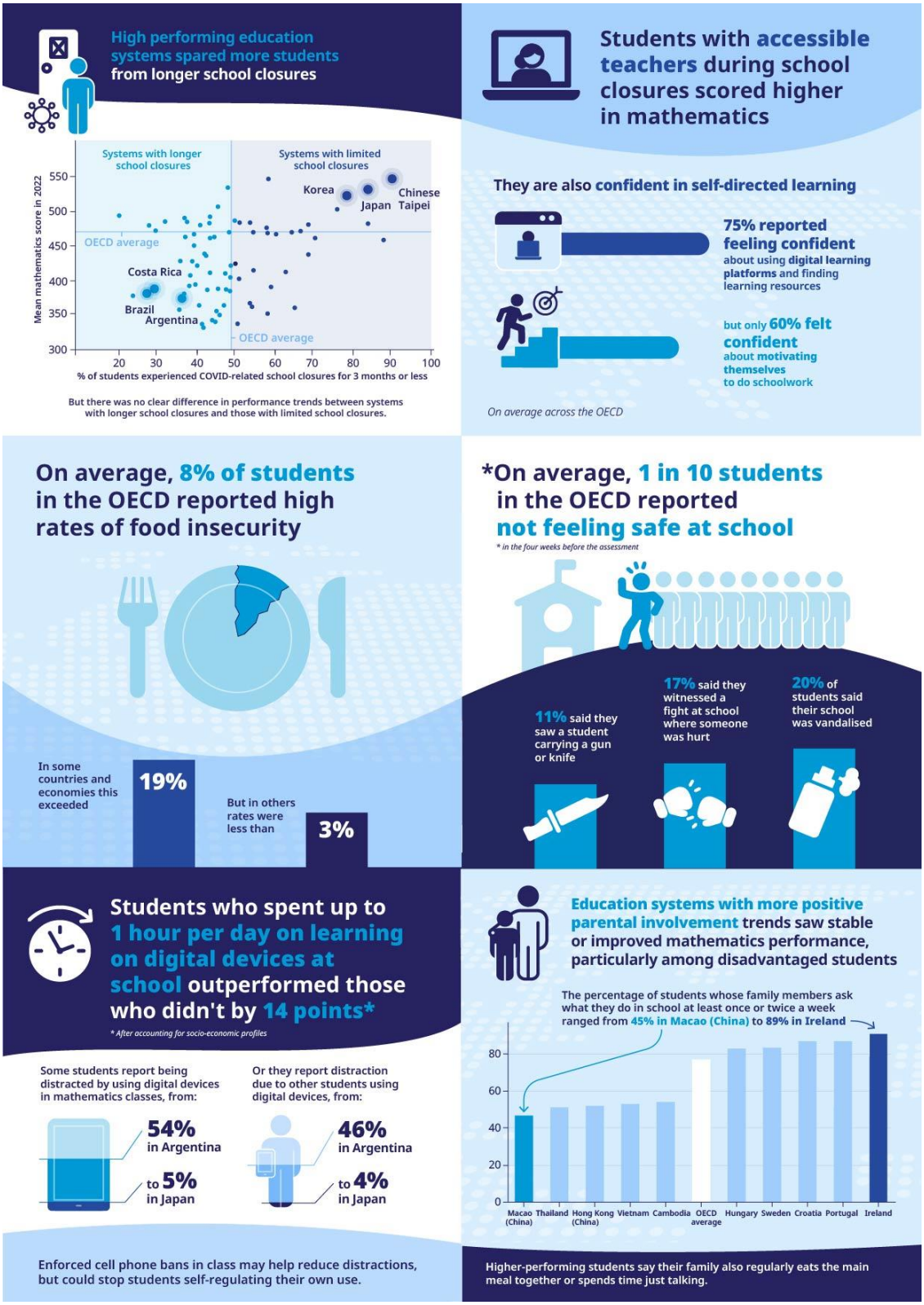
Data for all snapshot tables is available on line:

StatLink https://stat.link/d84fig

Infographic 1. PISA 2022 key results [1/2]



Infographic 2. PISA 2022 key results [2/2]



What is PISA?

OECD's Programme for International Student Assessment (PISA)

What should citizens know and be able to do? In response to that question and to the need for internationally comparable evidence on student performance, the Organisation for Economic Co-operation and Development (OECD) launched the Programme for International Student Assessment (PISA) in 1997 and the first assessment was conducted in 2000.

PISA is a triennial survey of 15-year-old students around the world that assesses the extent to which they have acquired key knowledge and skills essential for full participation in social and economic life. PISA assessments do not just ascertain whether students near the end of their compulsory education can reproduce what they have learned; they also examine how well students can extrapolate from what they have learned and apply their knowledge in unfamiliar settings, both in and outside of school.

While the eighth assessment was originally planned for 2021, the PISA Governing Board postponed the assessment to 2022 because of the many difficulties education systems faced due to the COVID-19 pandemic.

What is unique about PISA?

PISA is unique because of its:

- **policy orientation**, which links data on student learning outcomes with data on students' backgrounds and attitudes towards learning, and with key aspects that shape their learning, in and outside of school; by doing so, PISA can highlight differences in performance and identify the characteristics of students, schools and education systems that perform well
- **innovative concept of student competency**, which refers to students' capacity to apply their knowledge and skills in key areas, and to analyse, reason and communicate effectively as they identify, interpret and solve problems in a variety of situations
- **relevance to lifelong learning**, as PISA asks students to report on their motivation to learn, their beliefs about themselves, and their learning strategies
- **regularity**, which enables countries to monitor their progress in meeting key learning objectives
- **breadth of coverage**, which, in PISA 2022, encompassed 37 OECD countries and 44 partner countries and economies.

Which countries and economies participate in PISA?

PISA is used as an assessment tool in many regions around the world. It was implemented in 43 countries and economies in the first assessment (32 in 2000 and 11 in 2002), 41 in the second assessment (2003), 57 in the third assessment (2006), 75 in the fourth assessment (65 in 2009 and 10 in 2010), 65 in the fifth assessment (2012), 72

in the sixth assessment (2015) and 79 in the seventh assessment (2018). In 2022, 81 countries and economies participated in PISA.

Figure 1. Map of PISA countries and economies

OECD member countries in PISA 2022

Australia
Austria
Belgium
Canada
Chile
Colombia
Costa Rica
Czech Republic
Denmark
Estonia
Finland
France
Germany
Greece
Hungary
Iceland
Ireland
Israel
Italy
Japan
Korea
Latvia
Lithuania
Mexico
Netherlands
New Zealand
Norway
Poland
Portugal
Slovak Republic
Slovenia
Spain
Sweden
Switzerland
Türkiye
United Kingdom
United States

Partner countries and economies in PISA 2022

Albania
Argentina
Baku (Azerbaijan)
Brazil
Brunei Darussalam
Bulgaria
Cambodia
Croatia
Cyprus
Dominican Republic
El Salvador
Georgia
Guatemala
Hong Kong (China)
Indonesia
Jamaica
Jordan
Kazakhstan
Kosovo
Macao (China)
Malaysia
Malta
Republic of Moldova
Mongolia
Montenegro
Morocco
North Macedonia
Palestinian Authority
Panama
Paraguay
Peru
Philippines
Qatar
Romania
Saudi Arabia
Serbia
Singapore
Chinese Taipei
Thailand
Ukraine
United Arab Emirates
Uruguay
Uzbekistan
Viet Nam

Countries and economies in previous cycles

Algeria
Azerbaijan
Beijing (China)
Belarus
Bosnia and Herzegovina
Guangdong (China)
Himachal Pradesh (India)
Jiangsu (China)
Kyrgyzstan
Lebanon
Liechtenstein
Luxembourg
Mauritius
Miranda (Venezuela)
Russian Federation
Shanghai (China)
Tamil Nadu (India)
Trinidad and Tobago
Tunisia
Zhejiang (China)

First-time participants include Cambodia, El Salvador, Guatemala, Jamaica, Mongolia, the Palestinian Authority, Paraguay and Uzbekistan, while Cambodia, Guatemala and Paraguay participated in the PISA for Development programme. Chinese provinces/municipalities (Beijing, Shanghai, Jiangsu and Zhejiang) and Lebanon are

participants in PISA 2022 but were unable to collect data because schools were closed during the intended data collection period.

Key features of PISA 2022

The content

The PISA 2022 survey focused on mathematics, with reading, science and creative thinking as minor areas of assessment. In each round of PISA, one subject is tested in detail, taking up nearly half of the total testing time. The main subject in 2022 was mathematics, as it was in 2012 and 2003. Reading was the main subject in 2000, 2009 and 2018, science was the main subject in 2006 and 2015.

With this alternating schedule, a thorough analysis of achievement in each of the three core subjects is presented every nine (or 10) years; and an analysis of trends is offered every three (or four) years. As this cycle was postponed from 2021 to 2022 due to the COVID-19 pandemic, this cycle offers results one year later than previous cycles.

Creative thinking was assessed as an innovative domain for the first time in PISA 2022.

The *PISA 2022 Assessment and Analytical Framework* (OECD, 2023[1]) presents definitions and more detailed descriptions of the subjects assessed in PISA 2022:

- Mathematics is defined as students' capacity to reason mathematically and to formulate, employ and interpret mathematics to solve problems in a variety of real-world contexts. It includes concepts, procedures, facts and tools to describe, explain and predict phenomena. It helps individuals make well-founded judgements and decisions, and become constructive, engaged and reflective 21st-century citizens.
- Reading is defined as students' capacity to understand, use, evaluate, reflect on and engage with texts in order to achieve one's goals, develop one's knowledge and potential, and participate in society.
- Science literacy is defined as students' ability to engage with science-related issues, and with the ideas of science, as a reflective citizen. A scientifically literate person is willing to engage in reasoned discourse about science and technology, which requires the competencies to explain phenomena scientifically, evaluate and design scientific enquiry, and interpret data and evidence scientifically.
- Creative thinking is defined as students' ability to engage productively in the generation, evaluation and improvement of ideas that can result in original and effective solutions, advances in knowledge and impactful expressions of imagination.

PISA 2022 also included an assessment of young people's financial literacy, which was optional for countries and economies.

The students

Some 690 000 students took the assessment in 2022, representing about 29 million 15-year-olds in the schools of the 81 countries and economies.

PISA students are aged between 15 years 3 months and 16 years 2 months at the time of the assessment, and they have completed at least 6 years of formal schooling. Using this age across countries and over time allows PISA to consistently compare the knowledge and skills of individuals born in the same year who are still in school at age 15, despite the diversity of their education histories in and outside of school. They can be enrolled in any type of institution, participate in full-time or part-time education, in academic or vocational programmes, and attend public or private schools or foreign schools within the country.

The population of PISA-participating students is defined by the PISA Technical Standards as are the students who are excluded from participating (see Annex A2). The overall exclusion rate within a country is required to be below 5% to ensure that, under reasonable assumptions, any distortions in national mean scores would remain within plus

or minus five score points, i.e. typically within the order of magnitude of two standard errors of sampling. Exclusion could take place either through the schools that participated or the students who participated within schools. There are several reasons why a school or a student could be excluded from PISA. Schools might be excluded because they are situated in remote regions and are inaccessible, because they are very small, or because of organisational or operational factors that precluded participation. Students might be excluded because of intellectual disability or limited proficiency in the language of the assessment.

The assessment

As was done in 2015 and 2018, computer-based tests were used in most countries and economies in PISA 2022, with assessments lasting a total of two hours for each student. In mathematics and reading, a multi-stage adaptive approach was applied in computer-based tests whereby students were assigned a block of test items based on their performance in preceding blocks.

Test items were a mixture of multiple-choice questions and questions requiring students to construct their own responses. The items were organised in groups based on a passage setting out a real-life situation. More than 15 hours of test items for reading, mathematics, science and creative thinking were covered, with different students taking different combinations of test items.

There were six different kinds of test forms representing various combinations of two of the four domains (i.e. the three core domains, plus the innovative domain). Typically, within each country/economy, 94% of students received test forms covering 60 minutes of mathematics as the major domain, and another 60 minutes of one of the three minor or innovative domains (reading, science or creative thinking). In addition, 6% of students received test forms composed of two minor domains. Each test form was completed by enough students to allow for estimations of proficiency and psychometric analyses of all items by students in each country/economy and in relevant subgroups within a country/economy, such as boys and girls, or students from different social and economic backgrounds.

In addition, PISA 2022 retained a paper-based version of the assessment that included only trend items that had been used in prior paper-based assessments. This paper-based assessment was implemented in four countries: Cambodia, Guatemala, Paraguay and Viet Nam.

The assessment of financial literacy was offered again in PISA 2022 as an optional computer-based test. It was based on a revised framework based on the PISA 2022 updated framework. The cognitive instruments included trend items and a set of new interactive items that were developed specifically for PISA 2022.

The questionnaires

Students answered a background questionnaire, which took about 35 minutes to complete. The questionnaire sought information about the students' attitudes, dispositions and beliefs, their homes, and their school and learning experiences. School principals completed a questionnaire that covered school management and organisation, and the learning environment. Both students and schools responded to items in the Global Crises Module in their respective questionnaires. These items aimed to elicit their perspectives on how learning was organised when schools were closed because of the COVID-19 pandemic.

Some countries/economies also distributed additional questionnaires to elicit more information. These included: a questionnaire for teachers asking about themselves and their teaching practices; and a questionnaire for parents asking them to provide information about their perceptions of and involvement in their child's school and learning.

Countries/economies could also choose to distribute two other optional questionnaires for students: a questionnaire about students' familiarity with computers and a questionnaire about students' well-being. A financial literacy questionnaire was also distributed to the students in the countries/economies that conducted the optional financial literacy assessment.

Where can you find the results?

The initial PISA 2022 results are released in five volumes:

- **Volume I: The State of Learning and Equity in Education** (OECD, 2023[2]) presents two of the main education outcomes: performance and equity. The volume examines countries' and economies' performance in mathematics, reading and science and how performance has changed over time. In addition, equity in education is analysed from the perspectives of inclusion and fairness, focusing on students' gender, socio-economic status and immigrant background.
- **Volume II: Learning During – and From – Disruption** (OECD, 2023[3]) examines various student-, school-, and system-level characteristics, and analyses how these are related to student outcomes, such as performance, equity and student well-being. The volume also presents data on how learning was organised when schools were closed because of COVID-19. These results can assist countries in building resilience in their education systems, schools and students so they are all better able to withstand disruptions in teaching and learning.
- **Volume III** (OECD, forthcoming[4]) is on creative thinking. This volume examines students' capacity to generate original and diverse ideas in the 66 countries and economies that participated in the innovative domain assessment for the PISA 2022 cycle. It explores how student performance and attitudes associated with creative thinking vary across and within countries, and with different student- and school-level characteristics. The chapter also offers an insight into students' participation in creative activities, how opportunities to engage in creative thinking vary across schools and socio-demographic factors, and how these are associated with different student outcomes including well-being.
- **Volume IV** (OECD, forthcoming[5]) is on financial literacy. This volume examines 15-year-old students' understanding about money matters in the 23 countries and economies that participated in this optional assessment. The volume explores how the financial literacy of 15-year-old students is associated with their competencies in other subjects and how it varies across socio-demographic factors. It also offers an overview of students' experiences with money, of their financial behavior and attitudes, and of exposure to financial literacy in school.
- **Volume V** (OECD, forthcoming[6]) on students' readiness for lifelong learning. This volume presents key aspects of students' preparedness to continue learning throughout their lives. These include students' attitudes towards mathematics, their social and emotional skills, and their aspirations for future education and a career.

References

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OECD (2023), *PISA 2022 Results (Volume I): The State of Learning and Equity in Education*. [2]

OECD (2023), *PISA 2022 Results (Volume II): Learning During – and From – Disruption*. [3]

OECD (forthcoming), *PISA 2022 Results (Volume III)*. [4]

OECD (forthcoming), *PISA 2022 Results (Volume IV)*. [5]

OECD (forthcoming), *PISA 2022 Results (Volume V)*. [6]

1 The state of learning and equity in education in 2022

This chapter summarises the major findings of PISA 2022, whose main subject was mathematics. It begins with countries'/economies' performance results, and situates 2022 results against longer-term trends in PISA performance. The chapter discusses PISA's definition of equity in education from the perspective of inclusiveness and fairness; how equitable education systems are in 2022; and how equity has evolved over the past decade, highlighting countries that have successfully combined strong performance with fair and inclusive systems. The chapter also comments on performance from the standpoint of students' gender and immigrant background.

For Australia, Canada, Denmark, Hong Kong (China), Ireland, Jamaica, Latvia, the Netherlands, New Zealand, Panama, the United Kingdom and the United States, caution is required when interpreting estimates because one or more PISA sampling standards were not met (see Reader's Guide, Annexes A2 and A4).

This is the first PISA assessment of 15-year-old students since the COVID-19 pandemic severely disrupted education around the world.

How did countries/economies perform? Eighteen countries and economies scored above the OECD average in PISA's three core subjects of mathematics, reading and science (Australia*, Canada*, the Czech Republic, Denmark*, Estonia, Finland, Hong Kong (China)*, Ireland*, Japan, Korea, Macao (China), New Zealand*, Poland, Singapore, Sweden, Switzerland, Chinese Taipei and the United Kingdom*).

In terms of top performance, Singapore, Macao (China), Chinese Taipei, Hong Kong (China)*, Japan and Korea (in order of performance) outdid all other countries and economies in mathematics, which was the focus subject of PISA 2022. Reading performance was led by Singapore, Ireland*, Japan, Korea, Chinese Taipei, Estonia and Macao (China) (in order of performance). In science, the highest-performing education systems are Singapore, Japan, Macao (China), Canada*, Chinese Taipei, Korea, Estonia and Hong Kong (China)* (in order of performance). Singapore scored significantly higher than all other countries/economies in mathematics (575 points), reading (543 points) and science (561 points).

The gap in performance between the highest- and lowest-performing countries is 153 score points in mathematics among OECD countries and 238 points among *all* education systems that took part in PISA 2022. Within education systems themselves, the score gap that separates the highest- and lowest-performing students (i.e. the difference between the 90th and the 10th percentile of performance) is 235 points on average across OECD countries. At 137 points, the gap is smallest in the Dominican Republic and widest in Chinese Taipei at 294.

PISA 2022: an unprecedented performance drop

The PISA 2022 results are unprecedented. Mean performance in OECD countries fell by 15 points in mathematics and by 10 score points in reading. This is roughly the same as half a year's worth of learning in reading and three-quarters of a school year in mathematics. In contrast, average performance in science did not alter significantly.

It is important to look at the context. In two decades of PISA tests, the OECD average score has never changed by more than four points in mathematics or five points in reading between consecutive assessments. This is what makes 2022 PISA results so unique. The dramatic fall in performance suggests a negative shock affecting many countries at the same time COVID-19 would appear to be an obvious factor.

However, take a closer look at the data. Trend analysis of PISA results before 2018 reveal that performance in reading and science began to decline well before the pandemic. In these subjects, performance peaked in 2012 and 2009, respectively, before dipping. This indicates that longer-term issues are also at play.

It is worth mentioning that some countries are bucking the trend of long-term decline: Colombia, Macao (China), Peru and Qatar improved in all three subjects on average since they began to take part in PISA. In many other countries/economies, student performance has remained stable over time.

A level playing field for all students: inclusive and fair learning

PISA 2022 is about much more than educational excellence. It is also about equity in education, namely, that all students, regardless of background, are given a fair chance to reach their full potential.

In a highly *inclusive* education system all students can access good-quality education and achieve at least the baseline level of skills in mathematics, reading and science. How many 15-year-olds reached at least PISA's basic proficiency level in these subjects (Level 2)? Across OECD countries, an average of 69% of students have at least basic proficiency in math as well as about 75% of students in reading and science – 61% of students reached basic proficiency in all three core subjects. If 15-year-olds who are not covered by the PISA sample (e.g. because they

were not enrolled in school or were held back before Grade 7) are included, an average of 55% of 15-year-olds achieved baseline proficiency in all three core PISA subjects in OECD countries.

The *fairness* of an education system lies in the extent to which students, irrespective of their backgrounds, have an equal opportunity to reach their full potential. Because the focus subject of PISA 2022 is mathematics, it measures fairness by the difference in students' mathematics performance that can be explained by their socio-economic status. Fairness can also be captured by looking at gender or immigration gaps in performance.

PISA 2022 finds that the country or economy students are educated in makes a difference in how they perform. Some 31% of differences in student performance are due to differences in countries' education systems – mainly in how they are organised, financed and use their resources.

Analysis consistently shows that advantaged students performed better than their disadvantaged peers in all countries/economies in 2022. However, some systems are doing a better job at supporting widespread student success. For example, disadvantaged students in Macao (China) outperformed even the most advantaged students in many other PISA-participating countries and economies.

Per capita GDP gives a rough sense of the magnitude of financing education systems can call upon: Some 62% of the difference in countries'/economies' mean scores is related to per capita GDP (47% in OECD countries). Even more pertinently, spending per student accounts for 54% of the gap in mean performance between countries/economies (51% in OECD countries).

As spending per student increases, so does a country's mean performance. But only up to a point. Above USD 75 000 per student, the two begin to decouple. Top-performing countries and economies in PISA 2022 differ markedly in their spending per student. What an education system does with its money is important.

Student socio-economic background and performance

Turning to the students themselves, what insights has PISA 2022 revealed about their backgrounds that can explain their performances? First off, socio-economically advantaged students scored 93 points more in mathematics than their disadvantaged peers on average across OECD countries. The performance gap related to students' socio-economic status is widest in Romania and the Slovak Republic, followed by Hungary, Israel and Chinese Taipei.

Disadvantaged students in OECD countries are seven times more likely on average than advantaged students to *not* achieve basic mathematics proficiency. The same is true for science. When it comes to reading, the odds of low performance are more than five times higher for disadvantaged students than their advantaged peers.

Countries and economies have their work cut out in assisting students from disadvantaged backgrounds to excel academically. A close examination of academically resilient students, who are high-performing despite their disadvantages, could provide valuable insights. On average across OECD countries, 10% of disadvantaged students scored in the top quarter of mathematics performance in their own countries in PISA 2022, and 11% in reading and science. Uzbekistan, Cambodia and Kosovo have the highest shares of academically resilient students.

The long view

If we look at the relationship between students' socio-economic profiles and their PISA performance from a decade ago, we see something interesting: the share of disadvantaged low performers was more or less the same between 2012 and 2018, on average across OECD countries, but shot up by nine percentage points between 2018 and 2022.

Trend analysis shows that the socio-economic gap in student performance widened very little over the last decade on average in the OECD zone. However, in eight countries/economies the gap has grown – seven of which are European (Estonia, Finland, the Netherlands*, Norway, Romania, Sweden and Switzerland; the non-European economy is Macao [China]).

What is widening the performance gap in these systems that is attributable to students' socio-economic backgrounds? It is not an improvement in advantaged students' performance but, rather, a decline in the performance of their less privileged counterparts.

Gender and immigrant background

Regarding gender, boys outperformed girls in mathematics by nine score points in PISA 2022 but girls surpassed boys in reading by 24 score points on average across OECD countries.

The gender gap in mathematics performance did not change between 2018 and 2022 in most countries/economies, typically because performance declined for both boys and girls.

Turning to students' immigrant background, PISA 2022 reveals interesting insights in its relationship with performance. At first glance, non-immigrant students tended to outperform immigrant students in all PISA subjects in most (but not all) countries. But students with an immigrant background are typically not as well-off as their non-immigrant peers – the share of disadvantaged students is almost 37% among immigrant students compared to 22% among non-immigrant students on average across OECD countries. And, an average of 52% of immigrant students communicate in a language at home that differs from the language of the PISA assessment in OECD countries. This is the case for only 4% of non-immigrant students.

However, when results are compared between immigrant and non-immigrant students of similar socio-economic and language background, it turns out that immigrant students *outperform* non-immigrant students in more countries/economies than where the opposite is true (that is, in countries/economies where at least 5% of the student population has an immigrant background). If policy compensates for immigrant students' disadvantage and language barriers (for example, by targeting educational resources to socio-economically disadvantaged immigrant students), countries/economies can significantly boost the performance of their immigrant students.

Education systems that combine strong performance with equity in education

Countries and economies can learn from solidly performing education systems that have high levels of inclusion and fairness, such as in Canada*, Denmark*, Finland, Hong Kong (China)*, Ireland*, Japan, Korea, Latvia*, Macao (China) and the United Kingdom*.

In all these countries/economies, the strength of the relationship between student socio-economic status and performance is weaker than the OECD average, meaning these systems have high fairness by socio-economic status. They are also highly inclusive in that their percentages of 15-year-olds reaching at least basic proficiency in mathematics, reading and science are above the OECD average. Furthermore, average mathematics, reading and science scores in all these countries are higher than the OECD average (except for Latvia* where the mean score in reading is not statistically significantly different from the OECD average).

Hong Kong (China)* and Macao (China) are particularly remarkable in being able to significantly overcome their students' socio-economic backgrounds to achieve very high levels of performance.

Volume II discusses resilient education systems and how they preserved equitable learning and students' well-being during the difficult years of the pandemic. PISA 2022 has found several features resilient systems have in common. These include shorter periods of school closure; fewer obstacles to remote learning; keeping schools safe; ensuring greater discipline; keeping parents involved in students' learning; tracking students later; reducing grade repetition; providing good-quality education staff and materials; encouraging peer-to-peer tutoring; and combining school autonomy with quality-assurance mechanisms.

Student performance and equity in education as covered in this volume

The first of five volumes reporting the main results of PISA 2022, this volume covers how students performed, and how fair and inclusive education systems in PISA-participating countries and economies are. The success of an education system is based on several key education outcomes. This volume focuses on two of these outcomes – performance and equity – and reports on whether education systems were able to combine high levels of student performance with equity in education. Figure I.1.1 summarises how student performance is covered in this volume and Figure I.1.2 summarises how equity in education is covered. As in previous PISA assessments, results from PISA 2022 show that strong performance and greater equity in education are not mutually exclusive. Successful education systems that achieve excellence and equity continue to be found in PISA 2022 despite the challenges that the COVID-19 pandemic brought to education all over the world.

Figure I.1.1. Student performance as covered in this volume

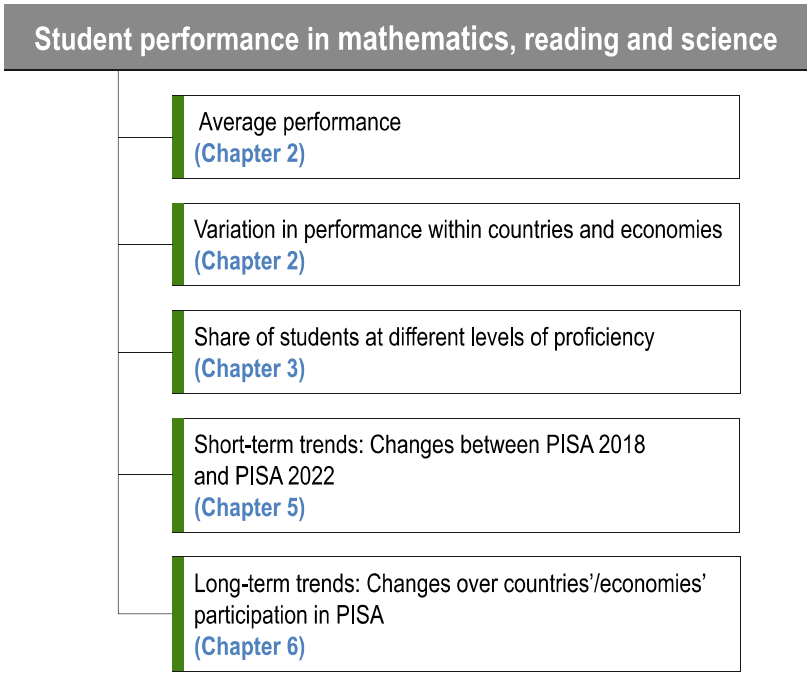
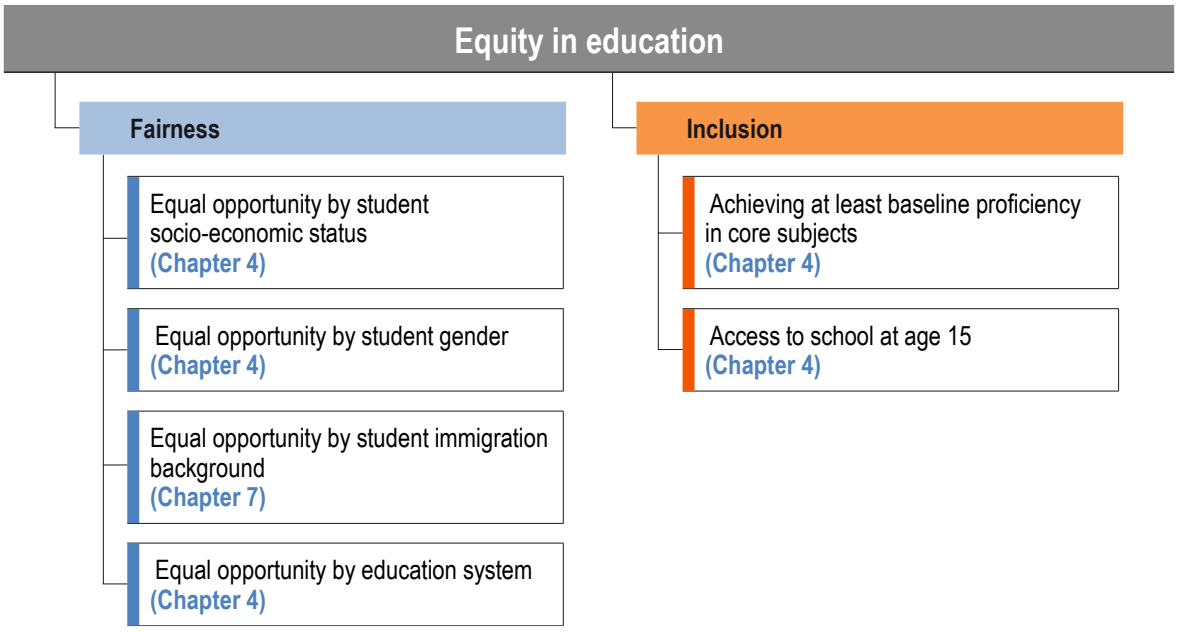


Figure I.1.2. Equity in education as covered in this volume



2 How did countries perform in PISA?

This chapter compares students' mean scores and the variation in their performance in mathematics, reading and science across the countries and economies that participated in the PISA 2022 assessment.

For Netherlands, Newfoundland and Labrador, Alberta, Hong Kong (China), Manitoba, United States, Latvia, Scotland, Quebec, New Zealand, United Kingdom, Northern Ireland, England, Wales, Denmark, Ontario, Panama, Nova Scotia, Australia, British Columbia, Ireland, Jamaica and Canada, caution is required when interpreting estimates because one or more PISA sampling standards were not met (see Reader's Guide, Annexes A2 and A4).

What the data tell us

- Singapore scored significantly higher, on average, than all other countries and economies that participated in PISA 2022 in mathematics (575 points), reading (543 points) and science (561 points).
- In mathematics, six East Asian education systems (Hong Kong [China]*, Japan, Korea, Macao [China], Singapore and Chinese Taipei) outperformed all other countries and economies. In reading, behind top-performing education system Singapore, Ireland* performed as well as Estonia, Japan, Korea and Chinese Taipei and better than 75 other countries and economies. In science, the highest performing countries are the same six East Asian countries/economies, Canada* and Estonia.
- The gap in performance between the highest- and lowest-performing countries is 153 score points in mathematics among OECD countries and 238 points among all education systems that took part in PISA 2022.
- The gap between the 90th percentile of mathematics performance (the score above which only 10% of students scored) and the 10th percentile of performance (the score below which only 10% of students scored) is more than 135 score points in all countries and economies. On average across OECD countries, 235 score points separate these extremes.

PISA measures student performance as the extent to which 15-year-old students near the end of their compulsory education have acquired the knowledge and skills that are essential for full participation in modern societies, particularly in the core domains of reading, mathematics, and science.

This chapter examines student performance in PISA 2022. In its first section, the chapter reports the average performance in mathematics, reading and science for each country and economy, comparing it to other countries and economies, and to the average performance across OECD countries. The second section examines variation in performance within and between countries and economies; for example, it shows how large the score gap that separates the highest-performing and lowest-performing students within each country and economy is. It also examines how variation in performance is related to the average performance across PISA-participating countries and economies. A student performance ranking among all countries and economies that took part in PISA 2022 is provided in the third section.

Trends in student performance over time are considered in Chapters 5 and 6 of this report. For short-term changes between PISA 2018 and 2022, see Chapter 5; for long-term trajectories in student performance over countries' entire participation in PISA, see Chapter 6.

Average performance in mathematics, reading and science

In PISA 2022, the mean mathematics score among OECD countries is 472 points; the mean score in reading is 476 points; and the mean score in science is 485 points. Singapore scored significantly higher than all other countries/economies that participated in PISA 2022 in mathematics (575 points), reading (543 points) and science (561 points).

Table I.2.1, Table I.2.2 and Table I.2.3 show each country's/economy's mean score and indicate pairs of countries/economies where the differences between the means are statistically significant[1]. For each country/economy shown in the middle column, the countries/economies whose mean scores are not statistically significantly different are listed in the right column. In these tables, countries and economies are divided into three broad groups: those whose mean scores are statistically around the OECD mean (highlighted in light grey); those whose mean scores are above the OECD mean (highlighted in blue); and those whose mean scores are below the OECD mean (highlighted in dark grey).

In mathematics, six East Asian education systems (Hong Kong [China]*, Japan, Korea, Macao [China], Singapore and Chinese Taipei) outperformed all other countries and economies (Table I.2.1). Another 17 countries also performed above the OECD average in mathematics, ranging from Estonia (mean score of 510 points) to New Zealand* (mean score of 479 points).

In reading, behind the top-performing education system (Singapore), Ireland* performed as well as Estonia, Japan, Korea and Chinese Taipei; and outperformed all other countries/economies (Table I.2.1). In addition to those six countries and economies, another 14 education systems performed above the OECD average in reading, ranging from Macao (China) (mean score of 510) to Italy (mean score of 482 points).

All countries and economies that performed above the OECD average in mathematics also performed above the OECD average in reading, except for Austria, Belgium, Latvia*, the Netherlands* and Slovenia. Similarly, all countries and economies that performed above the OECD average in reading also performed above the OECD average in mathematics, except for Italy and the United States*.

In science, the highest-performing education systems are Canada*, Estonia, Hong Kong (China)*, Japan, Korea, Macao (China), Singapore and Chinese Taipei (Table I.2.2). Finland performed as well as Canada* in science. In addition to these nine countries and economies, another 15 education systems also performed above the OECD average in science, ranging from Australia* (mean score of 507 points) to Belgium (mean score of 491 points).

All countries and economies that performed above the OECD average in science also performed above the OECD average in mathematics and reading, except for six countries/economies. Austria, Belgium, Latvia* and Slovenia performed above the OECD average in science and mathematics but not in reading; United States performed above the OECD average in science and reading but not in mathematics; and Germany performed above the OECD average in science but not in mathematics or reading. In both of these subjects, Germany's mean score is not statistically significantly different from the OECD average.

Eighteen countries and economies performed above the OECD average in mathematics, reading and science (Australia*, Canada*, the Czech Republic, Denmark*, Estonia, Finland, Hong Kong [China]*, Ireland*, Japan, Korea, Macao [China], New Zealand*, Poland, Singapore, Sweden, Switzerland, Chinese Taipei and the United Kingdom*).

The gap in performance between the highest- and lowest-performing countries is 153 score points in mathematics among OECD countries and 238 points among all education systems that took part in PISA 2022. In reading, the gap in performance between the highest- and lowest-performing countries is 107 score points among OECD countries and 214 points among all education systems that took part in PISA 2022. In science, the gap in performance between the highest- and lowest-performing countries is 137 score points among OECD countries and 214 points among all education systems that took part in PISA 2022.

Table I.2.1. Comparing countries' and economies' performance in mathematics [1/2]

Statistically significantly **above** the OECD average
Not statistically significantly different from the OECD average
Statistically significantly **below** the OECD average

Mean score	Comparison country/economy	Countries and economies whose mean score is not statistically significantly different from the comparison country's/economy's score
575	Singapore	
552	*Macao (China)*	*Chinese Taipei*
547	*Chinese Taipei*	*Macao (China)*, *Hong Kong (China)**
540	*Hong Kong (China)**	*Chinese Taipei*, Japan
536	Japan	*Hong Kong (China)**, Korea
527	Korea	Japan
510	Estonia	Switzerland
508	Switzerland	Estonia
497	Canada*	Netherlands*
493	Netherlands*	Canada*, Ireland*, Belgium, Denmark*, United Kingdom*, Poland, Austria, Australia*, Czech Republic
492	Ireland*	Netherlands*, Belgium, Denmark*, United Kingdom*, Poland, Austria, Australia*, Czech Republic
489	Belgium	Netherlands*, Ireland*, Denmark*, United Kingdom*, Poland, Austria, Australia*, Czech Republic, Slovenia, Finland
489	Denmark*	Netherlands*, Ireland*, Belgium, United Kingdom*, Poland, Austria, Australia*, Czech Republic, Finland
489	United Kingdom*	Netherlands*, Ireland*, Belgium, Denmark*, Poland, Austria, Australia*, Czech Republic, Slovenia, Finland, Latvia*
489	Poland	Netherlands*, Ireland*, Belgium, Denmark*, United Kingdom*, Austria, Australia*, Czech Republic, Slovenia, Finland, Latvia*
487	Austria	Netherlands*, Ireland*, Belgium, Denmark*, United Kingdom*, Poland, Australia*, Czech Republic, Slovenia, Finland, Latvia*, Sweden
487	Australia*	Netherlands*, Ireland*, Belgium, Denmark*, United Kingdom*, Poland, Austria, Czech Republic, Slovenia, Finland, Latvia*, Sweden
487	Czech Republic	Netherlands*, Ireland*, Belgium, Denmark*, United Kingdom*, Poland, Austria, Australia*, Slovenia, Finland, Latvia*, Sweden
485	Slovenia	Belgium, United Kingdom*, Poland, Austria, Australia*, Czech Republic, Finland, Latvia*, Sweden
484	Finland	Belgium, Denmark*, United Kingdom*, Poland, Austria, Australia*, Czech Republic, Slovenia, Latvia*, Sweden, New Zealand*
483	Latvia*	United Kingdom*, Poland, Austria, Australia*, Czech Republic, Slovenia, Finland, Sweden, New Zealand*
482	Sweden	Austria, Australia*, Czech Republic, Slovenia, Finland, Latvia*, New Zealand*, Germany
479	New Zealand*	Finland, Latvia*, Sweden, Lithuania, Germany, France
475	Lithuania	New Zealand*, Germany, France, Spain, Hungary, Portugal, Italy, Viet Nam
475	Germany	Sweden, New Zealand*, Lithuania, France, Spain, Hungary, Portugal, Italy, Viet Nam, Norway
474	France	New Zealand*, Lithuania, Germany, Spain, Hungary, Portugal, Italy, Viet Nam, Norway, United States*
473	Spain	Lithuania, Germany, France, Hungary, Portugal, Italy, Viet Nam, Norway, United States*
473	Hungary	Lithuania, Germany, France, Spain, Portugal, Italy, Viet Nam, Norway, United States*
472	Portugal	Lithuania, Germany, France, Spain, Hungary, Italy, Viet Nam, Norway, United States*
471	Italy	Lithuania, Germany, France, Spain, Hungary, Portugal, Viet Nam, Norway, Malta, United States*, Slovak Republic
469	Viet Nam	Lithuania, Germany, France, Spain, Hungary, Portugal, Italy, Norway, Malta, United States*, Slovak Republic, Croatia
468	Norway	Germany, France, Spain, Hungary, Portugal, Italy, Viet Nam, Malta, United States*, Slovak Republic, Croatia
466	Malta	Italy, Viet Nam, Norway, United States*, Slovak Republic, Croatia
465	United States*	France, Spain, Hungary, Portugal, Italy, Viet Nam, Norway, Malta, Slovak Republic, Croatia, Iceland, Israel
464	Slovak Republic	Italy, Viet Nam, Norway, Malta, United States*, Croatia, Iceland, Israel
463	Croatia	Viet Nam, Norway, Malta, United States*, Slovak Republic, Iceland, Israel
459	Iceland	United States*, Slovak Republic, Croatia, Israel
458	Israel	United States*, Slovak Republic, Croatia, Iceland, Türkiye
453	Türkiye	Israel
442	Brunei Darussalam	*Ukrainian regions (18 of 27)*, Serbia
441	*Ukrainian regions (18 of 27)*	Brunei Darussalam, Serbia
440	Serbia	Brunei Darussalam, *Ukrainian regions (18 of 27)*
431	United Arab Emirates	Greece, Romania
430	Greece	United Arab Emirates, Romania, Kazakhstan, Mongolia
428	Romania	United Arab Emirates, Greece, Kazakhstan, Mongolia
425	Kazakhstan	Greece, Romania, Mongolia
425	Mongolia	Greece, Romania, Kazakhstan, Bulgaria
418	*Cyprus*	Bulgaria, Moldova
417	Bulgaria	Mongolia, *Cyprus*, Moldova, Qatar, Chile
414	Moldova	*Cyprus*, Bulgaria, Qatar, Chile, Uruguay, Malaysia
414	Qatar	Bulgaria, Moldova, Chile
412	Chile	Bulgaria, Moldova, Qatar, Uruguay, Malaysia
409	Uruguay	Moldova, Chile, Malaysia, Montenegro

Countries and economies are ranked in descending order of the mean performance in mathematics.
Source: OECD, PISA 2022 Database, Table I.B1.2.1.

Table I.2.1. Comparing countries' and economies' performance in mathematics [2/2]

Statistically significantly **above** the OECD average
Not statistically significantly different from the OECD average
Statistically significantly **below** the OECD average

Mean score	Comparison country/economy	Countries and economies whose mean score is not statistically significantly different from the comparison country's/economy's score
409	**Malaysia**	Moldova, Chile, Uruguay, Montenegro
406	***Montenegro***	Uruguay, Malaysia
397	***Baku (Azerbaijan)***	Mexico, Thailand, Peru
395	**Mexico**	*Baku (Azerbaijan)*, Thailand, Peru, Georgia
394	**Thailand**	*Baku (Azerbaijan)*, Mexico, Peru, Georgia, Saudi Arabia, North Macedonia
391	**Peru**	*Baku (Azerbaijan)*, Mexico, Thailand, Georgia, Saudi Arabia, North Macedonia
390	**Georgia**	Mexico, Thailand, Peru, Saudi Arabia, North Macedonia, Costa Rica, Colombia
389	**Saudi Arabia**	Thailand, Peru, Georgia, North Macedonia, Costa Rica, Colombia
389	**North Macedonia**	Thailand, Peru, Georgia, Saudi Arabia, Costa Rica, Colombia
385	**Costa Rica**	Georgia, Saudi Arabia, North Macedonia, Colombia, Jamaica*
383	**Colombia**	Georgia, Saudi Arabia, North Macedonia, Costa Rica, Brazil, Argentina, Jamaica*
379	**Brazil**	Colombia, Argentina, Jamaica*
378	**Argentina**	Colombia, Brazil, Jamaica*
377	**Jamaica***	Costa Rica, Colombia, Brazil, Argentina
368	**Albania**	*Palestinian Authority*, Indonesia, Morocco, Uzbekistan
366	***Palestinian Authority***	Albania, Indonesia, Morocco, Uzbekistan, Jordan
366	**Indonesia**	Albania, *Palestinian Authority*, Morocco, Uzbekistan, Jordan
365	**Morocco**	Albania, *Palestinian Authority*, Indonesia, Uzbekistan, Jordan, Panama*
364	**Uzbekistan**	Albania, *Palestinian Authority*, Indonesia, Morocco, Jordan
361	**Jordan**	*Palestinian Authority*, Indonesia, Morocco, Uzbekistan, Panama*
357	**Panama***	Morocco, Jordan, *Kosovo*, Philippines
355	***Kosovo***	Panama*, Philippines
355	**Philippines**	Panama*, *Kosovo*
344	**Guatemala**	El Salvador, Dominican Republic
343	**El Salvador**	Guatemala, Dominican Republic
339	**Dominican Republic**	Guatemala, El Salvador, Paraguay, Cambodia
338	**Paraguay**	Dominican Republic, Cambodia
336	**Cambodia**	Dominican Republic, Paraguay

Countries and economies are ranked in descending order of the mean performance in mathematics.
Source: OECD, PISA 2022 Database, Table I.B1.2.1.

Table I.2.2. Comparing countries' and economies' performance in reading [1/2]

Statistically significantly **above** the OECD average
Not statistically significantly different from the OECD average
Statistically significantly **below** the OECD average

Mean score	Comparison country/economy	Countries and economies whose mean score is not statistically significantly different from the comparison country's/economy's score
543	Singapore	
516	Ireland*	Japan, Korea, *Chinese Taipei*, Estonia
516	Japan	Ireland*, Korea, *Chinese Taipei*, Estonia, *Macao (China)*
515	Korea	Ireland*, Japan, *Chinese Taipei*, Estonia, *Macao (China)*
515	*Chinese Taipei*	Ireland*, Japan, Korea, Estonia, *Macao (China)*
511	Estonia	Ireland*, Japan, Korea, *Chinese Taipei*, *Macao (China)*, Canada*, United States*
510	*Macao (China)*	Japan, Korea, *Chinese Taipei*, Estonia, Canada*, United States*
507	Canada*	Estonia, *Macao (China)*, United States*
504	United States*	Estonia, *Macao (China)*, Canada*, New Zealand*, *Hong Kong (China)**, Australia*, United Kingdom*
501	New Zealand*	United States*, *Hong Kong (China)**, Australia*
500	*Hong Kong (China)**	United States*, New Zealand*, Australia*, United Kingdom*
498	Australia*	United States*, New Zealand*, *Hong Kong (China)**, United Kingdom*
494	United Kingdom*	United States*, *Hong Kong (China)**, Australia*, Finland, Denmark*, Poland, Czech Republic
490	Finland	United Kingdom*, Denmark*, Poland, Czech Republic, Sweden
489	Denmark*	United Kingdom*, Finland, Poland, Czech Republic, Sweden, Switzerland, Italy
489	Poland	United Kingdom*, Finland, Denmark*, Czech Republic, Sweden, Switzerland, Italy
489	Czech Republic	United Kingdom*, Finland, Denmark*, Poland, Sweden, Switzerland
487	Sweden	Finland, Denmark*, Poland, Czech Republic, Switzerland, Italy, Austria, Germany
483	Switzerland	Denmark*, Poland, Czech Republic, Sweden, Italy, Austria, Germany, Belgium, Portugal
482	Italy	Denmark*, Poland, Sweden, Switzerland, Austria, Germany, Belgium, Portugal, Norway, Croatia, Latvia*, France, Israel
480	Austria	Sweden, Switzerland, Italy, Germany, Belgium, Portugal, Norway, Croatia, Latvia*, Spain, France, Israel, Hungary
480	Germany	Sweden, Switzerland, Italy, Austria, Belgium, Portugal, Norway, Croatia, Latvia*, Spain, France, Israel, Hungary, Lithuania
479	Belgium	Switzerland, Italy, Austria, Germany, Portugal, Norway, Croatia, Latvia*, Spain, France, Israel, Hungary
477	Portugal	Switzerland, Italy, Austria, Germany, Belgium, Norway, Croatia, Latvia*, Spain, France, Israel, Hungary, Lithuania
477	Norway	Italy, Austria, Germany, Belgium, Portugal, Croatia, Latvia*, Spain, France, Israel, Hungary, Lithuania
475	Croatia	Italy, Austria, Germany, Belgium, Portugal, Norway, Latvia*, Spain, France, Israel, Hungary, Lithuania
475	Latvia*	Italy, Austria, Germany, Belgium, Portugal, Norway, Croatia, Spain, France, Israel, Hungary, Lithuania
474	Spain	Austria, Germany, Belgium, Portugal, Norway, Croatia, Latvia*, France, Israel, Hungary, Lithuania
474	France	Italy, Austria, Germany, Belgium, Portugal, Norway, Croatia, Latvia*, Spain, Israel, Hungary, Lithuania, Slovenia
474	Israel	Italy, Austria, Germany, Belgium, Portugal, Norway, Croatia, Latvia*, Spain, France, Hungary, Lithuania, Slovenia
473	Hungary	Austria, Germany, Belgium, Portugal, Norway, Croatia, Latvia*, Spain, France, Israel, Lithuania, Slovenia
472	Lithuania	Germany, Portugal, Norway, Croatia, Latvia*, Spain, France, Israel, Hungary, Slovenia
469	Slovenia	France, Israel, Hungary, Lithuania, Viet Nam**
462	Viet Nam**	Slovenia, Netherlands*, Türkiye
459	Netherlands*	Viet Nam**, Türkiye
456	Türkiye	Viet Nam**, Netherlands*
448	Chile	Slovak Republic, Malta
447	Slovak Republic	Chile, Malta, Serbia
445	Malta	Chile, Slovak Republic, Serbia
440	Serbia	Slovak Republic, Malta, Greece, Iceland
438	Greece	Serbia, Iceland
436	Iceland	Serbia, Greece, Uruguay, Romania, *Ukrainian regions (18 of 27)*
430	Uruguay	Iceland, Brunei Darussalam, Romania, *Ukrainian regions (18 of 27)*
429	Brunei Darussalam	Uruguay, Romania, *Ukrainian regions (18 of 27)*
428	Romania	Iceland, Uruguay, Brunei Darussalam, *Ukrainian regions (18 of 27)*
428	*Ukrainian regions (18 of 27)*	Iceland, Uruguay, Brunei Darussalam, Romania
419	Qatar	United Arab Emirates, Mexico, Costa Rica
417	United Arab Emirates	Qatar, Mexico, Costa Rica, Jamaica*
415	Mexico	Qatar, United Arab Emirates, Costa Rica, Moldova, Brazil, Jamaica*, Colombia, Peru
415	Costa Rica	Qatar, United Arab Emirates, Mexico, Moldova, Brazil, Jamaica*, Colombia, Peru
411	Moldova	Mexico, Costa Rica, Brazil, Jamaica*, Colombia, Peru, Bulgaria
410	Brazil	Mexico, Costa Rica, Moldova, Jamaica*, Colombia, Peru, Bulgaria

** Caution is required when comparing estimates based on PISA 2022 with other countries/economies as a strong linkage to the international PISA reading scale could not be established (see Reader's Guide and Annex A4).
Countries and economies are ranked in descending order of the mean performance in reading.
Source: OECD, PISA 2022 Database, Table I.B1.2.2.

Table I.2.2. Comparing countries' and economies' performance in reading [2/2]

Statistically significantly **above** the OECD average
Not statistically significantly different from the OECD average
Statistically significantly **below** the OECD average

Mean score	Comparison country/economy	Countries and economies whose mean score is not statistically significantly different from the comparison country's/economy's score
410	**Jamaica***	United Arab Emirates, Mexico, Costa Rica, Moldova, Brazil, Colombia, Peru, Montenegro, Bulgaria, Argentina
409	**Colombia**	Mexico, Costa Rica, Moldova, Brazil, Jamaica*, Peru, Montenegro, Bulgaria, Argentina
408	**Peru**	Mexico, Costa Rica, Moldova, Brazil, Jamaica*, Colombia, Montenegro, Bulgaria
405	**Montenegro**	Jamaica*, Colombia, Peru, Bulgaria, Argentina
404	**Bulgaria**	Moldova, Brazil, Jamaica*, Colombia, Peru, Montenegro, Argentina
401	**Argentina**	Jamaica*, Colombia, Montenegro, Bulgaria
392	**Panama***	Malaysia, Kazakhstan
388	**Malaysia**	Panama*, Kazakhstan, Saudi Arabia
386	**Kazakhstan**	Panama*, Malaysia, Saudi Arabia
383	**Saudi Arabia**	Malaysia, Kazakhstan, *Cyprus*, Thailand, Mongolia
381	***Cyprus***	Saudi Arabia, Thailand, Mongolia
379	**Thailand**	Saudi Arabia, *Cyprus*, Mongolia, Guatemala, Georgia, Paraguay
378	**Mongolia**	Saudi Arabia, *Cyprus*, Thailand, Guatemala, Georgia, Paraguay
374	**Guatemala**	Thailand, Mongolia, Georgia, Paraguay
374	**Georgia**	Thailand, Mongolia, Guatemala, Paraguay
373	**Paraguay**	Thailand, Mongolia, Guatemala, Georgia
365	***Baku (Azerbaijan)***	El Salvador, Indonesia
365	**El Salvador**	*Baku (Azerbaijan)*, Indonesia, Albania
359	**Indonesia**	*Baku (Azerbaijan)*, El Salvador, North Macedonia, Albania, Dominican Republic
359	**North Macedonia**	Indonesia, Albania
358	**Albania**	El Salvador, Indonesia, North Macedonia
351	**Dominican Republic**	Indonesia, *Palestinian Authority*, Philippines
349	***Palestinian Authority***	Dominican Republic, Philippines
347	**Philippines**	Dominican Republic, *Palestinian Authority*, *Kosovo*, Jordan, Morocco
342	***Kosovo***	Philippines, Jordan, Morocco
342	**Jordan**	Philippines, *Kosovo*, Morocco
339	**Morocco**	Philippines, *Kosovo*, Jordan, Uzbekistan
336	**Uzbekistan**	Morocco
329	**Cambodia**	

** Caution is required when comparing estimates based on PISA 2022 with other countries/economies as a strong linkage to the international PISA reading scale could not be established (see Reader's Guide and Annex A4).
Countries and economies are ranked in descending order of the mean performance in reading.
Source: OECD, PISA 2022 Database, Table I.B1.2.2.

Table I.2.3. Comparing countries' and economies' performance in science [1/2]

Statistically significantly **above** the OECD average
Not statistically significantly different from the OECD average
Statistically significantly **below** the OECD average

Mean score	Comparison country/economy	Countries and economies whose mean score is not statistically significantly different from the comparison country's/economy's score
561	Singapore	
547	Japan	*Macao (China)*
543	*Macao (China)*	Japan, *Chinese Taipei*
537	*Chinese Taipei*	*Macao (China)*, Korea
528	Korea	*Chinese Taipei*, Estonia, *Hong Kong (China)**
526	Estonia	Korea, *Hong Kong (China)**
520	*Hong Kong (China)**	Korea, Estonia, Canada*
515	Canada*	*Hong Kong (China)**, Finland
511	Finland	Canada*, Australia*
507	Australia*	Finland, New Zealand*, Ireland*, Switzerland, United States*
504	New Zealand*	Australia*, Ireland*, Switzerland, Slovenia, United Kingdom*, United States*, Poland
504	Ireland*	Australia*, New Zealand*, Switzerland, Slovenia, United Kingdom*, United States*, Poland, Czech Republic
503	Switzerland	Australia*, New Zealand*, Ireland*, Slovenia, United Kingdom*, United States*, Poland, Czech Republic
500	Slovenia	New Zealand*, Ireland*, Switzerland, United Kingdom*, United States*, Poland, Czech Republic
500	United Kingdom*	New Zealand*, Ireland*, Switzerland, Slovenia, United States*, Poland, Czech Republic, Latvia*, Denmark*, Sweden, Germany
499	United States*	Australia*, New Zealand*, Ireland*, Switzerland, Slovenia, United Kingdom*, Poland, Czech Republic, Latvia*, Denmark*, Sweden, Germany , Austria, Belgium, Netherlands*
499	Poland	New Zealand*, Ireland*, Switzerland, Slovenia, United Kingdom*, United States*, Czech Republic, Latvia*, Denmark*, Sweden, Germany
498	Czech Republic	Ireland*, Switzerland, Slovenia, United Kingdom*, United States*, Poland, Latvia*, Denmark*, Sweden, German y, Austria
494	Latvia*	United Kingdom*, United States*, Poland, Czech Republic, Denmark*, Sweden, German y, Austria, Belgium, Netherlands*, France
494	Denmark*	United Kingdom*, United States*, Poland, Czech Republic, Latvia*, Sweden, German y, Austria, Belgium, Netherlands*, France
494	Sweden	United Kingdom*, United States*, Poland, Czech Republic, Latvia*, Denmark*, German y, Austria, Belgium, Netherlands*, France
492	Germany	United Kingdom*, United States*, Poland, Czech Republic, Latvia*, Denmark*, Sweden, Austria, Belgium, Netherlands*, France, Hungary, Lithuania, Portugal
491	Austria	United States*, Czech Republic, Latvia*, Denmark*, Sweden, German y, Belgium, Netherlands*, France, Hungary, Lithuania, Portugal
491	Belgium	United States*, Latvia*, Denmark*, Sweden, German y, Austria, Netherlands*, France, Hungary, Lithuania, Portugal
488	Netherlands*	United States*, Latvia*, Denmark*, Sweden, German y, Austria, Belgium, France, Hungary, Spain, Lithuania, Portugal, Croatia
487	France	Latvia*, Denmark*, Sweden, Germany, Austria, Belgium, Netherlands*, Hungary, Spain, Lithuania, Portugal, Croatia
486	Hungary	Germany, Austria, Belgium, Netherlands*, France, Spain, Lithuania, Portugal, Croatia
485	Spain	Netherlands*, France, Hungary, Lithuania, Portugal, Croatia
484	Lithuania	Germany, Austria, Belgium, Netherlands*, France, Hungary, Spain, Portugal, Croatia, Norway, Italy
484	Portugal	Germany, Austria, Belgium, Netherlands*, France, Hungary, Spain, Lithuania, Croatia, Norway, Italy
483	Croatia	Netherlands*, France, Hungary, Spain, Lithuania, Portugal, Norway, Italy
478	Norway	Lithuania, Portugal, Croatia, Italy, Türkiye, Viet Nam
477	Italy	Lithuania, Portugal, Croatia, Norway, Türkiye, Viet Nam
476	Türkiye	Norway, Italy, Viet Nam
472	Viet Nam	Norway, Italy, Türkiye, Malta, Israel
466	Malta	Viet Nam, Israel, Slovak Republic
465	Israel	Viet Nam, Malta, Slovak Republic
462	Slovak Republic	Malta, Israel
450	*Ukrainian regions (18 of 27)*	Serbia, Iceland, Brunei Darussalam, Chile
447	Serbia	*Ukrainian regions (18 of 27)*, Iceland, Brunei Darussalam, Chile, Greece
447	Iceland	*Ukrainian regions (18 of 27)*, Serbia, Brunei Darussalam, Chile, Greece
446	Brunei Darussalam	*Ukrainian regions (18 of 27)*, Serbia, Iceland, Chile, Greece
444	Chile	*Ukrainian regions (18 of 27)*, Serbia, Iceland, Brunei Darussalam, Greece
441	Greece	Serbia, Iceland, Brunei Darussalam, Chile, Uruguay
435	Uruguay	Greece, Qatar, United Arab Emirates, Romania
432	Qatar	Uruguay, United Arab Emirates, Romania
432	United Arab Emirates	Uruguay, Qatar, Romania
428	Romania	Uruguay, Qatar, United Arab Emirates, Kazakhstan, Bulgaria
423	Kazakhstan	Romania, Bulgaria
421	Bulgaria	Romania, Kazakhstan, Moldova, Malaysia
417	Moldova	Bulgaria, Malaysia, Mongolia, Colombia, Costa Rica
416	Malaysia	Bulgaria, Moldova, Mongolia, Colombia, Costa Rica, *Cyprus*, Mexico, Thailand

Countries and economies are ranked in descending order of the mean performance in science.
Source: OECD, PISA 2022 Database, Table I.B1.2.3.

Table I.2.3. Comparing countries' and economies' performance in science [2/2]

Statistically significantly **above** the OECD average
Not statistically significantly different from the OECD average
Statistically significantly **below** the OECD average

Mean score	Comparison country/economy	Countries and economies whose mean score is not statistically significantly different from the comparison country's/economy's score
412	Mongolia	Moldova, Malaysia, Colombia, Costa Rica, *Cyprus*, Mexico, Thailand, Peru, Argentina
411	Colombia	Moldova, Malaysia, Mongolia, Costa Rica, *Cyprus*, Mexico, Thailand, Peru, Argentina, Jamaica*
411	Costa Rica	Moldova, Malaysia, Mongolia, Colombia, *Cyprus*, Mexico, Thailand, Peru, Argentina, Jamaica*
411	*Cyprus*	Malaysia, Mongolia, Colombia, Costa Rica, Mexico, Thailand, Peru, Argentina, Jamaica*
410	Mexico	Malaysia, Mongolia, Colombia, Costa Rica, *Cyprus*, Thailand, Peru, Argentina, Jamaica*
409	Thailand	Malaysia, Mongolia, Colombia, Costa Rica, *Cyprus*, Mexico, Peru, Argentina, Brazil, Jamaica*
408	Peru	Mongolia, Colombia, Costa Rica, *Cyprus*, Mexico, Thailand, Argentina, Montenegro, Brazil, Jamaica*
406	Argentina	Mongolia, Colombia, Costa Rica, *Cyprus*, Mexico, Thailand, Peru, Montenegro, Brazil, Jamaica*
403	Montenegro	Peru, Argentina, Brazil, Jamaica*
403	Brazil	Thailand, Peru, Argentina, Montenegro, Jamaica*
403	Jamaica*	Colombia, Costa Rica, *Cyprus*, Mexico, Thailand, Peru, Argentina, Montenegro, Brazil
390	Saudi Arabia	Panama*
388	Panama*	Saudi Arabia, Georgia, Indonesia, *Baku (Azerbaijan)*
384	Georgia	Panama*, Indonesia, *Baku (Azerbaijan)*, North Macedonia
383	Indonesia	Panama*, Georgia, *Baku (Azerbaijan)*, North Macedonia
380	*Baku (Azerbaijan)*	Panama*, Georgia, Indonesia, North Macedonia, Albania, Jordan
380	North Macedonia	Georgia, Indonesia, *Baku (Azerbaijan)*, Albania
376	Albania	*Baku (Azerbaijan)*, North Macedonia, Jordan, El Salvador, Guatemala
375	Jordan	*Baku (Azerbaijan)*, Albania, El Salvador, Guatemala, *Palestinian Authority*
373	El Salvador	Albania, Jordan, Guatemala, *Palestinian Authority*, Paraguay, Morocco
373	Guatemala	Albania, Jordan, El Salvador, *Palestinian Authority*, Paraguay, Morocco
369	*Palestinian Authority*	Jordan, El Salvador, Guatemala, Paraguay, Morocco
368	Paraguay	El Salvador, Guatemala, *Palestinian Authority*, Morocco
365	Morocco	El Salvador, Guatemala, *Palestinian Authority*, Paraguay, Dominican Republic
360	Dominican Republic	Morocco, *Kosovo*, Philippines, Uzbekistan
357	*Kosovo*	Dominican Republic, Philippines, Uzbekistan
356	Philippines	Dominican Republic, *Kosovo*, Uzbekistan
355	Uzbekistan	Dominican Republic, *Kosovo*, Philippines
347	Cambodia	

Countries and economies are ranked in descending order of the mean performance in science.
Source: OECD, PISA 2022 Database, Table I.B1.2.3.

Box I.2.1. How is student mathematics anxiety related to their performance in mathematics?

Students who perform better in mathematics have, on average, lower levels of anxiety about mathematics. In PISA, this finding was first reported in 2012 (OECD, 2013[1]) and it is also found in PISA 2022.

As examined in this box, a negative association between mathematics performance and mathematics anxiety is found in every education system that took part in PISA 2022, without exceptions. At the system level, the cross-national association between average levels of mathematics anxiety and mean mathematics performance is also negative but more variation in anxiety levels exists among top-performing countries.

Furthermore, research suggests that positive attitudes towards mathematics and learning can help students reduce their levels of mathematics anxiety and its negative consequences on mathematics performance (Choe et al., 2019[2]; Dowker, Sarkar and Looi, 2016[3]; Carey et al., 2016[4]; Goetz et al., 2010[5]; Ashcraft and Kirk, 2001[6]). As shown in the second part of this box, a growth mindset – the belief that one's abilities and intelligence can be developed over time rather than being an invariant innate gift – is one of the positive attitudes towards learning that can alleviate mathematics anxiety.

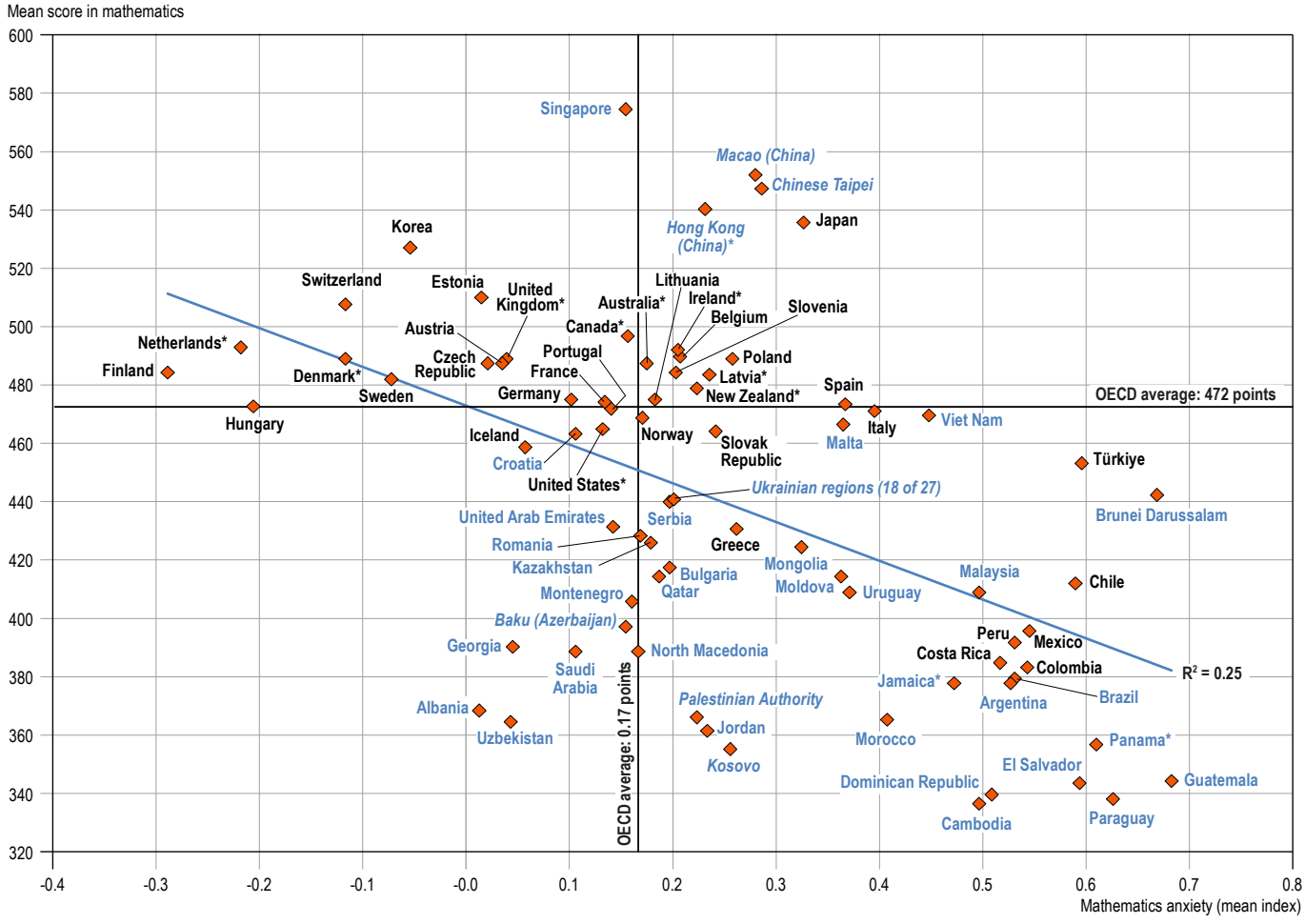
Mathematics anxiety in PISA 2022

To measure students' anxiety about mathematics, PISA 2022 asked students whether they agreed ("strongly disagree", "disagree", "agree", or "strongly agree") with the following six statements: "I often worry that it will be difficult for me in mathematics classes"; "I worry that I will get poor marks in mathematics"; "I get very tense when I have to do mathematics homework"; "I get very nervous doing mathematics problems"; "I feel helpless when doing a mathematics problem"; and "I feel anxious about failing in mathematics". Data from these items was combined to create the PISA index of mathematics anxiety (ANXMAT).

Within countries/economies, mathematics anxiety is negatively associated with student achievement in mathematics in every education system that took part in PISA 2022 regardless of student and school characteristics. On average across OECD countries, a one-point increase in the index of mathematics anxiety is associated with a decrease in mathematics achievement of 18 score points after accounting for students' and schools' socio-economic profile (Table I.B1.2.17).

Countries/economies with higher average levels of mathematics anxiety perform less well in mathematics. International differences in the index of mathematics anxiety account for about 25% of the variation in student performance in mathematics across all countries and economies that took part in PISA 2022 (Figure I.2.1).

Figure I.2.1. Mathematics anxiety and mean score in mathematics in PISA 2022



Note: Only countries and economies with available data are shown.
Source: OECD, PISA 2022 Database, Tables I.B1.2.1 and I.B1.2.16.

Mathematics anxiety is particularly high among countries/economies with low levels of performance in mathematics. The 17 countries/economies with the highest levels of mathematics anxiety in PISA 2022 (i.e. values higher than .47 in ANXMAT) performed below the OECD average in mathematics; out of those 17 countries/economies, 13 have a mean performance in mathematics below 400 points.

Conversely, the lowest levels of anxiety tend to be in countries whose mean score in mathematics is above the OECD average, most noticeably Denmark*, Finland, the Netherlands* and Switzerland (Figure I.2.1). Nevertheless, countries/economies with high levels of performance in mathematics differ widely in their levels of mathematics anxiety. Importantly, four out of the six East Asian countries/economies that outperformed all other countries/economies in mathematics in PISA 2022 show high levels of mathematics anxiety (Hong Kong [China]*, Japan, Macao [China] and Chinese Taipei); the exceptions are Korea and Singapore, where students show levels of mathematics anxiety similar to or lower than the OECD average.

Research has addressed anxiety as a multidimensional or multifaceted construct: sources of anxiety may be as diverse as its consequences (Zeidner et al., 2005[7]). Anxiety could have at least cognitive and somatic components, and could be further disentangled from test anxiety and other types of anxiety that may have a direct impact on student performance (Zeidner et al., 2005[7]). Treating anxiety as multidimensional may help to understand why, in some countries/economies, personal and situational aspects may affect anxiety differently (Putwain, Woods and Symes, 2010[8]), and more specifically, the relationship between anxiety and performance as measured by PISA. Further research is needed on how these individual factors and other cultural dimensions (Ho et al., 2000[9]; Zhang, Zhao and Kong, 2019[10]) interact and may differentially affect students' mathematics performance in PISA.

Growth mindset and mathematics anxiety

Growth mindset can help students overcome performance-related anxiety (Yeager and Walton, 2011[11]) potentially reducing its negative consequences on performance and, ultimately, well-being (OECD, 2021[12]; Yeager et al., 2019[13]). A growth mindset, as opposed to a fixed mindset, is the belief in the malleability of ability and intelligence, and is one possible explanation why some people fulfil their potential while others do not (Dweck, 2006[14]). People with a growth mindset are more likely to work to develop their skills and be motivated when experiencing drawbacks; by contrast, individuals with fixed mindsets (who believe that people are born with certain invariant characteristics that cannot be changed) tend to favour validation of their abilities, avoid challenges and stay within their comfort zone. One characteristic of students with a growth mindset is reduced anxiety about learning, which is linked to their positive view of failure and obstacles (Dweck and Yeager, 2019[15]).

PISA 2022 asked students whether they agreed (“strongly disagree”, “disagree”, “agree”, or “strongly agree”) with the following statement: “Your intelligence is something about you that you can’t change very much”. Students strongly disagreeing or disagreeing with the statement are considered to have a growth mindset.

PISA results show that students who reported having a growth mindset have less mathematics anxiety than students with a fixed mindset on average across OECD countries (difference of -0.13 points in the mathematics anxiety index) and in 42 out of 73 countries and economies with available data (Table I.BI.2.16). Furthermore, a growth mindset is positively associated with student performance in mathematics. Students who reported having a growth mindset score better in mathematics than students with a fixed mindset even after accounting for student and school socio-economic profile on average across OECD countries (difference of 18 score points) and in 57 countries and economies (Table I.BI.2.17).

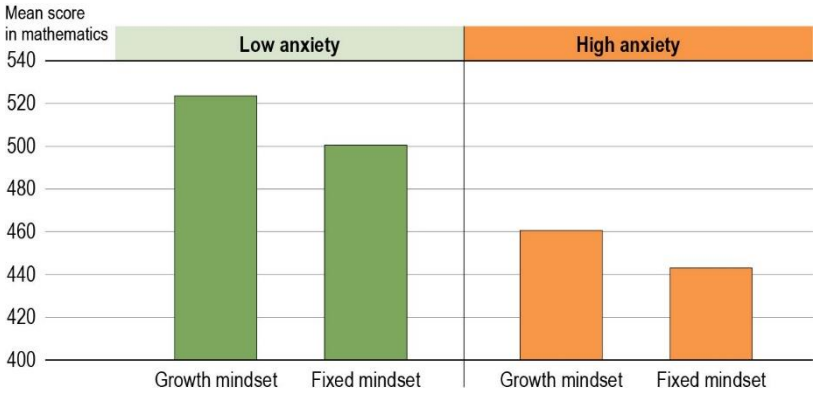
Mathematics anxiety and growth mindset are considered together in Figure I.2.2, which shows the OECD average score in mathematics for four groups of students: those with (i) high mathematics anxiety and growth mindset, (ii) high mathematics anxiety and fixed mindset, (iii) low mathematics anxiety and growth mindset, and (iv) low mathematics anxiety and fixed mindset. Students who were more anxious about mathematics scored better in mathematics if they had a growth mindset (461 score points) than if they had a fixed mindset (443 score points). Similarly, students who were less anxious about mathematics scored better if they had a growth mindset (523 score points) than if they had a fixed mindset (500 score points).

This OECD pattern is also observed in most countries with available data. In 54 out of 73 countries/economies, students with low anxiety performed better in math if they had a growth mindset rather than fixed mindset. Also, in 46 out of 73 countries/economies, students with high anxiety performed better in math if they had a growth mindset rather than fixed (Table I.BI.2.17).

This association holds even after accounting for student and school socio- economic profile (Table I.BI.2.17).

Figure I.2.2. Mathematics performance and anxiety in mathematics among students with fixed and growth mindsets

OECD Average



Note: Low/high anxiety are students in the bottom/top quarter of the distribution in the ANXMAT index in their own countries/economies.
Source: OECD, PISA 2022 Database, Table I.B1.2.17.

Policy implications

Mathematics anxiety can be diminished by means of mathematics training but also by improving positive attitudes towards mathematics and learning, including role models, further support in schools and fostering growth mindsets (Beilock et al., 2010[16]). To develop students' ability to tackle real-world problems and apply mathematical knowledge successfully, schools and education systems need to go beyond formal mathematics education. To deal head-on with important barriers to mathematics learning, it is important to understand and address students' attitudes and emotions about mathematics, and to develop positive students' mindsets and disposition towards learning challenges and effort.

Variation in performance within and between countries and economies

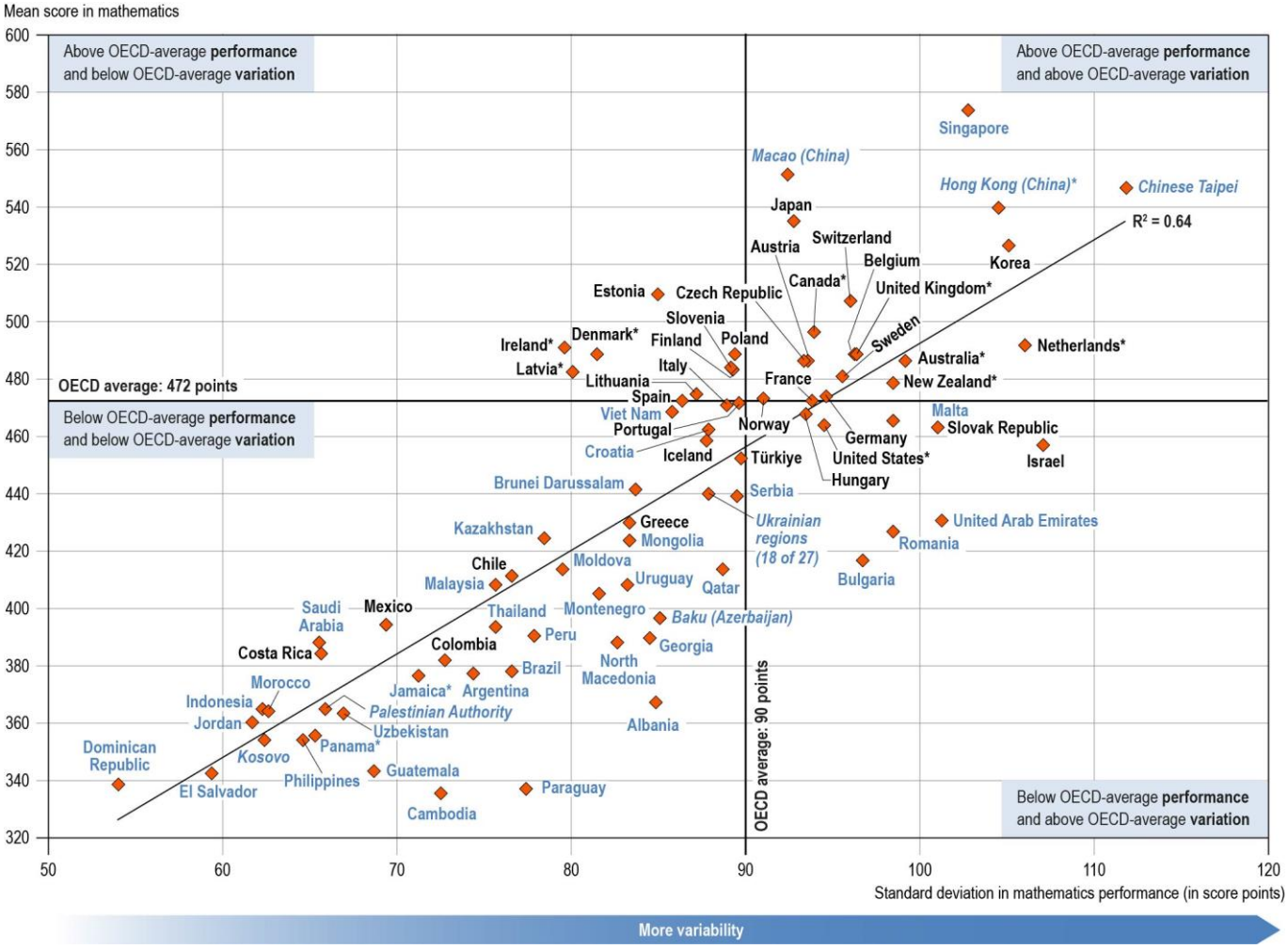
Variation in performance within countries

The Dominican Republic has the smallest variation in mathematics proficiency (54 score points) while several other countries and economies whose mean performance was below the OECD average also have small variations in performance[2]. Variation in student performance tends to be greater among high-performing than low-performing education systems. As shown in Figure I.2.3, there is a strong correlation between average performance in mathematics and variation in performance in mathematics. That said, this is not the case for all countries. For instance, Latvia* has a mean of 483 and a standard deviation of 80.

However, among countries that performed above the OECD average, Ireland*, Latvia* and Denmark* stand out for their relatively small variation in performance (standard deviation around 80 score points) (Figure I.2.3). Similarly, among countries that performed below the OECD average, Bulgaria, Israel, Malta, Romania, the Slovak Republic

and the United Arab Emirates, stand out for their relatively large variation in performance (standard deviation greater than 95 score points).

Figure I.2.3. Average performance in mathematics and variation in performance



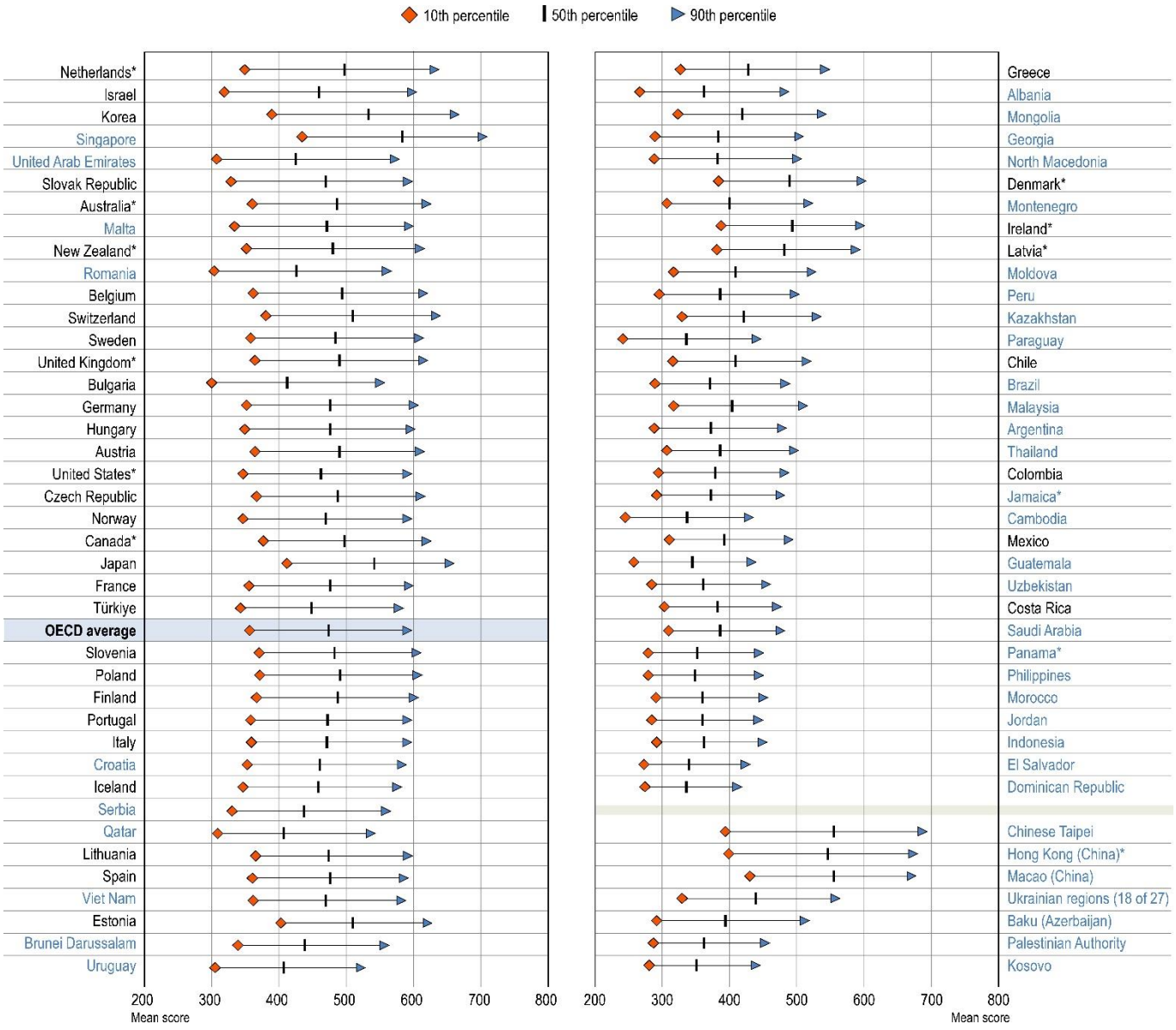
Source: OECD, PISA 2022 Database, Table I.B1.2.1.

Another measure of variation in performance within countries is the score gap that separates the highest- and lowest-performing students within a country (i.e. inter-decile range). In mathematics, the difference between the 90th percentile of performance (the score above which only 10% of students scored) and the 10th percentile of performance (the score below which only 10% of students scored) is more than 135 score points in all countries and economies; on average across OECD countries, 235 score points separate these extremes (Figure I.2.4).

The largest differences between top-performing and low-achieving students in mathematics are found in Israel, the Netherlands* and Chinese Taipei (Figure I.2.4). In these countries, the inter-decile range is 280 score points or more, which means that student performance in mathematics is highly unequal across 15-year-olds.

By contrast, the smallest differences between high- and low-achieving students are found among countries and economies with low (i.e. lower than 370 points) mean scores (the Dominican Republic, El Salvador, Indonesia, Jordan and Kosovo). In these countries, the 90th percentile of the mathematics distribution is below the average score across OECD countries.

Figure I.2.4. Mean score in mathematics at 10th, 50th and 90th percentile of performance distribution



Note: All differences between the 90th and the 10th percentiles are statistically significant (see Annex A3).
Countries and economies are ranked in descending order of the difference in mathematics performance between 90th percentile and 10th percentile.
Source: OECD, PISA 2022 Database, Table I.B1.2.1.

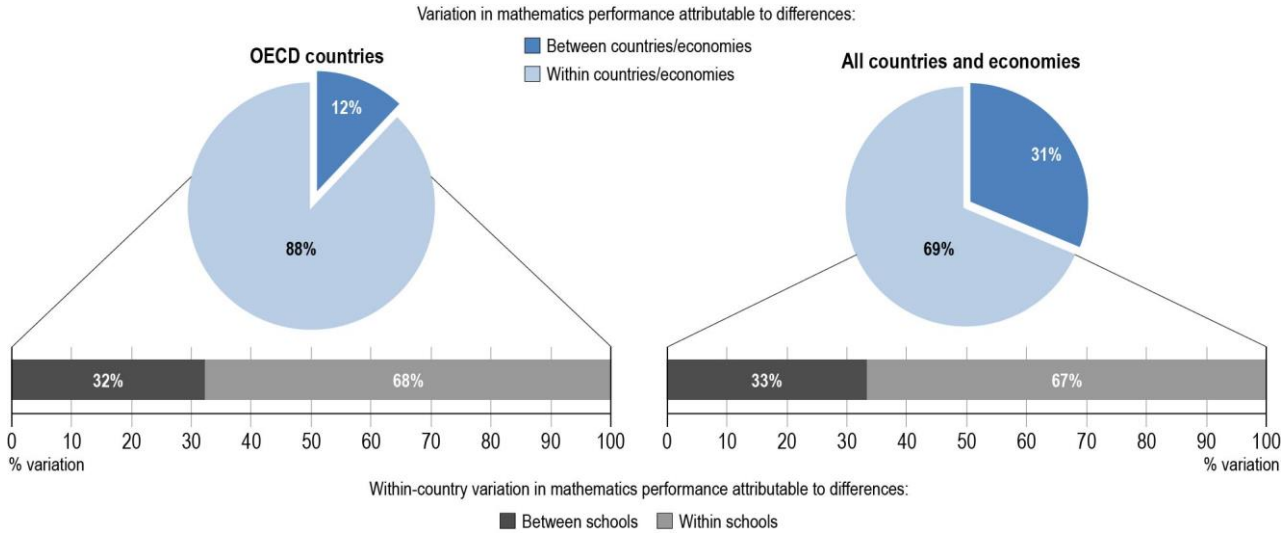
Performance differences among educational systems, schools and students

Student performance varies widely among 15-year-olds and that variation can be broken down into differences at the student, school and education system levels[3]. This analysis is important from a policy perspective. Pinpointing where differences in student performance lie enables education stakeholders to target policy[4]. For example, if a large percentage of the total variation in student performance is linked to differences in student performance between education systems, this means that education system characteristics (e.g. economic and social conditions, education policies) strongly influence student performance. Similarly, if differences between schools account for a significant part of the overall variation in performance within a country/economy, then differences in school characteristics are important for policy to consider.

In PISA 2022, about 31% of the variation in mathematics performance is linked to mean differences in student performance between participating education systems (Figure I.2.5) across all countries and economies. This means that the characteristics of education systems have a great deal of influence on student performance. As shown in Chapter 4, the economic and social conditions of different countries/economies, which are often beyond the control of education policy makers and educators, can influence student performance by means of, for example, wealthier countries spending more on education than mid- and low-income countries. On the other hand, it is education policy makers and educators who determine education policies and practices, including the organisation of schooling and learning, and the allocation of available resources across schools and students.

Across OECD countries, however, only 12% of the variation in mathematics performance is between education systems. In other words, the characteristics of education systems do not play an important role in explaining differences in student performance among OECD countries. This is likely because the economic and social conditions of OECD countries are very similar to each other. It is also possible that education policies and practices vary less across OECD countries than across all PISA-participating countries.

Figure I.2.5. Variation in mathematics performance between systems, schools and students

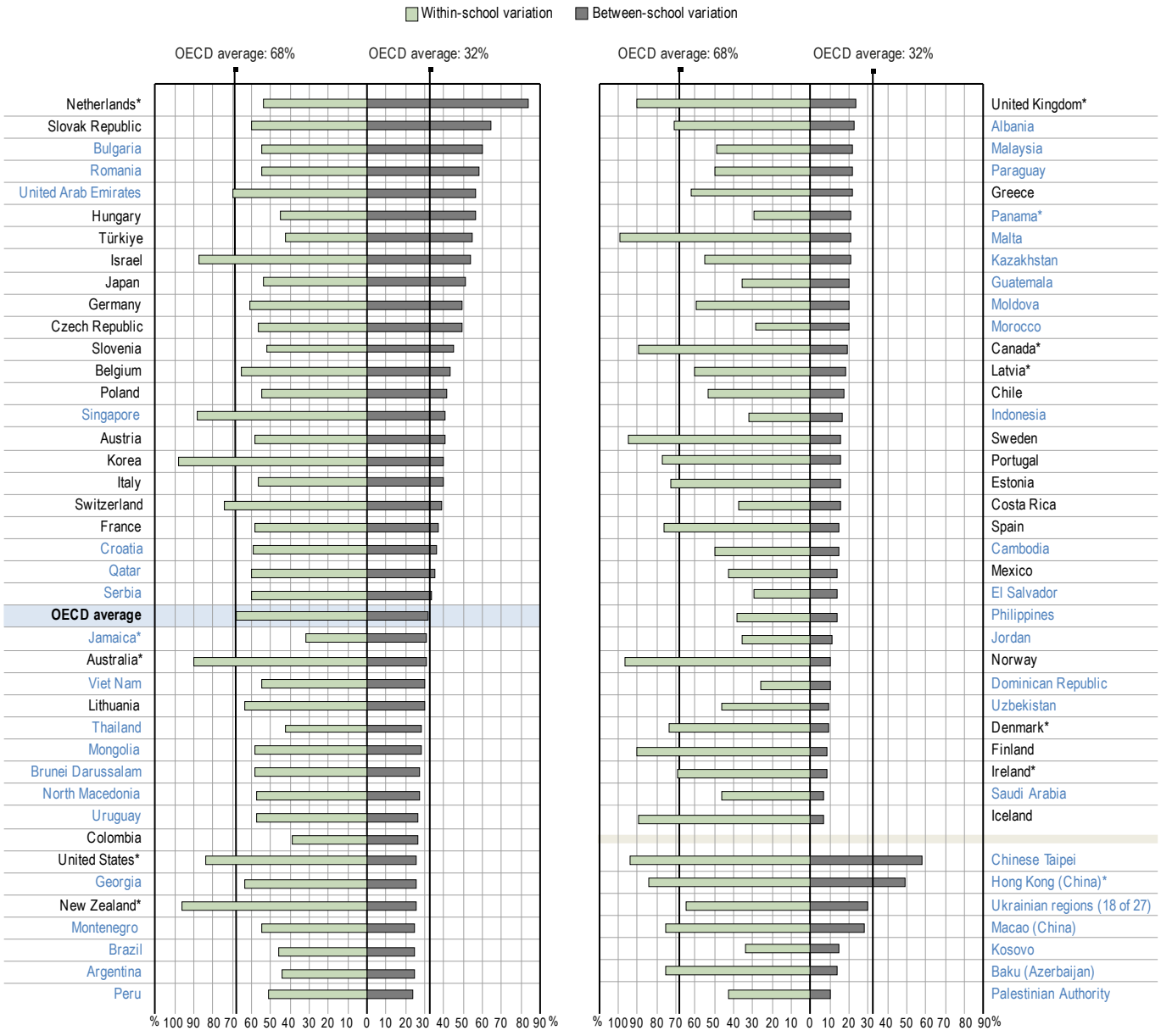


Source: OECD, PISA 2022 Database.

Out of the variation observed within countries in PISA 2022, 32% of the OECD average variation in mathematics performance is between schools (right side of Figure I.2.6); the remaining part of the variation (68%) is within schools (left side of the figure). This means that school characteristics do not play a dominant role in explaining student performance; instead, it is the characteristics of students themselves (i.e. their background, attitudes and behaviour, etc.), and the characteristics of different classrooms and different grades within schools that account for most of the overall variation in student performance.

The extent of between-school variation in mathematics performance differs widely across countries/economies. In six countries and economies between-school differences account for 10% or less of the total variation in performance (Iceland, Saudi Arabia, Ireland*, Finland, Denmark* and Uzbekistan, in ascending order). By contrast, in 10 other countries (Bulgaria, Hungary, Israel, Japan, the Netherlands*, Romania, the Slovak Republic, Chinese Taipei, Türkiye and the United Arab Emirates) differences between schools account for at least 50% of the total variation in the country's performance.

Figure I.2.6. Variation in mathematics performance between and within schools



Note: This figure is restricted to schools with the modal ISCED level for 15-year-old students[5].
Countries and economies are ranked in descending order of the between-school variation in mathematics performance as a percentage of the total variation in performance across OECD countries.
Source: OECD, PISA 2022 Database, Table I.B1.2.12.

Ranking countries' and economies' performance in PISA

The goal of PISA is to provide useful information to educators and policy makers on the strengths and weaknesses of their country's education system, their progress made over time, and opportunities for improvement. When ranking countries' and economies' student performance in PISA, it is important to consider the social and economic context of schooling (see next section). Moreover, many countries and economies score at similar levels; small differences that are not statistically significant or practically meaningful should not be considered (see Box 1 in Reader's Guide).

Table I.2.4, Table I.2.5 and Table I.2.6 show for each country and economy an estimate of where its mean performance ranks among all other countries and economies that participated in PISA as well as, for OECD countries, among all OECD countries. Because mean-score estimates are derived from samples and are thus associated with statistical uncertainty, it is often not possible to determine an exact ranking for all countries and economies. However, it is possible to identify the range of possible rankings for the country's or economy's mean performance[6]. This range of ranks can be wide, particularly for countries/economies whose mean scores are similar to those of many other countries/economies.

Table I.2.4, Table I.2.5 and Table I.2.6 also include the results of provinces, regions, states or other subnational entities within the country for countries where the sampling design supports such reporting. For these subnational entities, a rank order was not estimated. Still, the mean score and its confidence interval allow the performances of subnational entities and countries/economies to be compared. For example, Quebec (Canada*) scored below top-performers Macao (China), Singapore, Chinese Taipei and Hong Kong (China)*, but close to Korea in mathematics.

Table I.2.4. Mathematics performance at national and subnational levels [1/2]

	Mean score	95% confidence interval	All countries/economies		OECD countries	
			Upper rank	Lower rank	Upper rank	Lower rank
Singapore	575	572 - 577	1	1		
Macao (China)	552	550 - 554	2	4		
Chinese Taipei	547	540 - 554	2	6		
Hong Kong (China)	540	534 - 546	2	6		
Japan	536	530 - 541	3	6	1	2
Korea	527	520 - 535	3	7	1	2
Quebec (Canada)*	514	506 - 521				
Estonia	510	506 - 514	6	9	3	4
Switzerland	508	504 - 512	7	10	3	5
Alberta (Canada)*	504	492 - 515				
Flemish community (Belgium)	501	495 - 507				
Castile and Leon (Spain)	499	492 - 507				
Canada*	497	494 - 500	8	18	5	13
British Columbia (Canada)*	496	488 - 505				
Ontario (Canada)*	495	489 - 501				
Asturias (Spain)	495	486 - 504				
Cantabria (Spain)	495	486 - 504				
Madrid (Spain)	494	487 - 501				
Netherlands*	493	485 - 500	7	26	4	20
La Rioja (Spain)	493	485 - 501				
Navarre (Spain)	492	484 - 501				
England (United Kingdom)*	492	487 - 497				
Ireland*	492	488 - 496	9	22	5	18
Trento (Italy)	491	487 - 494				
Belgium	489	485 - 494	9	24	5	20
Denmark*	489	485 - 493	9	24	5	19
United Kingdom*	489	485 - 493	9	24	5	20
Poland	489	485 - 493	9	24	5	20
Austria	487	483 - 492	9	28	5	20
Australia*	487	484 - 491	9	25	6	20
Czech Republic	487	483 - 491	9	26	5	20
Aragon (Spain)	487	478 - 496				
Galicia (Spain)	486	479 - 494				
Slovenia	485	482 - 487	10	28	6	21
Finland	484	480 - 488	10	30	6	24
German-speaking community (Belgium)	483	473 - 494				
Latvia*	483	479 - 487	10	32	6	25
Basque Country (Spain)	482	474 - 490				
Sweden	482	478 - 486	10	32	6	27
Bolzano (Italy)	482	476 - 488				
Northern (Viet Nam)	480	467 - 494				
New Zealand*	479	475 - 483	11	33	7	28
Prince Edward Island (Canada)	478	465 - 491				
Lithuania	475	472 - 479	18	36	16	29
Northern Ireland (United Kingdom)*	475	469 - 481				
Germany	475	469 - 481	11	37	8	30
France	474	469 - 479	16	37	15	29
French community (Belgium)	474	468 - 480				
Spain	473	470 - 476	21	36	18	29
Hungary	473	468 - 478	19	37	16	30
Comunidad Valenciana (Spain)	473	465 - 480				
Portugal	472	467 - 477	20	37	17	30
Italy	471	465 - 477	18	38	16	31
Balearic Islands (Spain)	471	463 - 478				
Scotland (United Kingdom)*	471	465 - 476				
Manitoba (Canada)*	470	465 - 476				
Nova Scotia (Canada)*	470	463 - 477				
Viet Nam	469	462 - 477	16	39		
Catalonia (Spain)	469	458 - 481				
Extremadura (Spain)	469	459 - 479				
Norway	468	464 - 472	23	38	19	31
New Brunswick (Canada)	468	462 - 474				
Saskatchewan (Canada)	468	462 - 473				
Malta	466	463 - 469	24	38		
Wales (United Kingdom)*	466	460 - 472				
United States*	465	457 - 473	21	39	18	32
Slovak Republic	464	458 - 470	24	39	20	32
Castile-La Mancha (Spain)	464	457 - 470				
Southern (Viet Nam)	463	450 - 477				
Murcia (Spain)	463	455 - 472				
Croatia	463	458 - 468	24	39		
Central (Viet Nam)	461	449 - 474				
Iceland	459	456 - 462	30	40	26	32
Newfoundland and Labrador (Canada)*	459	448 - 469				

Notes: OECD countries are shown in bold black. Partner countries and economies are shown in bold blue. Provinces, regions, states or other subnational entities are shown in black italics (OECD countries) or blue italics (partner countries).
Range-of-rank estimates are computed based on mean and standard-error-of-the-mean estimates for each country/economy, and take into account multiple comparisons amongst countries and economies at similar levels of performance. For an explanation of the method, see Annex A3. For subnational entities, a rank order was not estimated.
Countries and economies are ranked in descending order of the mean performance in mathematics.
Source: OECD, PISA 2022 Database, Tables I.B1.2.1 and I.B2.2.1.

Table I.2.4 Mathematics performance at national and subnational levels [2/2]

	Mean score	95% confidence interval	All countries/economies		OECD countries	
			Upper rank	Lower rank	Upper rank	Lower rank
Israel	458	451 - 464	26	41	23	32
Andalusia (Spain)	457	448 - 467				
Türkiye	453	450 - 456	33	41	28	32
Almaty (Kazakhstan)	453	440 - 465				
Astana (Kazakhstan)	449	434 - 463				
Canary Islands (Spain)	447	438 - 456				
Central (Mongolia)	443	436 - 449				
Brunei Darussalam	442	440 - 444	40	43		
Ukrainian regions (18 of 27)	441	433 - 449	37	47		
North-Kazakhstan region (Kazakhstan)	441	431 - 451				
Kostanay region (Kazakhstan)	440	424 - 456				
Serbia	440	434 - 446	38	46		
Aktobe region (Kazakhstan)	437	429 - 445				
Zhambyl region (Kazakhstan)	433	422 - 444				
East-Kazakhstan region (Kazakhstan)	432	418 - 446				
United Arab Emirates	431	429 - 433	41	48		
Greece	430	426 - 435	41	48	33	33
Romania	428	420 - 436	40	53		
Pavlodar region (Kazakhstan)	426	416 - 435				
Kazakhstan	425	422 - 429	42	50		
Mongolia	425	420 - 430	41	52		
West-Kazakhstan region (Kazakhstan)	424	417 - 432				
Bogota (Colombia)	423	413 - 432				
Karagandy region (Kazakhstan)	421	412 - 429				
Akmola region (Kazakhstan)	419	408 - 430				
Cyprus	418	416 - 421	45	54		
Bulgaria	417	411 - 424	43	55		
Moldova	414	410 - 419	45	55		
Qatar	414	412 - 416	46	54		
Kyzyl-Orda region (Kazakhstan)	414	404 - 423				
Almaty region (Kazakhstan)	412	403 - 421				
Chile	412	408 - 416	46	55	34	34
Khangai (Mongolia)	409	397 - 421				
Uruguay	409	405 - 413	48	56		
Malaysia	409	404 - 413	47	58		
Shymkent (Kazakhstan)	407	397 - 416				
Montenegro	406	403 - 408	50	58		
Atyrau region (Kazakhstan)	405	393 - 417				
Melilla (Spain)	404	392 - 416				
Baku (Azerbaijan)	397	392 - 402	53	64		
Mexico	395	391 - 399	54	64	35	37
Ceuta (Spain)	395	382 - 407				
Thailand	394	389 - 399	54	65		
South (Brazil)	394	387 - 401				
Peru	391	387 - 396	56	65		
Georgia	390	385 - 395	56	67		
Turkestan region (Kazakhstan)	389	375 - 403				
Saudi Arabia	389	385 - 392	56	66		
North Macedonia	389	387 - 390	56	65		
Southeast (Brazil)	388	383 - 394				
Costa Rica	385	381 - 388	56	67	35	37
Middle-West (Brazil)	384	370 - 397				
Colombia	383	377 - 389	56	69	35	37
Western (Mongolia)	381	372 - 391				
Brazil	379	376 - 382	62	69		
Argentina	378	373 - 382	61	71		
Jamaica*	377	371 - 384	58	72		
Albania	368	364 - 372	64	75		
Palestinian Authority	366	362 - 369	66	75		
Indonesia	366	361 - 370	66	76		
Morocco	365	358 - 371	64	76		
Uzbekistan	364	360 - 368	67	76		
Northeast (Brazil)	363	356 - 369				
Jordan	361	357 - 365	68	76		
North (Brazil)	357	348 - 366				
Panama*	357	351 - 362	68	78		
Kosovo	355	353 - 357	70	76		
Philippines	355	350 - 360	68	78		
Guatemala	344	340 - 349	75	81		
El Salvador	343	340 - 347	75	81		
Dominican Republic	339	336 - 342	77	81		
Paraguay	338	333 - 342	77	81		
Cambodia	336	331 - 342	77	81		

Notes: OECD countries are shown in bold black. Partner countries and economies are shown in bold blue. Provinces, regions, states or other subnational entities are shown in black italics (OECD countries) or blue italics (partner countries).
Range-of-rank estimates are computed based on mean and standard-error-of-the-mean estimates for each country/economy, and take into account multiple comparisons amongst countries and economies at similar levels of performance. For an explanation of the method, see Annex A3. For subnational entities, a rank order was not estimated.
Countries and economies are ranked in descending order of the mean performance in mathematics.
Source: OECD, PISA 2022 Database, Tables I.B1.2.1 and I.B2.2.1.

Table I.2.5. Reading performance at national and subnational levels [1/2]

	Mean score	95% confidence interval	All countries/economies		OECD countries	
			Upper rank	Lower rank	Upper rank	Lower rank
Singapore	543	539 - 546	1	1		
*Alberta (Canada)**	525	512 - 537				
Ireland*	516	511 - 521	2	9	1	6
Japan	516	510 - 522	2	11	1	6
Korea	515	508 - 523	2	12	1	7
Chinese Taipei	515	509 - 522	2	11		
*Ontario (Canada)**	512	504 - 519				
Estonia	511	506 - 516	2	12	1	7
*British Columbia (Canada)**	511	499 - 522				
Macao (China)	510	508 - 513	2	11		
Canada*	507	503 - 511	2	13	1	8
United States*	504	495 - 512	2	18	1	14
*Quebec (Canada)**	501	492 - 510				
New Zealand*	501	497 - 505	3	17	3	12
Hong Kong (China)	500	494 - 505	3	18		
Australia*	498	494 - 502	6	18	5	14
Castile and Leon (Spain)	498	489 - 507				
Asturias (Spain)	497	486 - 508				
Prince Edward Island (Canada)	496	476 - 517				
*England (United Kingdom)**	496	491 - 502				
Madrid (Spain)	496	488 - 504				
United Kingdom*	494	490 - 499	8	22	6	17
Cantabria (Spain)	494	482 - 506				
Trento (Italy)	494	490 - 498				
*Scotland (United Kingdom)**	493	486 - 499				
Finland	490	486 - 495	9	26	6	20
*Nova Scotia (Canada)**	489	477 - 501				
Denmark*	489	484 - 494	9	30	6	23
Poland	489	483 - 494	9	30	6	24
Czech Republic	489	484 - 493	9	28	7	23
Aragon (Spain)	488	477 - 498				
Sweden	487	482 - 492	10	30	7	25
La Rioja (Spain)	487	472 - 502				
*Manitoba (Canada)**	486	478 - 493				
Galicia (Spain)	485	476 - 495				
*Northern Ireland (United Kingdom)**	485	479 - 492				
Saskatchewan (Canada)	484	476 - 492				
Switzerland	483	479 - 488	13	32	9	27
Flemish community (Belgium)	483	476 - 490				
Bolzano (Italy)	482	470 - 494				
Comunidad Valenciana (Spain)	482	474 - 490				
Italy	482	476 - 487	13	33	9	27
Austria	480	475 - 486	13	34	10	28
Germany	480	473 - 487	13	34	9	29
Belgium	479	474 - 484	14	34	10	28
*Newfoundland and Labrador (Canada)**	478	464 - 492				
Navarre (Spain)	478	463 - 492				
Portugal	477	471 - 482	14	34	10	29
Norway	477	472 - 482	14	34	11	29
Croatia	475	471 - 480	15	34		
Latvia*	475	470 - 479	16	34	13	29
Spain	474	471 - 478	19	34	15	29
France	474	468 - 480	15	34	11	29
Israel	474	467 - 481	14	34	11	29
French community (Belgium)	474	466 - 481				
Hungary	473	467 - 479	16	34	14	29
Lithuania	472	468 - 476	19	34	15	29
Balearic Islands (Spain)	472	459 - 484				
*Northern (Viet Nam)***	469	457 - 482				
New Brunswick (Canada)	469	461 - 477				
Slovenia	469	465 - 472	20	34	17	29
Murcia (Spain)	468	458 - 478				
Extremadura (Spain)	468	456 - 481				
Castile-La Mancha (Spain)	468	459 - 477				
German-speaking community (Belgium)	467	448 - 485				
Basque Country (Spain)	466	457 - 476				
*Wales (United Kingdom)**	466	458 - 473				
Canary Islands (Spain)	463	452 - 474				
Catalonia (Spain)	462	450 - 475				
Bogota (Colombia)	462	451 - 474				
Viet Nam**	462	454 - 470				
*Southern (Viet Nam)***	461	448 - 474				
Andalusia (Spain)	461	451 - 471				
Netherlands*	459	451 - 468	21	40	19	32

** Caution is required when comparing estimates based on PISA 2022 with other countries/economies as a strong linkage to the international PISA reading scale could not be established (see Reader's Guide and Annex A4).

Notes: OECD countries are shown in bold black. Partner countries and economies are shown in bold blue. Provinces, regions, states or other subnational entities are shown in black italics (OECD countries) or blue italics (partner countries).

Range-of-rank estimates are computed based on mean and standard-error-of-the-mean estimates for each country/economy, and take into account multiple comparisons amongst countries and economies at similar levels of performance. For an explanation of the method, see Annex A3. For subnational entities, a rank order was not estimated.

Countries and economies are ranked in descending order of the mean performance in reading.

Source: OECD, PISA 2022 Database, Table I.B1.2.2 and Table I.B2.2.

Table I.2.5. Reading performance at national and subnational levels [2/2]

	Mean score	95% confidence interval	All countries/economies		OECD countries	
			Upper rank	Lower rank	Upper rank	Lower rank
Türkiye	456	452 - 460	34	38	29	32
*Central (Viet Nam)***	452	438 - 466				
Chile	448	443 - 453	34	42	29	34
Slovak Republic	447	441 - 453	34	43	29	34
Malta	445	442 - 449	34	43		
Serbia	440	435 - 446	35	45		
Greece	438	433 - 444	35	45	31	34
Iceland	436	432 - 440	36	45	31	34
Uruguay	430	426 - 435	39	47		
Brunei Darussalam	429	427 - 432	39	45		
Romania	428	421 - 436	36	54		
Ukrainian regions (18 of 27)	428	420 - 435	37	54		
Kostanay region (Kazakhstan)	427	410 - 443				
South (Brazil)	427	418 - 435				
Astana (Kazakhstan)	424	410 - 438				
Middle-West (Brazil)	424	406 - 442				
Almaty (Kazakhstan)	423	412 - 435				
Southeast (Brazil)	420	413 - 427				
Qatar	419	416 - 422	43	55		
United Arab Emirates	417	415 - 420	44	55		
North-Kazakhstan region (Kazakhstan)	417	405 - 429				
Mexico	415	410 - 421	43	57	35	37
Costa Rica	415	410 - 420	44	57	35	37
Moldova	411	406 - 416	44	57		
East-Kazakhstan region (Kazakhstan)	410	396 - 425				
Brazil	410	406 - 414	44	57		
Jamaica *	410	401 - 418	44	58		
Colombia	409	401 - 416	44	58	35	37
Peru	408	403 - 414	44	58		
Melilla (Spain)	405	386 - 424				
Montenegro	405	402 - 408	48	58		
Ceuta (Spain)	404	383 - 426				
Bulgaria	404	398 - 411	46	59		
Karagandy region (Kazakhstan)	402	393 - 411				
Argentina	401	396 - 406	48	59		
Pavlodar region (Kazakhstan)	400	387 - 412				
Akmola region (Kazakhstan)	399	386 - 413				
Central (Mongolia)	398	392 - 404				
Northeast (Brazil)	392	385 - 400				
Panama *	392	385 - 399	52	64		
Malaysia	388	383 - 393	56	67		
West-Kazakhstan region (Kazakhstan)	387	377 - 398				
Kazakhstan	386	383 - 390	58	65		
Aktobe region (Kazakhstan)	383	375 - 391				
Saudi Arabia	383	379 - 386	58	67		
North (Brazil)	382	370 - 395				
Cyprus	381	379 - 383	58	67		
Thailand	379	373 - 384	58	69		
Mongolia	378	374 - 383	58	69		
Atyrau region (Kazakhstan)	378	366 - 390				
Almaty region (Kazakhstan)	375	364 - 386				
Guatemala	374	369 - 379	59	70		
Georgia	374	369 - 378	60	70		
Paraguay	373	368 - 378	60	70		
Shymkent (Kazakhstan)	366	355 - 377				
Baku (Azerbaijan)	365	360 - 370	63	73		
El Salvador	365	359 - 370	63	74		
Kyzyl-Orda region (Kazakhstan)	364	356 - 371				
Khangai (Mongolia)	363	353 - 373				
Indonesia	359	353 - 364	65	76		
North Macedonia	359	357 - 360	68	74		
Albania	358	355 - 362	68	75		
Zhambyl region (Kazakhstan)	353	343 - 363				
Dominican Republic	351	347 - 356	68	78		
Palestinian Authority	349	345 - 353	71	78		
Turkestan region (Kazakhstan)	347	333 - 360				
Philippines	347	340 - 353	69	79		
Kosovo	342	340 - 344	73	79		
Jordan	342	337 - 347	73	80		
Morocco	339	332 - 347	72	80		
Uzbekistan	336	332 - 339	75	80		
Cambodia	329	325 - 333	77	80		
Western (Mongolia)	326	318 - 335				

** Caution is required when comparing estimates based on PISA 2022 with other countries/economies as a strong linkage to the international PISA reading scale could not be established (see Reader's Guide and Annex A4).

Notes: OECD countries are shown in bold black. Partner countries and economies are shown in bold blue. Provinces, regions, states or other subnational entities are shown in black italics (OECD countries) or blue italics (partner countries).

Range-of-rank estimates are computed based on mean and standard-error-of-the-mean estimates for each country/economy, and take into account multiple comparisons amongst countries and economies at similar levels of performance. For an explanation of the method, see Annex A3. For subnational entities, a rank order was not estimated.

Countries and economies are ranked in descending order of the mean performance in reading.

Source: OECD, PISA 2022 Database, Table I.B1.2.2 and Table I.B2.2.

Table I.2.6. Science performance at national and subnational levels [1/2]

	Mean score	95% confidence interval	All countries/economies		OECD countries	
			Upper rank	Lower rank	Upper rank	Lower rank
Singapore	561	559 - 564	1	1		
Japan	547	541 - 552	2	5	1	1
Macao (China)	543	541 - 545	2	5		
Chinese Taipei	537	531 - 544	2	7		
Alberta (Canada)*	534	520 - 547				
Korea	528	521 - 535	2	9	2	5
Estonia	526	522 - 530	4	8	2	4
Hong Kong (China)	520	515 - 526	4	11		
British Columbia (Canada)*	519	509 - 528				
Ontario (Canada)*	517	510 - 524				
Canada*	515	511 - 519	5	13	2	9
Quebec (Canada)*	512	504 - 520				
Finland	511	506 - 516	6	18	3	14
Australia*	507	503 - 511	7	21	4	15
Castile and Leon (Spain)	506	498 - 515				
Galicia (Spain)	506	496 - 516				
New Zealand*	504	500 - 509	8	25	4	20
Cantabria (Spain)	504	493 - 515				
Ireland*	504	499 - 508	8	25	4	20
Asturias (Spain)	503	491 - 515				
England (United Kingdom)*	503	497 - 508				
Switzerland	503	498 - 507	9	25	5	21
Madrid (Spain)	502	495 - 510				
Slovenia	500	497 - 503	9	26	5	21
United Kingdom*	500	495 - 504	9	27	5	23
La Rioja (Spain)	500	481 - 518				
Aragon (Spain)	499	489 - 510				
United States*	499	491 - 508	7	32	4	26
Poland	499	494 - 504	9	28	5	23
Flemish community (Belgium)	499	493 - 506				
Czech Republic	498	493 - 502	9	29	5	24
Prince Edward Island (Canada)	496	470 - 522				
Trento (Italy)	495	491 - 499				
Bolzano (Italy)	495	486 - 504				
Latvia*	494	489 - 498	11	32	7	26
Denmark*	494	489 - 499	10	32	7	26
Saskatchewan (Canada)	494	488 - 500				
Sweden	494	489 - 498	11	32	7	26
Germany	492	486 - 499	10	35	6	28
Manitoba (Canada)*	492	484 - 500				
Nova Scotia (Canada)*	492	484 - 500				
Newfoundland and Labrador (Canada)*	491	481 - 502				
Austria	491	486 - 496	11	33	7	28
Belgium	491	486 - 495	11	34	9	28
Navarre (Spain)	489	478 - 500				
Northern Ireland (United Kingdom)*	488	482 - 495				
Netherlands*	488	480 - 496	10	35	7	29
German-speaking community (Belgium)	487	470 - 505				
France	487	482 - 493	14	35	11	29
Hungary	486	481 - 491	15	35	11	29
Spain	485	481 - 488	18	35	14	29
Lithuania	484	480 - 489	17	35	14	29
Portugal	484	479 - 489	16	35	13	29
Scotland (United Kingdom)*	483	477 - 489				
Comunidad Valenciana (Spain)	483	474 - 492				
New Brunswick (Canada)	483	474 - 491				
Croatia	483	478 - 487	18	35		
Murcia (Spain)	482	471 - 492				
Balearic Islands (Spain)	480	470 - 490				
Basque Country (Spain)	480	470 - 489				
French community (Belgium)	479	472 - 486				
Extremadura (Spain)	479	467 - 492				
Norway	478	474 - 483	22	37	18	30
Northern (Viet Nam)	478	466 - 489				
Italy	477	471 - 484	18	38	18	31
Catalonia (Spain)	477	466 - 489				
Türkiye	476	472 - 480	24	38	21	31
Castile-La Mancha (Spain)	475	466 - 484				
Southern (Viet Nam)	474	462 - 486				
Andalusia (Spain)	473	464 - 483				
Wales (United Kingdom)*	473	465 - 480				
Canary Islands (Spain)	473	463 - 482				
Viet Nam	472	465 - 479	23	38		
Malta	466	462 - 469	33	39		

Notes: OECD countries are shown in bold black. Partner countries and economies are shown in bold blue. Provinces, regions, states or other subnational entities are shown in black italics (OECD countries) or blue italics (partner countries).
Range-of-rank estimates are computed based on mean and standard-error-of-the-mean estimates for each country/economy, and take into account multiple comparisons amongst countries and economies at similar levels of performance. For an explanation of the method, see Annex A3. For subnational entities, a rank order was not estimated.
Countries and economies are ranked in descending order of the mean performance in science.
Source: OECD, PISA 2022 Database, Table I.B1.2.3 and Table I.B2.3.

Table I.2.6. Science performance at national and subnational levels [2/2]

	Mean score	95% confidence interval	All countries/economies		OECD countries	
			Upper rank	Lower rank	Upper rank	Lower rank
Israel	465	458 - 471	32	40	27	31
Central (Viet Nam)	463	450 - 475				
Slovak Republic	462	456 - 468	32	40	28	31
Bogota (Colombia)	459	448 - 470				
Almaty (Kazakhstan)	458	446 - 470				
Astana (Kazakhstan)	455	440 - 470				
Kostanay region (Kazakhstan)	455	438 - 471				
Ukrainian regions (18 of 27)	450	443 - 458	36	46		
North-Kazakhstan region (Kazakhstan)	450	439 - 461				
Serbia	447	442 - 453	37	46		
Iceland	447	443 - 450	39	45	32	34
Brunei Darussalam	446	443 - 448	39	45		
Chile	444	439 - 448	39	48	32	34
East-Kazakhstan region (Kazakhstan)	441	427 - 455				
Greece	441	435 - 446	39	48	32	34
Uruguay	435	431 - 440	39	50		
Qatar	432	430 - 435	43	50		
Pavlodar region (Kazakhstan)	432	420 - 444				
United Arab Emirates	432	429 - 435	43	50		
Central (Mongolia)	430	425 - 435				
Akmola region (Kazakhstan)	428	416 - 441				
Romania	428	420 - 435	41	58		
Karagandy region (Kazakhstan)	427	418 - 436				
Aktobe region (Kazakhstan)	425	416 - 434				
West-Kazakhstan region (Kazakhstan)	424	416 - 432				
Kazakhstan	423	420 - 427	45	55		
Bulgaria	421	415 - 427	45	61		
South (Brazil)	421	412 - 430				
Moldova	417	412 - 422	48	61		
Malaysia	416	412 - 421	48	61		
Melilla (Spain)	414	392 - 437				
Almaty region (Kazakhstan)	414	403 - 425				
Southeast (Brazil)	413	406 - 419				
Mongolia	412	408 - 417	48	63		
Colombia	411	405 - 418	48	63	35	37
Costa Rica	411	406 - 416	48	63	35	37
Cyprus	411	408 - 414	49	63		
Middle-West (Brazil)	411	395 - 426				
Ceuta (Spain)	410	385 - 436				
Mexico	410	405 - 415	49	63	35	37
Thailand	409	404 - 415	49	63		
Peru	408	403 - 413	50	63		
Shymkent (Kazakhstan)	407	395 - 419				
Argentina	406	401 - 411	50	63		
Atyrau region (Kazakhstan)	406	395 - 417				
Montenegro	403	401 - 405	53	64		
Brazil	403	399 - 407	53	64		
Jamaica*	403	395 - 411	50	66		
Kyzyl-Orda region (Kazakhstan)	402	393 - 411				
Zhambyl region (Kazakhstan)	400	390 - 410				
Khangai (Mongolia)	396	385 - 408				
Saudi Arabia	390	387 - 394	63	68		
Turkestan region (Kazakhstan)	389	377 - 401				
Panama*	388	381 - 395	61	73		
Northeast (Brazil)	386	378 - 394				
Georgia	384	380 - 389	63	73		
Indonesia	383	378 - 388	64	74		
Baku (Azerbaijan)	380	376 - 384	64	76		
North Macedonia	380	378 - 382	65	74		
North (Brazil)	380	367 - 392				
Albania	376	372 - 380	65	76		
Jordan	375	370 - 379	65	76		
El Salvador	373	368 - 378	65	78		
Guatemala	373	369 - 377	65	77		
Palestinian Authority	369	365 - 373	69	78		
Paraguay	368	364 - 372	69	78		
Western (Mongolia)	367	358 - 375				
Morocco	365	359 - 372	67	80		
Dominican Republic	360	356 - 364	72	80		
Kosovo	357	355 - 359	76	81		
Philippines	356	350 - 362	73	81		
Uzbekistan	355	351 - 359	76	81		
Cambodia	347	343 - 351	78	81		

Notes: OECD countries are shown in bold black. Partner countries and economies are shown in bold blue. Provinces, regions, states or other subnational entities are shown in black italics (OECD countries) or blue italics (partner countries).
Range-of-rank estimates are computed based on mean and standard-error-of-the-mean estimates for each country/economy, and take into account multiple comparisons amongst countries and economies at similar levels of performance. For an explanation of the method, see Annex A3. For subnational entities, a rank order was not estimated.
Countries and economies are ranked in descending order of the mean performance in science.
Source: OECD, PISA 2022 Database, Table I.B1.2.3 and Table I.B2.3.

Average performance in different aspects of mathematics competence

This section focuses on student performance in two sets of mathematics subscales: process subscales and content subscales. Each item in the PISA 2022 computer-based mathematics assessment was classified into one of the four mathematics-processes subscales of *formulating*, *employing*, *interpreting*, and *reasoning*. Similarly, each item in the PISA 2022 computer-based mathematics assessment was classified into one of the four mathematics-content subscales of *change and relationships*, *space and shape*, *quantity*, and *uncertainty and data*.

The relative strengths and weaknesses of each country's/economy's education system are analysed by looking at differences in mean performance across the PISA mathematics subscales within the process and content subscales. See Annex A1 for detailed definitions of subscales.

Table I.2.7 shows the country/economy mean for the overall mathematics scale and for each of the four mathematics-process subscales. It also points to which differences along the (standardised) subscale means are significant, indicating a country's/economy's relative strengths and weaknesses.

For example, in Japan mean performance in mathematics is 536 score points. Japan's score is also 536 points in the mathematics-processes subscales of *formulating* and *employing,* and the score is very similar (534 points) in the process subscale of *reasoning*. However, in the *interpreting* process, the score is considerably higher (544 points). Compared to differences in how students performed in different subscales on average across PISA-participating countries/economies (i.e. hereafter, for simplicity, the "worldwide average"), students in Japan are stronger at *interpreting* than all other mathematics-process subscales.

On average across OECD countries, students are relatively stronger at *interpreting* than *formulating* and stronger at *interpreting* than *employing*, compared to the worldwide average. In addition, students are relatively stronger at *reasoning* than *formulating* and *employing,* and relatively stronger at *employing* than *formulating* on average across OECD countries compared to the worldwide average. The same pattern of relative strengths was observed in Spain and the United Kingdom*. In Belgium, Canada*, Korea and New Zealand*, the pattern is the same as the OECD average except that there are no significant differences in how students performed in *formulating* and *employing*.

In 22 countries/economies, students are relatively stronger at *reasoning* than *formulating*; in 23 countries/economies, students are relatively stronger at *reasoning* than *employing*; and in 17 countries/economies, students are relatively stronger at *reasoning* than *interpreting*, compared to the worldwide average.

In six countries/economies, there are no significant differences in how students performed across different mathematics-process subscales. For example, in Latvia*, overall mean performance in mathematics is 483 score points with 483 points in *formulating*; 484 points in *employing*; 485 points in *interpreting*; and 481 points in reasoning. The same homogeneity in performance across mathematics-process subscales is observed in Malta, Panama*, Qatar, Serbia and Türkiye.

Table I.2.7. Comparing countries and economies on the mathematics-process subscales [1/2]

	Mean performance in mathematics (overall mathematics scale)	Mean performance on each mathematics-process subscale				Relative strengths in mathematics: Standardised mean performance on the mathematics-process subscale...[1]			
		Formulating	Employing	Interpreting	Reasoning	... formulating (fs) is higher than on...	... employing (em) is higher than on...	... interpreting (in) is higher than on...	... reasoning (re) is higher than on...
Singapore	575	576	580	577	572		fs in re		
Macao (China)	552	556	552	550	553				in
Chinese Taipei	547	550	550	548	547		in		
Hong Kong (China)	540	542	547	540	538		fs in re		
Japan	536	536	536	544	534			fs em re	
Korea	527	526	523	531	528			fs em	fs em
Estonia	510	507	513	511	509		fs in	fs	fs
Switzerland	508	507	508	506	513				fs em in
Canada*	497	494	495	503	499			fs em	fs em
Netherlands*	493	492	499	496	490		fs in re	re	
Ireland*	492	487	494	495	490		fs	fs re	fs
Belgium	489	486	488	494	490			fs em	fs em
Denmark*	489	485	488	491	495			fs	fs em in
United Kingdom*	489	484	489	492	490		fs	fs em	fs em
Poland	489	485	491	490	488		fs	fs	
Austria	487	484	488	482	492	in	in		fs em in
Australia*	487	484	486	493	486			fs em re	
Czech Republic	487	489	489	484	486	in	in		in
Slovenia	485	482	483	487	485			fs em	
Finland	484	482	482	486	486				fs em
Latvia*	483	483	484	485	481				
Sweden	482	474	481	478	491		fs in		fs em in
New Zealand*	479	474	477	486	481			fs em	fs em
Lithuania	475	471	477	477	471		fs re	fs re	
Germany	475	469	477	475	473		fs re	fs	fs
France	474	463	472	482	473		fs	fs em re	fs
Spain	473	465	470	477	477		fs	fs em	fs em
Hungary	473	467	477	475	469		fs re	fs re	
OECD average	472	469	472	474	473		fs	fs em	fs em
Portugal	472	467	467	481	470			fs em re	
Italy	471	464	470	471	474		fs	fs	fs em in
Norway	468	465	466	467	476				fs em in
Malta	466	464	465	465	466				
United States*	465	463	459	475	464	em		fs em re	em
Slovak Republic	464	462	467	461	467		fs in		fs in
Croatia	463	455	463	467	466		fs	fs	fs em
Iceland	459	455	462	457	460		fs in		fs
Israel	458	459	456	456	463	em in			em in
Türkiye	453	451	452	455	454				
Brunei Darussalam	442	433	443	447	435		fs re	fs em re	
Ukrainian regions (18 of 27)	441	442	441	439	435	re			
Serbia	440	437	437	438	440				
United Arab Emirates	431	429	428	433	429	em		em	
Greece	430	428	421	435	434	em		em	em
Romania	428	425	428	428	423		re		

1. Relative strengths that are statistically significant are highlighted in a darker tone; empty cells indicate cases where the standardised subscale score is not significantly higher compared to other subscales, including cases in which it is lower. A country/economy is relatively stronger in one subscale than another if its standardised score, as determined by the mean and standard deviation of student performance in that subscale across all participating countries/economies, is significantly higher in the first subscale than in the second subscale. Process subscales are indicated by the following abbreviations: fs - formulating; em - employing; in - interpreting; re - reasoning.

Notes: Only countries and economies where PISA 2022 was delivered on computer are shown.

Although the OECD mean is shown in this table, the standardisation of subscale scores was performed according to the mean and standard deviation of students across all PISA-participating countries/economies.

The standardised scores that were used to determine the relative strengths of each country/economy are not shown in this table.

Countries and economies are ranked in descending order of mean mathematics performance.

Source: OECD, PISA 2022 Database, Tables I.B1.2.1, I.B1.2.4, I.B1.2.5, I.B1.2.6 and I.B1.2.7.

Table I.2.7. Comparing countries and economies on the mathematics-process subscales [2/2]

	Mean performance in mathematics (overall mathematics scale)	Mean performance on each mathematics-process subscale				Relative strengths in mathematics: Standardised mean performance on the mathematics-process subscale...[1]			
		Formulating	Employing	Interpreting	Reasoning	... formulating (fs) is higher than on...	... employing (em) is higher than on...	... interpreting (in) is higher than on...	... reasoning (re) is higher than on...
Kazakhstan	425	425	428	418	420	in re	in re		
Mongolia	425	423	428	423	411	re	in re	re	
Cyprus	418	420	413	419	420	em in		em	em
Bulgaria	417	420	420	411	414	in re	in re		in
Moldova	414	408	417	412	409		fs in re		
Qatar	414	410	414	414	413				
Chile	412	406	409	415	407			fs em re	
Uruguay	409	404	407	409	410				fs em
Malaysia	409	403	411	409	403		fs re	re	
Montenegro	406	403	404	401	412	em in			fs em in
Baku (Azerbaijan)	397	399	399	386	403	em in	in		em in
Mexico	395	389	398	391	389		fs in re		
Thailand	394	394	392	393	385	em in re	re	re	
Peru	391	388	391	389	386	re			
Georgia	390	392	392	383	384	in re	in re		
Saudi Arabia	389	387	385	388	391	em in			em in
North Macedonia	389	385	387	384	389	in			em in
Costa Rica	385	378	383	386	381			em	
Colombia	383	378	381	384	375			em re	
Brazil	379	377	376	378	376	em in re			
Argentina	378	373	373	379	373	em		em re	
Jamaica*	377	368	374	379	371			fs em re	
Albania	368	376	367	360	369	em in re	in		in
Palestinian Authority	366	368	366	362	358	em in re	re	re	
Indonesia	366	362	365	363	354	re	re	re	
Morocco	365	364	363	365	353	em re	re	re	
Uzbekistan	364	371	369	349	362	em in re	in re		in
Jordan	361	360	361	360	354	em in re			
Panama*	357	346	357	355	351				
Kosovo	355	352	357	350	353	in	in		
Philippines	355	347	352	357	350			em re	
El Salvador	343	345	343	340	339	em in re			
Dominican Republic	339	339	340	333	338	em in	in		

1. Relative strengths that are statistically significant are highlighted in a darker tone; empty cells indicate cases where the standardised subscale score is not significantly higher compared to other subscales, including cases in which it is lower. A country/economy is relatively stronger in one subscale than another if its standardised score, as determined by the mean and standard deviation of student performance in that subscale across all participating countries/economies, is significantly higher in the first subscale than in the second subscale. Process subscales are indicated by the following abbreviations: fs - formulating; em - employing; in - interpreting; re - reasoning.

Notes: Only countries and economies where PISA 2022 was delivered on computer are shown.

Although the OECD mean is shown in this table, the standardisation of subscale scores was performed according to the mean and standard deviation of students across all PISA-participating countries/economies.

The standardised scores that were used to determine the relative strengths of each country/economy are not shown in this table.

Countries and economies are ranked in descending order of mean mathematics performance.

Source: OECD, PISA 2022 Database, Tables I.B1.2.1, I.B1.2.4, I.B1.2.5, I.B1.2.6 and I.B1.2.7.

Content subscales

Table I.2.8 shows the country/economy mean for the overall mathematics scale and for each of the four mathematics-content subscales, and an indication of relative strengths in the mathematics content subscales.

On average across OECD countries, students are relatively stronger in *uncertainty and data* than *change and relationships*, and relatively stronger in *uncertainty and data* than *space and shape*, compared to the worldwide average. In addition, students are relatively stronger in *space and shape* than *change and relationships*; and relatively

stronger in *quantity* than *change and relationships* on average across OECD countries, compared to the worldwide average.

In 27 countries/economies, students are, as in the OECD average, relatively stronger in *uncertainty and data* than *space and shape*, compared to the worldwide average. In 13 countries/economies, students are relatively stronger in *uncertainty and data* than *change and relationships*, compared to the worldwide average.

By contrast, in 24 countries/economies, students are relatively stronger in *space and shape* than *uncertainty and data*. In 19 countries/economies, students are relatively stronger in *change and relationships* than *uncertainty and data*.

Table I.2.8. Comparing countries and economies on the mathematics-content subscales [1/2]

	Mean performance in mathematics (overall mathematics scale)	Mean performance on each mathematics-content subscale				Relative strengths in mathematics: Standardised mean performance on the mathematics-content subscale...[1]			
		Change and relationship	Quantity	Space and shape	Uncertainty and data	... change and relationship (cr) is higher than on...	... quantity (qn) is higher than on...	... space and shape (ss) is higher than on...	... uncertainty and data (ud) is higher than on...
Singapore	575	574	579	571	579	ss	cr ss ud		ss
Macao (China)	552	551	551	555	551			ud	
Chinese Taipei	547	549	547	551	546	ud		ud	
Hong Kong (China)	540	536	545	540	542		cr ss ud		
Japan	536	533	535	541	540			cr qn	cr
Korea	527	525	527	537	524			cr qn ud	
Estonia	510	508	515	513	503	ud	cr ud	cr ud	
Switzerland	508	504	510	518	502	ud	cr ud	cr qn ud	
Canada*	497	502	494	491	500	qn ss ud			qn ss
Netherlands*	493	489	497	485	496		cr ss		ss
Ireland*	492	492	494	474	499	ss	ss		cr ss
Belgium	489	488	488	490	493				qn
Denmark*	489	482	485	493	499			cr qn	cr qn ss
United Kingdom*	489	487	488	477	499	ss	ss		cr qn ss
Poland	489	483	493	487	489		cr ss ud		
Austria	487	482	491	490	485		cr ud	cr ud	
Australia*	487	486	483	486	494	qn			cr qn ss
Czech Republic	487	480	490	495	483		cr ud	cr qn ud	
Slovenia	485	479	485	492	483		cr ud	cr qn ud	
Finland	484	480	485	485	485		cr	cr	
Latvia*	483	484	485	488	478	ud	ud	cr qn ud	
Sweden	482	480	480	483	481				
New Zealand*	479	476	478	473	486				cr qn ss
Lithuania	475	473	479	472	470	ud	cr ss ud		
Germany	475	469	477	474	475		cr	cr	
France	474	475	470	472	477	qn			qn
Spain	473	474	471	463	478	qn ss	ss		qn ss
Hungary	473	467	479	469	472		cr ss ud		
OECD average	472	470	472	471	474		cr	cr	cr ss
Portugal	472	471	466	472	478	qn		qn	cr qn ss
Italy	471	469	470	471	473				
Norway	468	465	469	469	470			cr	
Malta	466	465	460	462	473	qn			cr qn ss
United States*	465	465	461	454	476	qn ss	ss		cr qn ss
Slovak Republic	464	458	468	472	456	ud	cr ud	cr ud	
Croatia	463	465	464	455	463	ss ud	ss		ss
Iceland	459	454	459	464	460		cr	cr qn ud	cr
Israel	458	460	459	450	456	ss ud	ss ud		
Türkiye	453	449	455	442	458	ss	cr ss		cr ss
Brunei Darussalam	442	445	436	444	444	qn		qn	qn
Ukrainian regions (18 of 27)	441	436	443	438	436		cr ud	ud	
Serbia	440	439	439	441	435	ud	ud	ud	
United Arab Emirates	431	434	425	423	432	qn ss			qn ss
Greece	430	431	424	429	435	qn		qn	qn
Romania	428	425	429	421	426		ss ud		

1. Relative strengths that are statistically significant are highlighted in a darker tone; empty cells indicate cases where the standardised subscale score is not significantly higher compared to other subscales, including cases in which it is lower. A country/economy is relatively stronger in one subscale than another if its standardised score, as determined by the mean and standard deviation of student performance in that subscale across all participating countries/economies, is significantly higher in the first subscale than in the second subscale. Content subscales are indicated by the following abbreviations: cr - change and relationship; qn - quantity; ss - space and shape; ud - uncertainty and data.
Notes: Only countries and economies where PISA 2022 was delivered on computer are shown.
Although the OECD mean is shown in this table, the standardisation of subscale scores was performed according to the mean and standard deviation of students across all PISA-participating countries/economies.
The standardised scores that were used to determine the relative strengths of each country/economy are not shown in this table.
Countries and economies are ranked in descending order of mean mathematics performance.
Source: OECD, PISA 2022 Database, Tables I.B1.2.1, I.B1.2.8, I.B1.2.9, I.B1.2.10 and I.B1.2.11.

Table I.2.8. Comparing countries and economies on the mathematics-content subscales [2/2]

	Mean performance in mathematics (overall mathematics scale)	Mean performance on each mathematics-content subscale				Relative strengths in mathematics: Standardised mean performance on the mathematics-content subscale...[1]			
		Change and relationship	Quantity	Space and shape	Uncertainty and data	... change and relationship (cr) is higher than on...	... quantity (qn) is higher than on...	... space and shape (ss) is higher than on...	... uncertainty and data (ud) is higher than on...
Kazakhstan	425	422	429	421	416	ud	cr ss ud	ud	
Mongolia	425	418	429	423	422		cr ud	cr ud	
Cyprus	418	422	412	424	417	qn ud		qn ud	qn
Bulgaria	417	418	419	412	413	ud	ud		
Moldova	414	411	418	409	407	ud	cr ss ud	ud	
Qatar	414	416	410	404	418	qn ss			qn ss
Chile	412	411	409	405	415	qn			qn ss
Uruguay	409	409	408	404	409				
Malaysia	409	406	404	416	409	qn		cr qn ud	qn
Montenegro	406	398	406	409	402		cr	cr qn ud	
Baku (Azerbaijan)	397	395	396	393	393	ud			
Mexico	395	391	397	388	391		cr ud		
Thailand	394	390	394	392	391				
Peru	391	390	391	383	389				
Georgia	390	384	392	389	383		cr ud	cr ud	
Saudi Arabia	389	389	386	383	390	qn			qn
North Macedonia	389	386	388	384	385				
Costa Rica	385	380	385	375	385		ss		cr ss
Colombia	383	381	381	370	385	ss	ss		qn ss
Brazil	379	377	376	370	381				cr qn ss
Argentina	378	377	375	368	375	ss			ss
Jamaica*	377	379	373	363	381	qn ss			qn ss
Albania	368	367	365	376	363	qn ud		cr qn ud	
Palestinian Authority	366	369	361	355	366	qn ss			qn ss
Indonesia	366	362	363	367	363			cr qn ud	
Morocco	365	366	360	362	363	qn ud		qn	
Uzbekistan	364	365	366	365	349	ud	ud	ud	
Jordan	361	365	355	348	364	qn ss			qn ss
Panama*	357	353	356	341	359	ss	ss		ss
Kosovo	355	352	356	357	348	ud	ud	cr qn ud	
Philippines	355	356	349	343	358	qn ss			qn ss
El Salvador	343	343	343	328	343	ss	ss		ss
Dominican Republic	339	339	339	332	337				

1. Relative strengths that are statistically significant are highlighted in a darker tone; empty cells indicate cases where the standardised subscale score is not significantly higher compared to other subscales, including cases in which it is lower. A country/economy is relatively stronger in one subscale than another if its standardised score, as determined by the mean and standard deviation of student performance in that subscale across all participating countries/economies, is significantly higher in the first subscale than in the second subscale. Content subscales are indicated by the following abbreviations: cr - change and relationship; qn - quantity; ss - space and shape; ud - uncertainty and data.
Notes: Only countries and economies where PISA 2022 was delivered on computer are shown.
Although the OECD mean is shown in this table, the standardisation of subscale scores was performed according to the mean and standard deviation of students across all PISA-participating countries/economies.
The standardised scores that were used to determine the relative strengths of each country/economy are not shown in this table.
Countries and economies are ranked in descending order of mean mathematics performance.
Source: OECD, PISA 2022 Database, Tables I.B1.2.1, I.B1.2.8, I.B1.2.9, I.B1.2.10 and I.B1.2.11.

Box I.2.2. How much do students improve in mathematics after age 15?

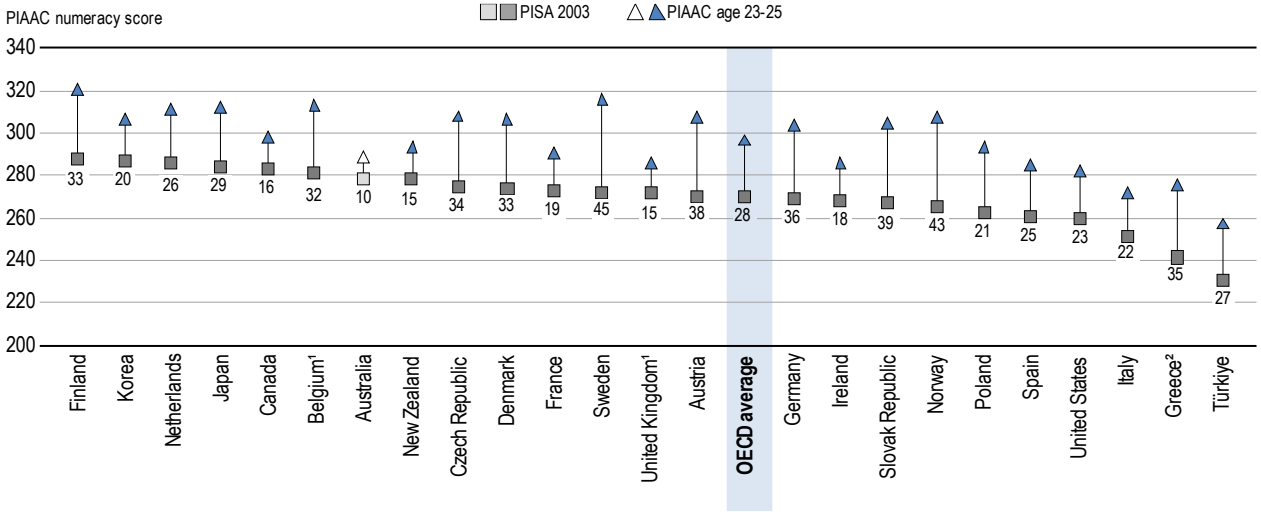
PISA offers a snapshot of 15-year-old students' proficiency in mathematics, reading and science. But how does proficiency in these areas continue to evolve over students' lives? Does it improve after they leave compulsory education? And, if it does, by how much?

The OECD Skills Outlook 2021 has published analyses combining data from PISA (2000, 2003 and 2006 assessments) and the Survey of Adult Skills, a product of the OECD Programme for the International Assessment of Adult Competencies (PIAAC) (2012 and 2015 assessment) to examine the growth in literacy and numeracy achievement between the ages of 15 and young adulthood (OECD, 2021[17]). These analyses show limited growth in achievement: across OECD countries, 15-year-olds have an average score of 268 on the PIAAC proficiency scale and in the years following compulsory schooling, their gain in literacy is on average 14 points. For numeracy, the gain in young adulthood is 28 points from a baseline PIAAC score of 269 at age 15[7]. Analyses also explore how this achievement growth relates to students' level of performance and their socio-economic status. In this box we present the analyses focusing on achievement growth in numeracy.

Performance growth in numeracy between age 15 and 24

Figure I.2.7 shows the growth in numeracy performance between the ages of 15 and 24 for 24 OECD countries with available data. The blue square represents the score of 15-year-olds from the 2003 PISA test and the black triangles represent the scores of the same cohort tested in the 2012 and 2015 PIAAC surveys at around the age of 24 (for coverage and representativeness reasons, the PIAAC age range was extended to include people born one year before and after the relevant PISA cohort, in this case 24-year-olds[8]).

Figure I.2.7. Performance growth in numeracy between ages 15 and 24



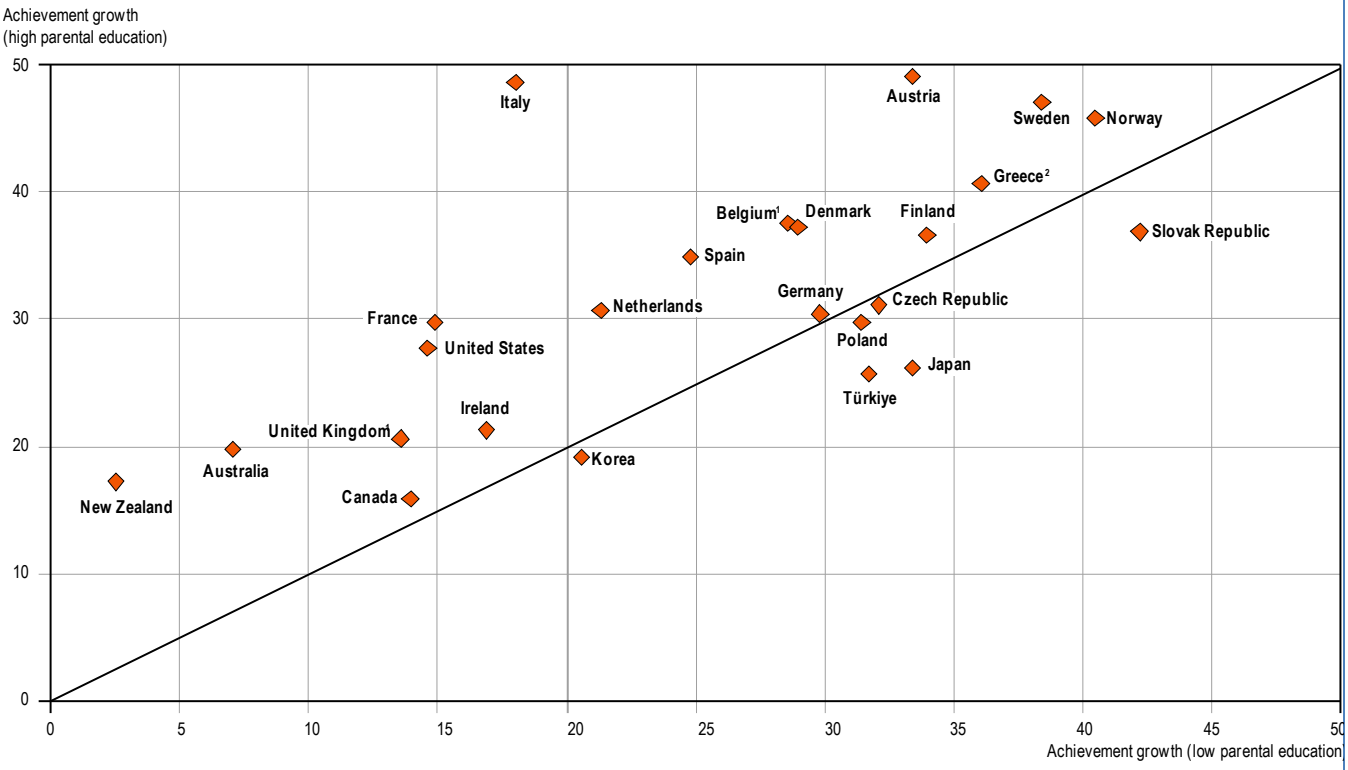
1. In PIAAC, data for Belgium refer only to Flanders and data for the United Kingdom* refer to England and Northern Ireland jointly.
2. The data for Greece include a large number of cases (1 032) in which there are responses to the background questionnaire but where responses to the assessment are missing. Proficiency scores have been estimated for these respondents based on their responses to the background questionnaire and the population model used to estimate plausible values for responses missing by design derived from the remaining 3 893 cases.
Notes: Only OECD countries with available information are shown. Differences between age 15 and ages 23-25 that are statistically significant are shown in a darker tone (see Annex A3).
PIAAC data refers to 2012 except for Chile, Greece, Israel and New Zealand, which refer to 2015. PISA mathematics scores are expressed in PIAAC numeracy scores, following (Borgonovi et al., 2017[18]) and based on methods described in the OECD Skills Outlook 2021 (OECD, 2021[17]), Chapter 3, Box 3.1.
Countries are ranked in descending level of achievement among 15 year olds.
Source: OECD Skills Outlook 2021 (OECD, 2021[17]), Table 3.8b.

As shown in the figure, performance in numeracy increased between the ages of 15 and 24 in every country with available data, except Australia*. On average across the 24 OECD countries, performance in numeracy increased by 28 points on the PIAAC numeracy scale, from 269 to 297 points. Performance in numeracy increased the most (more than 40 score points) in Norway and Sweden. In Austria, Germany and the Slovak Republic, performance in numeracy increased by more than 35 points. In Canada*, France, Ireland*, Korea, New Zealand*, and the United Kingdom* (i.e. England and Northern Ireland*), performance in numeracy increased the least (fewer than 20 points).

In addition, data show the numeracy performance of the 10% lowest and 10% highest performers (OECD, 2021, p. 128[17]). The 10% lowest-achieving 15-year-olds had an average score of 211 on the PIAAC scale compared with a score of 235 for the 10% lowest-achieving 24-year-olds: an increase of 24 points. In contrast, the numeracy score of the 10% best-performing 15-year-olds was 326 compared to 355 for the 10% best-performing 24-year-olds: an increase of 28 points. These results suggest that, on average, the gap in performance between the highest and lowest achievers in numeracy increased.

Figure I.2.8 shows the growth in numeracy skills between the ages of 15 and 24 in terms of students' parents' education level, which is used here as a proxy for socio-economic status. Results show that socio-economic inequalities not only persist but increase after leaving school in most countries with available data.

Figure I.2.8. Performance growth in numeracy between ages 15 and 24, by parental education



1. In PIAAC, data for Belgium refer only to Flanders and data for the United Kingdom* refer to England and Northern Ireland jointly.
2. The data for Greece include a large number of cases (1 032) in which there are responses to the background questionnaire but where responses to the assessment are missing. Proficiency scores have been estimated for these respondents based on their responses to the background questionnaire and the population model used to estimate plausible values for responses missing by design derived from the remaining 3 893 cases.
Notes: Only OECD countries with available information are shown. PIAAC data refers to 2012 except for Chile, Greece, Israel and New Zealand, which refer to 2015. PISA mathematics scores are expressed in PIAAC numeracy scores, following (Borgonovi et al., 2017[18]) and based on methods described in the OECD Skills Outlook 2021 (OECD, 2021[17]), Chapter 3, Box 3.1. Source: OECD Skills Outlook 2021 (OECD, 2021[17]), Table 3.15b.

On average across the 24 OECD countries represented in the figure, performance in numeracy increased by 25 score points among individuals whose parents had low levels of education (i.e. less than tertiary education completed) and by 32 points among individuals whose parents had high levels of education (i.e. tertiary education completed). Disparities in the growth of numeracy skills are marked in a number of countries, with the growth of skills especially high for individuals with highly educated parents. The vast majority of countries are in the upper triangle.

Policy implications

Once individuals leave compulsory education, their options for developing skills become very diverse. Some continue formal learning through adult education and training while others rely more on formal and informal learning at work and in everyday life. The impact of this differentiation on lifelong learning pathways can vary considerably between countries and within different groups within countries. An individual's ability to acquire new skills often depends on factors beyond the educational setting itself. Understanding what happens during this transition from school to young adulthood is essential. It is an opportunity for policy makers to promote foundational skills on a large scale and, where necessary, address educational deficits from earlier years.

Basic skills developed by age 15, including numeracy skills, are the foundation on which students develop their agency and transformative capacities (OECD, 2019[19]). While basic skills acquired early in school are perfected throughout life, the Skills Outlook 2021 shows the importance of acquiring a strong and solid foundation in school: data suggest that it is in the early years that essential skills are acquired and perfected.

Box I.2.3. The PISA 2022 framework for assessing mathematics

For the assessments of mathematics, reading and science, PISA develops subject-specific frameworks that define what it means to be proficient in the subject. These frameworks organise the subject according to key processes, contents and contexts that are measured in the assessment. The mathematics framework was updated for PISA 2022, while the reading and science frameworks remained identical to those used in 2018 (OECD, 2023[20]).

What's new in the PISA 2022 mathematics framework

The new PISA 2022 mathematics framework considers that large-scale social changes such as digitalisation and new technologies; the ubiquity of data for making personal decisions; and the globalising economy have reshaped what it means to be mathematically competent and well-equipped to participate as a thoughtful, engaged, and reflective citizen in the 21st century. What these changes mean for education is that being mathematically proficient is less about the reproduction of routine procedures and more about the use of mathematical reasoning; that is, thinking mathematically in ways that allow students to solve increasingly complex real-life problems in a variety of 21st-century contexts.

Reasoning does not necessarily require employing advanced mathematics, it requires a clear understanding of basic (i.e. foundational) mathematical concepts. It is about thinking independently, logically, and creatively to approach real-world tasks that cannot be easily automatised or solved using simple "recipes". Students at all levels of mathematics proficiency can demonstrate mathematical reasoning. At high levels of proficiency in mathematical reasoning, students understand that a problem is quantitative in nature and can formulate complex mathematical models to solve it. At lower levels of proficiency, mathematical reasoning is displayed by students who may not know much about formal mathematics but can intuitively spot a problem and solve it in informal ways, using elementary mathematics.

To develop students' ability to reason mathematically, schools and education systems need to go beyond teaching and evaluating routine mathematical procedures – students need to be ready to address unfamiliar real-world problems and apply the mathematical tools they have in new ways.

Mathematical processes

For each of the four mathematical processes examined in PISA 2022, a mathematics subscale was developed. Each PISA mathematics test item is designed to capture one of the processes, and students are not necessarily expected to use all four to respond to each test item.

Mathematical reasoning: i.e. "thinking mathematically", is the capacity to use mathematical concepts, tools, and logic to conceptualise and create solutions to real-life problems and situations. It involves recognising the mathematical nature inherent to a problem and developing strategies to solve it. This includes distinguishing between relevant and irrelevant information, using computational thinking, drawing logical conclusions, and recognising how solutions can be applied in a real-world context. Mathematical reasoning is also the capacity to construct arguments and provide evidence to support and explain ones' answers and solutions, and to develop awareness of ones' own thinking processes, including decisions made about which strategies to follow. Mathematical reasoning includes deductive and inductive reasoning. While reasoning underlies the other three mathematical processes described below, it nonetheless is different from them in that reasoning requires thinking through the whole problem-solving process rather than focusing on a specific part of it.

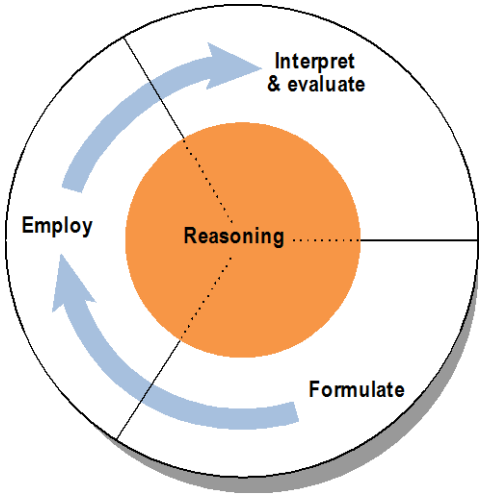
Formulating situations mathematically: mathematically literate students are able to recognise or identify the mathematical concepts and ideas underlying problems encountered in the real world, and then provide mathematical structure to the problems (i.e. formulate them in mathematical terms). This translation – from a contextualised situation to a well-defined mathematics problem – makes it possible to employ mathematical tools to solve real-world problems.

Employing mathematical concepts, facts and procedures: mathematically literate students are able to apply appropriate mathematics tools to solve mathematically formulated problems to obtain mathematical conclusions. This process involves activities such as performing arithmetic computations, solving equations, making logical deductions from mathematical assumptions, performing symbolic manipulations, extracting mathematical information from tables and graphs, representing and manipulating shapes in space, and analysing data.

Interpreting, applying, and evaluating mathematical outcomes: mathematically literate students are able to reflect upon mathematical solutions, results or conclusions and interpret them in the context of the real-life problem that started the process. This involves translating mathematical solutions or reasoning back into the context of the problem and determining whether the results are reasonable and make sense in the context of the problem.

Figure I.2.9. The mathematical modelling cycle in PISA 2022

Mathematical processes students go through to solve real-life problems and situations



Source: *PISA 2022 Assessment and Analytical Framework* (OECD, 2023[20]).

Mathematical content

PISA 2022 developed a mathematics subscale for each of these four content domains:

Quantity: number sense and estimation; quantification of attributes, objects, relationships, situations and entities in the world; understanding various representations of those quantifications, and judging interpretations and arguments based on quantity.

Uncertainty and data: recognising the place of variation in the real world, including having a sense of the quantification of that variation, and acknowledging its uncertainty and error in related inferences. It also includes forming, interpreting and evaluating conclusions drawn in situations where uncertainty is present. The presentation and interpretation of data are also included in this category, as well as basic topics in probability.

Change and relationships: understanding fundamental types of change and recognising when they occur in order to use suitable mathematical models to describe and predict change. Includes appropriate functions and equations/inequalities as well as creating, interpreting and translating among symbolic and graphical representations of relationships.

Space and shape: patterns; properties of objects; spatial visualisations; positions and orientations; representations of objects; decoding and encoding of visual information; navigation and dynamic interaction with real shapes as well as representations, movement, displacement, and the ability to anticipate actions in space.

Real-world contexts

Mathematical reasoning and problem-solving take place in real-world contexts. There are four different contexts used in PISA 2022, which were also used in previous cycles:

Personal context: related to one's self, one's family or one's peer group. For example, food preparation, shopping, games, personal health, personal transportation, recreation, sports, travel, personal scheduling and personal finance, etc.

Occupational context: related to the world of work. For example, measuring, costing and ordering materials for building payroll/accounting, quality control, scheduling/inventory, design/architecture and job-related decision making either with or without appropriate technology, etc.

Societal context: related to one's community, whether local, national or global. For example, voting systems, public transport, government, public policies, demographics, advertising, health, entertainment, national statistics and economics, etc.

Scientific context: related to the application of mathematics to the natural world, and issues and topics related to science and technology. For example, weather or climate, ecology, medicine, space science, genetics, measurement and the world of mathematics itself

Descriptors of performance at the lower end of the mathematics scale

Drawing from the PISA for Development framework (OECD, 2018[21]), the six proficiency levels used in previous PISA mathematics assessments have been expanded. Specifically, Level 1 has now been expanded to include Level 1a, 1b and 1c (see Chapter 3 for a description of what students can do at each proficiency level in mathematics). Five test items measure Level 1b in the computer-based mathematics assessment, and one item measures Level 1c in the paper-based mathematics assessment.

Box I.2.4. How PISA measures reading and science skills

How PISA measures reading skills

In PISA 2022, reading proficiency is defined as follows: "Reading literacy is understanding, using, evaluating, reflecting on and engaging with texts in order to achieve one's goals, to develop one's knowledge and potential, and to participate in society" (OECD, 2019[22]).

PISA conceives of reading skills as a broad set of competencies that allows readers to engage with written information presented in one or more texts for a specific purpose (RAND Reading Study Group and Snow, 2022[23]; Perfetti, Landi and Oakhill, 2005[24]).

Readers must understand the text and integrate this with their pre-existing knowledge. They must examine the author's (or authors') point of view and decide whether the text is reliable and truthful, and whether it is relevant to their goals or purpose (Bråten, Strømsø and Britt, 2009[25]).

Reading in the 21st century involves not only the printed page but electronic formats (i.e. digital reading). It requires triangulating different sources, navigating through ambiguity, distinguishing between fact and opinion, and constructing knowledge. During the pandemic, remote teaching initiatives heavily relied on the availability of digital education resources.

The PISA reading framework developed in PISA 2018 was used again in PISA 2022.

How PISA measures science skills

As defined in PISA, scientific proficiency is the ability to engage with science-related issues and the ideas of science as a reflective citizen (OECD, 2019[22]). A scientifically proficient person, therefore, is willing to engage in reasoned discourse about science and technology, which requires the competencies of:

Explaining phenomena scientifically: recognising, offering, and evaluating explanations for a range of natural and technological phenomena.

Evaluating and designing scientific enquiry: describing and appraising scientific investigations and proposing ways of addressing questions scientifically.

Interpreting data and evidence scientifically: analysing and evaluating data, claims and arguments in a variety of representations and drawing appropriate scientific conclusions.

Within this framework, performance in science requires three forms of knowledge: content knowledge, knowledge of the standard methodological procedures used in science, and knowledge of the reasons and ideas used by scientists to justify their claims. Explaining scientific and technological phenomena, for instance, demands knowledge of the content of science. Evaluating scientific enquiry and interpreting evidence scientifically also require an understanding of how scientific knowledge is established and the degree of confidence with which it is held. Therefore, individuals who are scientifically literate understand the major concepts and ideas that form the foundation of scientific and technological thought; how such knowledge has been derived; and the degree to which such knowledge is justified by evidence or theoretical explanations.

The definition of science proficiency recognises that there is an affective element to a student's competency: students' attitudes or dispositions towards science can influence their level of interest, sustain their engagement and motivate them to take action.

Science was the major assessment subject in PISA 2006 and 2015. The science assessment was updated in 2015 and was used again in PISA 2018 and PISA 2022. The PISA science framework developed in PISA 2015 continued to be used in PISA 2018 and PISA 2022.

Table I.2.9. How did countries perform in PISA 2022? Chapter 2 figures and tables

Table I.2.1	Comparing countries' and economies' performance in mathematics
Table I.2.2	Comparing countries' and economies' performance in reading
Table I.2.3	Comparing countries' and economies' performance in science
Figure I.2.1	Mathematics anxiety and mean score in mathematics in PISA 2022
Figure I.2.2	Mathematics performance and anxiety in mathematics among students with fixed and growth mindsets
Figure I.2.3	Average performance in mathematics and variation in performance
Figure I.2.4	Mean score in mathematics at 10th, 50th and 90th percentile of performance distribution
Figure I.2.5	Variation in mathematics performance between systems, schools and students
Figure I.2.6	Variation in mathematics performance between and within schools
Table I.2.4	Mathematics performance at national and subnational levels
Table I.2.5	Reading performance at national and subnational levels
Table I.2.6	Science performance at national and subnational levels
Table I.2.7	Comparing countries and economies on the mathematics-process subscales
Table I.2.8	Comparing countries and economies on the mathematics-content subscales
Figure I.2.7	Performance growth in numeracy between ages 15 and 24
Figure I.2.8	Performance growth in numeracy between ages 15 and 24, by parental education
Figure I.2.9	The mathematical modelling cycle in PISA 2022

StatLink https://stat.link/xluqor

Notes

[1] When comparing mean performance across countries/economies, only differences that are statistically significant should be considered (see Box 1 in Reader's Guide).

[2] The standard deviation summarises variation in performance among 15-year-old students within each country/economy. The average standard deviation in mathematics performance within OECD countries is 90 score points. If the standard deviation is larger than 90 score points, it indicates that student performance varies more from a particular country's/economy's average performance than it varies internationally. A smaller standard deviation means that student performance varies less in a country/economy than it varies internationally.

[3] This analysis was carried out in two steps. In the first step, the share of the variation in student performance that occurs between education systems was identified. In the second step, out of the remaining variation, the between-school and within-school was identified. Within-school variation are differences in performance between students.

[4] PISA results do not establish causality. PISA identifies empirical correlations between student achievement and the characteristics of schools and education systems, correlations that show consistent patterns across countries. Implications for policy are based on this correlational evidence and previous research.

[5] The reason for this restriction is the following: while the students sampled in PISA represent all 15-year-old students, whatever type of school they are enrolled in, they may not be representative of the students enrolled in their school. As a result, comparability at the school level may be compromised. For example, if grade repeaters in a country are enrolled in different schools than students in the modal grade because the modal grade in this country is the first year of upper secondary school (ISCED 3) while grade repeaters are enrolled in lower secondary school (ISCED 2), the average performance of schools where only students who had repeated a grade were assessed may be a poor

indicator of the actual average performance of these schools. By restricting the sampling to schools with the modal ISCED level for 15-year-old students, PISA ensures that the characteristics of the students sampled are as close as possible to the profiles of the students attending the school. The "modal ISCED level" is defined here as the level attended by at least one-third of the PISA sample. In 15 education systems (Baku [Azerbaijan], Cambodia, Colombia, Costa Rica, the Czech Republic, the Dominican Republic, Hong Kong [China]*, Indonesia, Jamaica, Kazakhstan, Morocco, the Netherlands, the Slovak Republic, Switzerland, and Chinese Taipei) both lower secondary (ISCED level 2) and upper secondary (ISCED level 3) schools meet this definition. In all other countries, analyses are restricted to either lower secondary or upper secondary schools (see Table I.B1.2.14 for details). In several countries, lower and upper secondary education are provided in the same school. As the restriction is made at the school level, some students from a grade other than the modal grade in the country may also be used in the analysis.

[6] See Annex A3 for a technical note on how the range of ranks were computed in PISA 2022.

[7] The PIAAC numeracy scale that is used here has a mean of 263 and a standard deviation of 47. Thus, for example, the gain in young adulthood of 28 points from a baseline PIAAC score of 269 at age 15, represents about 60% of a standard deviation.

[8] As discussed in Box 3.1, Chapter 3, of the OECD Skills Outlook 2021, in order to analyse literacy and numeracy performance growth between age 15 and young adulthood, analyses were conducted on synthetic cohorts, matching data from PISA and the relevant birth cohort in PIAAC: "Sample sizes used to construct the synthetic cohorts vary markedly: in PISA, the cohort comprises around 4 500 students per country, compared to only around 150 individuals in PIAAC. For this reason, the PIAAC age band was expanded to include people born one year before and after the relevant PISA cohort. For example, PISA 2000 results were matched to data for 26-28 year-olds surveyed in PIAAC in 2012 – which, unlike PISA, had been conducted only once so far – for the 17 countries that participated in both. To increase international coverage, data from PISA 2003 were added for three countries that administered PIAAC in 2015. Similarly, data for PISA 2003 were matched to data for 23-25 year-olds in PIAAC." For further reference, see Annex Table 3.A.1 in the OECD Skills Outlook 2021.

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3 What can students do in mathematics, reading and science?

This chapter presents the various levels of proficiency that students exhibited in PISA 2022 in mathematics, reading and science. It describes what students can do at each level of proficiency in each subject and how many students performed at each proficiency level. It then discusses student performance in specific aspects of mathematics.

For Australia, Canada, Denmark, Hong Kong (China), Ireland, Jamaica, Latvia, the Netherlands, New Zealand, Panama, the United Kingdom and the United States, caution is required when interpreting estimates because one or more PISA sampling standards were not met (see Reader's Guide, Annexes A2 and A4).

What the data tell us

- Some 69% of students attained at least baseline proficiency Level 2 in mathematics on average across OECD countries. Over 85% of students in Estonia, Hong Kong (China), Japan, Macao (China), Singapore and Chinese Taipei performed at this proficiency level or above.
- Roughly three out of four students attained at least baseline proficiency Level 2 in reading on average across OECD countries. A similar proportion attained at least Level 2 in science.
- On average across OECD countries, some 9% of students attained the highest proficiency levels, Level 5 or 6, in mathematics. In 16 out of 81 countries and economies participating in PISA 2022, more than 10% of students attained Level 5 or 6 proficiency; by contrast, in 42 countries and economies, less than 5% of students attained Level 5 or 6 proficiency in mathematics.
- Some 7% of students attained the highest proficiency levels, Level 5 or 6, in reading on average across OECD countries. A similar proportion attained Level 5 or 6 proficiency in science.

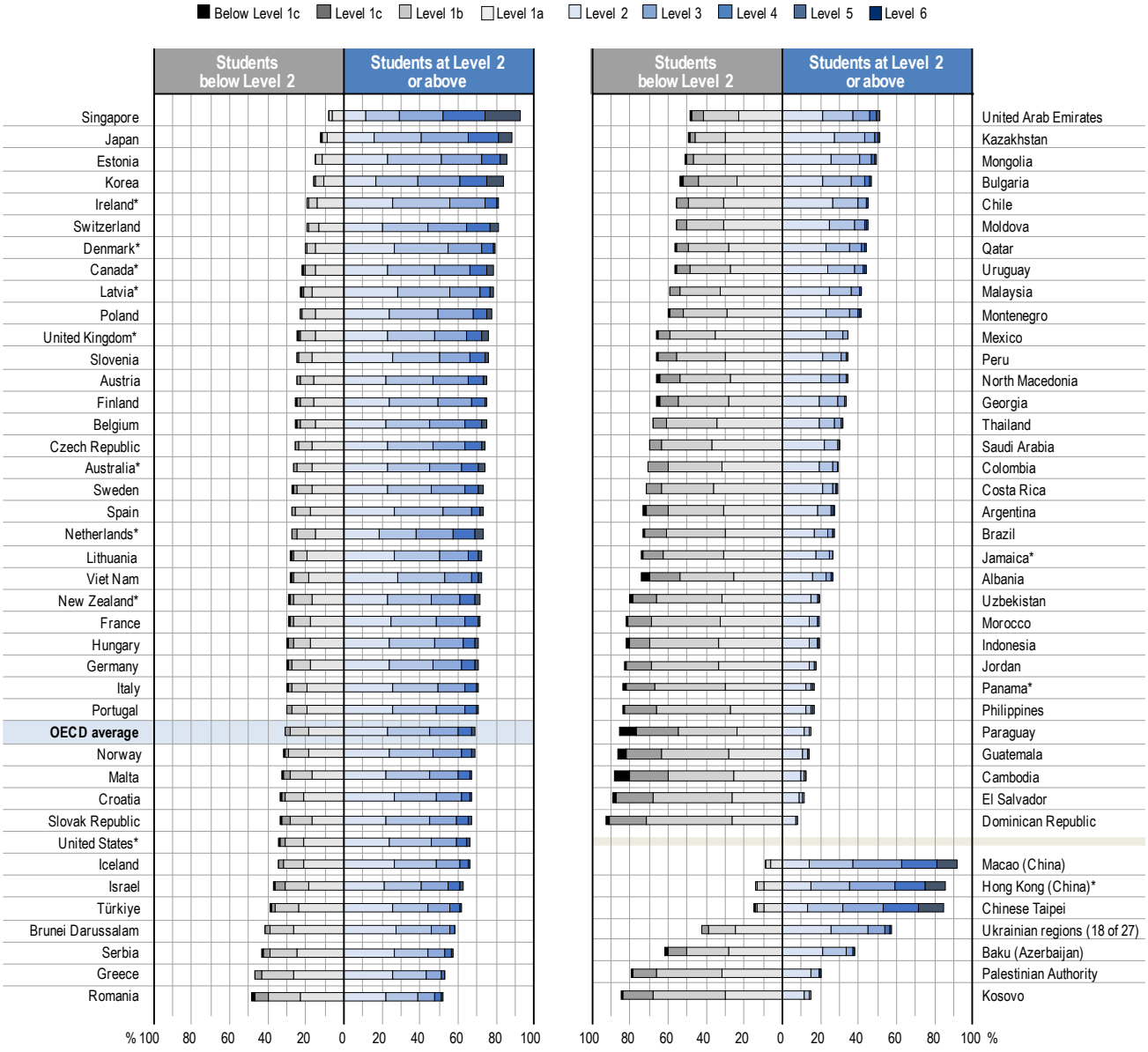
This chapter describes what students are able to do in mathematics, reading and science. Chapter 2 describes students' performance through their score on the PISA scale; scores, however, do not indicate what students are actually capable of accomplishing in each subject. This chapter translates PISA scores into proficiency levels to allow for a substantive interpretation of the kinds of tasks that students scoring higher or lower in PISA can complete successfully. For a detailed explanation of the way in which PISA scores are translated into proficiency levels, please see Annex A1.

What students can do in mathematics

Percentage of students at different levels of mathematics proficiency

In PISA 2022, the mathematics scale is divided into eight proficiency levels[1]. Figure I.3.1 shows how students are distributed across the eight levels of mathematics proficiency. In PISA, proficiency Level 2 is considered the baseline level of proficiency students need to participate fully in society. At this level, students begin to demonstrate the ability and initiative to use mathematics in simple real-life situations. Students who do not attain baseline Level 2 are referred to in this report as "low performers". Low-performing students are less likely to complete higher education and attaining better-paying and prestigious jobs in the future (OECD, 2016[1]; OECD, 2018[2]). The percentage of students performing at Level 1a or below (i.e. below Level 2) is shown on the left side of the vertical axis in Figure I.3.1.

Figure I.3.1. Students' proficiency in mathematics



Note: Cambodia, Guatemala, Paraguay and Viet Nam used a paper-based version of the PISA assessment (see Annex A5).
Countries and economies are ranked in descending order of the percentage of students who performed at or above Level 2.
Source: OECD, PISA 2022 Database, Table I.B1.3.1

PISA 2022 results show that 31% of students performed below Level 2 in mathematics on average across OECD countries. 19% of students scored at proficiency Level 1a in mathematics, 10% at proficiency Level 1b, 2% at proficiency Level 1c, and 0.3% below proficiency Level 1c on average across OECD countries.

Some educational systems have few low performers in mathematics. In six countries and economies, 15% or less of students performed below Level 2 in mathematics (Estonia, Chinese Taipei, Hong Kong [China]*, Japan, Macao [China] and Singapore, in descending order of the percentage of low performers). In these countries, most low-performing students scored at Level 1a rather than at proficiency Level 1b, Level 1c or Below Level 1c. This means that these systems are close to achieving universal basic proficiency in mathematics.

By contrast, some educational systems have many low performers in mathematics. In 35 educational systems more than half of students scored below proficiency Level 2, and in 12 of them more than 80% of students scored below proficiency Level 2. In 18 countries and economies, at least 30% of students performed at proficiency Level 1a; in 15 countries and economies, at least 30% of students performed at proficiency Level 1b; and, in 19 countries and economies, at least 10% of students performed at proficiency Level 1c.

The percentage of students performing at Level 2 or above in mathematics in PISA 2022 is shown on the right side of the vertical axis in Figure I.3.1. These are students who reach or surpass basic proficiency in mathematics. On average across OECD countries, 69% of students scored at Level 2 or above.

More students performed at proficiency Level 2 (23%) and Level 3 (22%) than at Level 4 (15%) on average across OECD countries. Furthermore, only a small proportion of students scored at Level 5 (7%) and Level 6 (2%) on average across OECD countries.

Students who attained proficiency Level 5 or Level 6 are referred to in this report as “top performers”. Only in eight countries and economies was the share of students scoring at proficiency Level 5 in mathematics higher than 10%. In most countries or economies (46 out of 81), the share of students scoring at proficiency Level 5 is lower than 5%. And, in 30 countries or economies only 1% or less of 15-year-olds scored at proficiency Level 5.

The share of students scoring at Level 6 is higher than 10% only in Hong Kong (China)*, Macao (China), Singapore and Chinese Taipei. In a great majority of countries or economies (75 out of 81), the share of students scoring at Level 6 is lower than 5%. In 46 countries or economies only 1% or less of students scored at this level in mathematics.

Results on student performance in mathematics subscales (i.e. mean score and proficiency levels) are available in tables included in Annex B1 (for countries and economies) and Annex B2 (for regions within countries).

The range of proficiencies covered by the PISA mathematics test

Table I.3.1 provides descriptions for all proficiency levels for mathematics[2]; it also shows the average share of students performing at each level across OECD countries.

Table I.3.1. Description of the eight levels of mathematics proficiency in PISA 2022

Level	Lower score limit	Percentage of students able to perform tasks at each level or above (OECD average)	Characteristics of tasks
6	669	2.0%	At Level 6, students can work through abstract problems and demonstrate creativity and flexible thinking to develop solutions. For example, they can recognise when a procedure that is not specified in a task can be applied in a non-standard context or when demonstrating a deeper understanding of a mathematical concept is necessary as part of a justification. They can link different information sources and representations, including effectively using simulations or spreadsheets as part of their solution. Students at this level are capable of critical thinking and have a mastery of symbolic and formal mathematical operations and relationships that they use to clearly communicate their reasoning. They can reflect on the appropriateness of their actions with respect to their solution and the original situation.
5	607	8.7%	At Level 5, students can develop and work with models for complex situations, identifying or imposing constraints, and specifying assumptions. They can apply systematic, well-planned problem-solving strategies for dealing with more challenging tasks, such as deciding how to develop an experiment, designing an optimal procedure, or working with more complex visualisations that are not given in the task. Students demonstrate an increased ability to solve problems whose solutions often require incorporating mathematical knowledge that is not explicitly stated in the task. Students at this level reflect on their work and consider mathematical results with respect to the real-world context.
4	545	23.6%	At Level 4, students can work ef fectively with explicit models for complex concrete situations, sometimes involving two variables, as well as demonstrate an ability to work with undefined models that they derive using a more sophisticated computational-thinking approach. Students at this level begin to engage with aspects of critical thinking, such as evaluating the reasonableness of a result by making qualitative judgements when computations are not possible from the given information. They can select and integrate different representations of information, including symbolic or graphical, linking them directly to aspects of real-world situations. At this level, students can also construct and communicate explanations and arguments based on their interpretations, reasoning, and methodology.
3	482	45.6%	At Level 3, students can devise solution strategies, including strategies that require sequential decision-making or flexibility in understanding of familiar concepts. At this level, students begin using computational-thinking skills to develop their solution strategy. They are able to solve tasks that require performing several different but routine calculations that are not all clearly defined in the problem statement. They can use spatial visualisation as part of a solution strategy or determine how to use a simulation to gather data appropriate for the task. Students at this level can interpret and use representations based on different information sources and reason directly from them, including conditional decision-making using a two-way table. They typically show some ability to handle percentages, fractions and decimal numbers, and to work with proportional relationships.
2	420	68.9%	At Level 2, students can recognise situations where they need to design simple strategies to solve problems, including running straightforward simulations involving one variable as part of their solution strategy. They can extract relevant information from one or more sources that use slightly more complex modes of representation, such as two-way tables, charts, or two-dimensional representations of three-dimensional objects. Students at this level demonstrate a basic understanding of functional relationships and can solve problems involving simple ratios. They are capable of making literal interpretations of results .
1a	358	87.6%	At Level 1a, students can answer questions involving simple contexts where all information needed is present, and the questions are clearly defined. Information may be presented in a variety of simple formats and students may need to work with two sources simultaneously to extract relevant information. They are able to carry out simple, routine procedures according to direct instructions in explicit situations, which may sometimes require multiple iterations of a routine procedure to solve a problem. They can perform actions that are obvious or that require very minimal synthesis of information, but in all instances the actions follow clearly from the given stimuli. Students at this level can employ basic algorithms, formulae, procedures, or conventions to solve problems that most often involve whole numbers.
1b	295	97.4%	At Level 1b, students can respond to questions involving easy to understand contexts where all information needed is dearly given in a simple representation (i.e., tabular or graphic) and, as necessary, recognize when some information is extraneous and can be ignored with respect to the specific question being asked. They are able to perform simple calculations with whole numbers, which follow from clearly prescribed instructions, defined in short, syntactically simple text.
1c	233	99.7%	At Level 1c, students can respond to questions involving easy to understand contexts where all relevant information is clearly given in a simple, familiar format (for example, a small table or picture) and defined in a very short, syntactically simple text. They are able to follow a clear instruction describing a single step or operation.

Source: OECD, PISA 2022 Database, Table I.B1.3.1.

Table I.3.2 presents the proficiency level of several released test items from both the PISA 2022 main study (i.e. items that were actually used in the assessment) and the PISA 2022 field trial. These items are presented in full in Annex C. Items that illustrate the proficiency levels applicable to the paper-based assessment were presented in the PISA 2012 Initial Report (OECD, 2014[3]).

Table I.3.2. Map of selected mathematics questions, illustrating proficiency levels

Level	Lower score limit	Question (in descending order of difficulty)	Question difficulty (in PISA score points)
6	669	FORESTEDAREA - Released item 3 (CMA161Q03)	840
		FORESTEDAREA - Released item 4 (CMA161Q04)	739
		POINTS - Released item 1 (CMA156Q01C)	672
		CAR PURCHASE - Released item 2 (CMA104Q02)	Field Trial
		DVD SALES - Released item 2 (CMA106Q02)	Field Trial
		MOVING TRUCK - Released item 2 (CMA1 18Q02)	Field Trial
5	607	FORESTEDAREA - Released item 2 (CMA161Q02)	647
		FORESTEDAREA - Released item 1 (CMA161Q01)	636
		TRIANGULAR PATTERN - Released item 3 (CMA150Q03)	620
		SPINNERS - Released item 2 (CMA159Q02)	Field Trial
		SPINNERS - Released item 3 (CMA159Q03)	Field Trial
4	545	DVD SALES - Released item 1 (CMA106Q01)	Field Trial
3	482	SOLAR SYSTEM - Released item 1 (CMA123Q01S)	514
		DVD SALES - Released item 3 (CMA106Q03)	Field Trial
		SPINNERS - Released item 1 (CMA159Q01)	Field Trial
2	420	TRIANGULAR PATTERN - Released item 2 (CMA150Q02)	448
		SOLAR SYSTEM - Released item 2 (CMA123Q02S)	430
		CAR PURCHASE - Released item 1 (CMA104Q01)	Field Trial
		MOVING TRUCK - Released item 1 (CMA1 18Q01)	Field Trial
1a	358	TRIANGULAR PATTERN - Released item 1 (CMA150Q01)	411
1b	295		
1c	233		

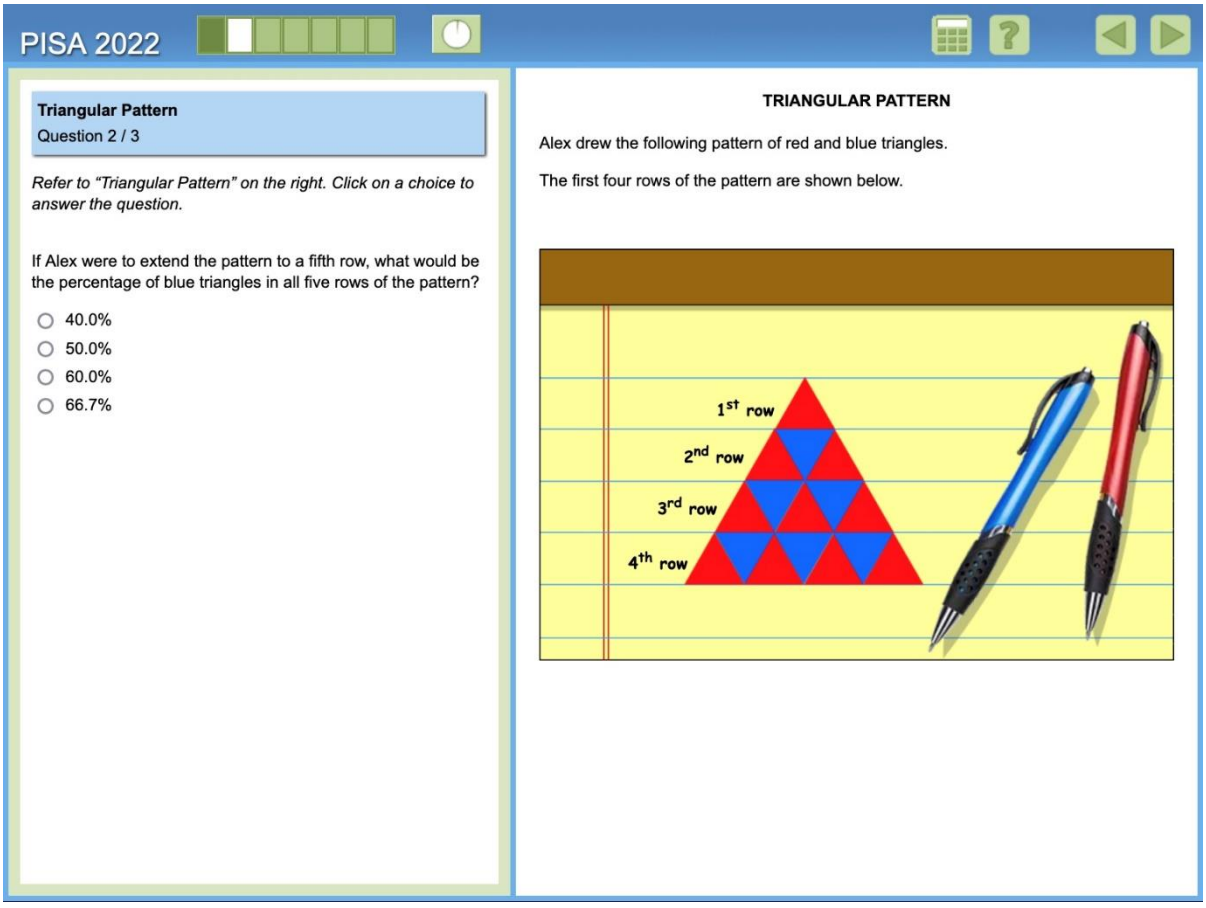
Note: Items with the label "Field Trial" in the Question difficulty column are items that were only used in the PISA 2022 field trial (i.e. not included in the main survey).

Question 1 in the TRIANGULAR PATTERN unit is an easy item at proficiency Level 1a. It illustrates the capacity of students to employ a simple algorithm to solve a clearly formulated question with all information shown. Students are presented with a drawing made of rows using alternating red and blue triangles. The drawing shows the first four rows of the pattern and students are asked to compute the percentage of blue triangles shown in these four rows. There are six blue triangles and 16 total triangles, so the percentage of blue triangles is 37.5% (6 ÷ 16 = 0.375). This question measures the e*mploying mathematical concepts, facts and procedures* process subscale, and *quantity* in the content subscale.

Question 2 in the same TRIANGULAR PATTERN unit is at proficiency Level 2 (Figure I.3.2). It builds off the first item of the unit by, again, asking students to compute the percentage of blue triangles. However, this time it is based on five rows of the pattern. Since the fifth row is not shown, students must extrapolate how many red and blue triangles this fifth row would contain based on the pattern established in the previous four rows and then calculate the new percentage of the total number of blue triangles. This item requires extending the pattern beyond what is shown. This

question measures the *formulating situations mathematically* process and *change and relationships* in the content category.

Figure I.3.2. Triangular Pattern unit, released item #2



Note: For the full set of publicly released mathematics items, see Annex C.

An example of an item at proficiency Level 3 is the first item in the SOLAR SYSTEM unit. It illustrates students' capacity to use data provided in a table to respond to explicit instructions. For this task, students need to determine which three planets have the average distances in Astronomical Units (au) between them that are shown in the model. To do this, students need to use the table in the stimulus that gives each planet's average distance from the Sun in au. This question measures the *interpreting, applying, and evaluating mathematical outcomes* process, and *quantity* in the content category.

Question 1 in the DVD SALES unit is a task at proficiency Level 4 (this item was not administered in the main study but only in the field trial). It illustrates students' capacity to evaluate whether a statement is supported by information shown in a graph. The item shows a scatterplot with the number of years after 2008 in the x-axis and the number of DVDs sold in millions in the y-axis. Students also see a table containing three statements about DVD sales in the United Kingdom for the years 2008 through 2014. To verify these statements and obtain full credit, students need to compute percentages, ratios, and differences, and interpret the slope of the graph in the linear model as a constant rate of change. This question measures the *formulating situations mathematically* process, and *uncertainty and data* in the content category.

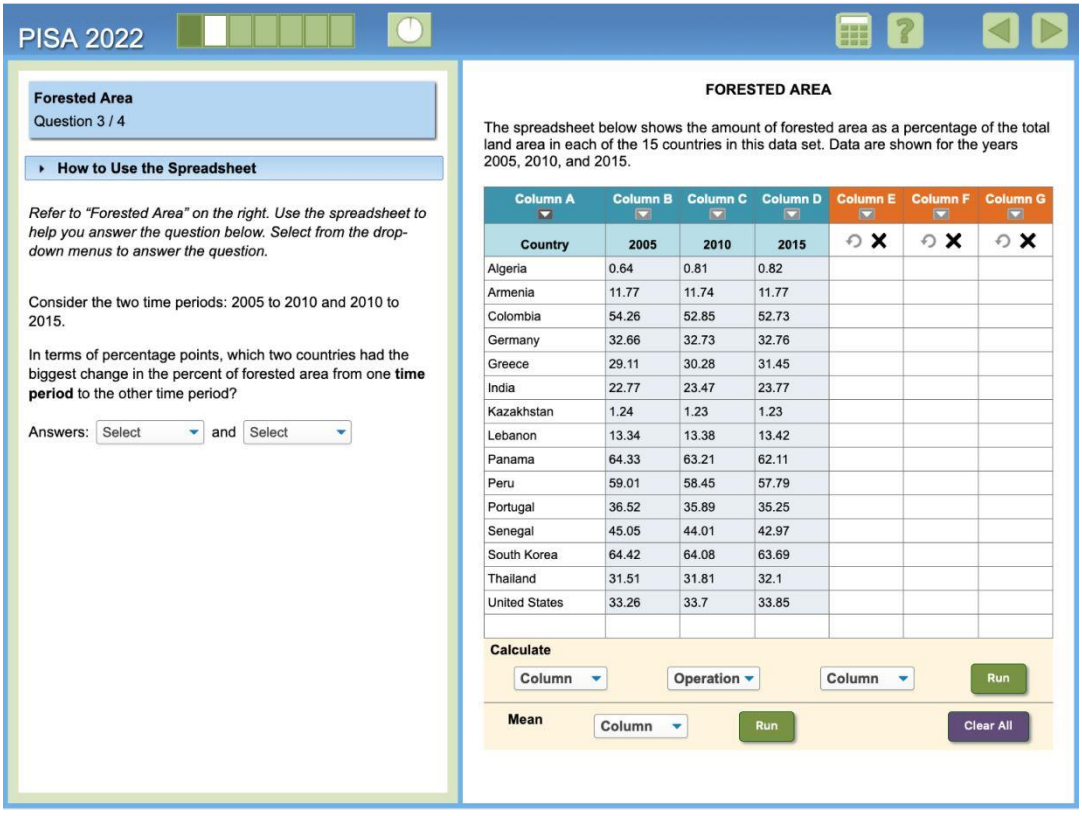
The FORESTED AREAS unit provides examples of tasks at proficiency Levels 5 and 6. The unit has an introduction screen that provides information about the context of the unit and lets students know that they will be using a

spreadsheet tool to assist with answering the questions. After the introduction screen, students come to a practice screen where they must perform several actions to familiarise themselves with the functionality of the spreadsheet. After the practice screen, students come to an instruction screen, which lets them know that instructions for using the spreadsheet are available in each item. The data used for all items in this unit comprise the amount of forested area as a percentage of the total land area for 15 countries in the years 2005, 2010, and 2015. The spreadsheet also has columns that are always empty when students first navigate to each item, and the default ordering of the countries is alphabetical.

Question 1 in the FORESTED AREAS unit is a task at proficiency Level 5. It asks students to identify the countries that had the greatest gain, the greatest loss or no overall change in its percentage of forested area between 2005 and 2015. To answer this question, students need to determine what calculation(s) to perform, how to use the spreadsheet to perform them, and, lastly, interpret the results with respect to the context. This question measures the *formulating situations mathematically* process, and *uncertainty and data* in the content category.

Question 3 in FORESTED AREAS is a task at proficiency Level 6 (Figure I.3.3). Students are told to consider the data in terms of two time periods: 2005 to 2010 and 2010 to 2015. They must identify the two countries that had biggest change in their percentage of forested area from one time period to the other. To answer this question, students need to calculate the change in the percent of forested area for each time period and then compute the change between the two time periods; they might also find it helpful to sort the results. Students have to devise a strategy for using the spreadsheet, which requires performing multiple operations before being able to evaluate the results. Possibly contributing to the difficulty of this item is recognising that "biggest change" in this context does not just mean an increase but it can also mean a decrease in the percentage of forested area between time periods. This question was allocated to the *interpreting, applying and evaluating mathematical outcomes* process category, and to the *uncertainty and data* content category.

Figure I.3.3. Forested Area unit, released item #3



Note: For the full set of publicly released mathematics items, see Annex C.

Box I.3.1. How PISA develops test items

The first step in defining a reporting scale in PISA is developing a framework for each subject assessed. This framework provides a definition of what it means to be proficient in the subject; delimits and organises the subject according to different dimensions; and suggests the kind of test items and tasks that can be used to measure what students can do in the subject within the constraints of the PISA design (OECD, 2023[4]). These frameworks were developed by a group of international experts for each subject and agreed upon by the participating countries.

The second step is the development of the test questions (i.e. items) to assess proficiency in each subject. A consortium of testing organisations under contract to the OECD on behalf of participating governments develops new items and selects items from previous PISA tests (i.e. "trend items") of the same subject. The expert group that developed the framework reviews these proposed items to confirm that they meet the requirements and specifications of the framework.

The third step is a qualitative review of the testing instruments by all participating countries and economies to ensure the items' overall quality and appropriateness in their own national context. These ratings are considered when selecting the final pool of items for the assessment. Selected items are then translated and adapted to create national versions of the testing instruments. These national versions are verified by the PISA consortium.

The verified national versions of the items are then presented to a sample of 15-year-old students in all participating countries and economies as part of a field trial. This is to ensure that they meet stringent quantitative standards of technical quality and international comparability. In particular, the field trial serves to verify the psychometric equivalence of items across countries and economies (see Annex A6).

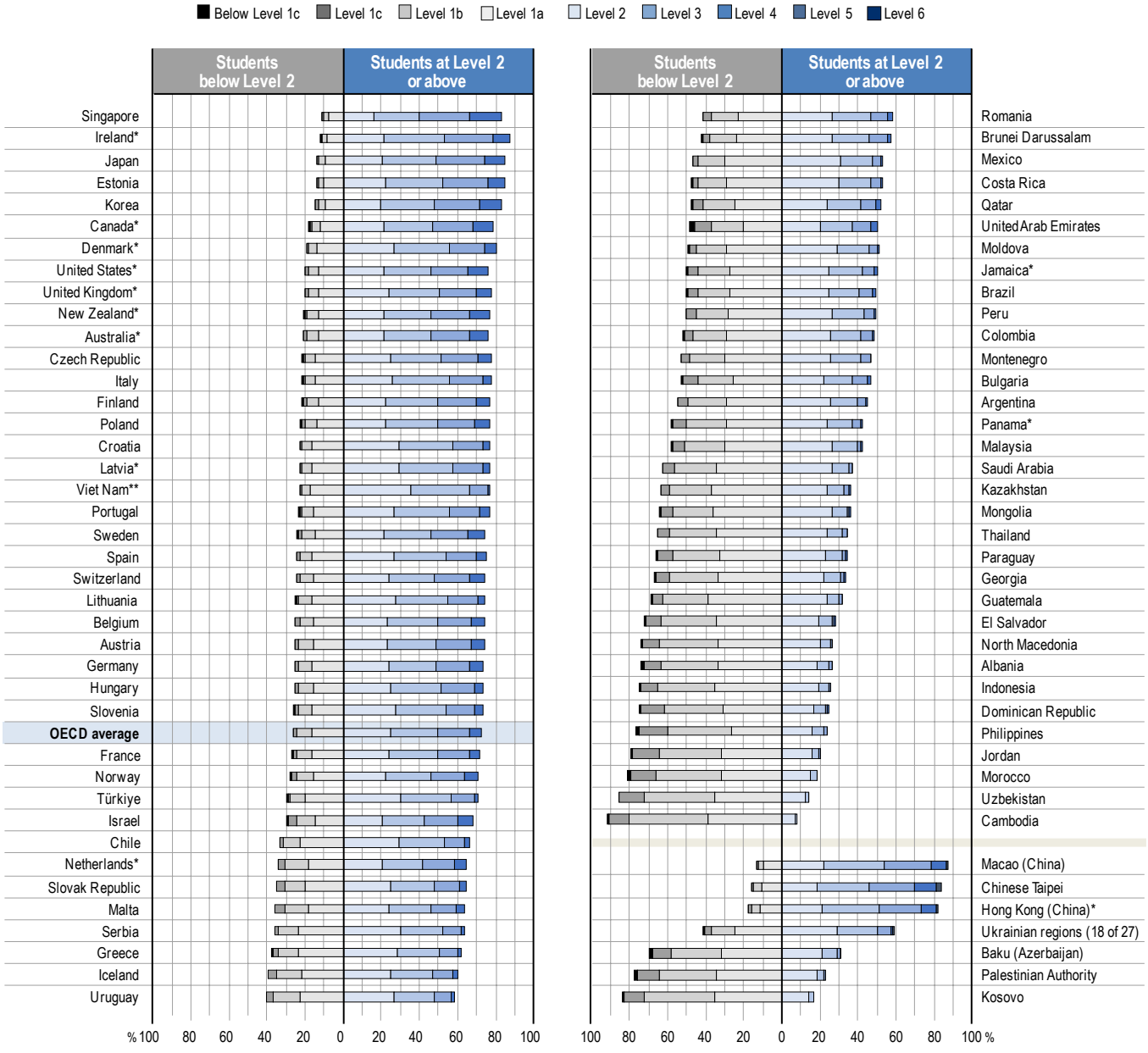
After the field trial, material is considered for rejection, revision or retention in the pool of potential items. The international expert group for each subject then formulates recommendations as to which items should be included in the main assessments. The final set of selected items is also subject to review by all countries and economies. This selection is balanced across the various dimensions specified in the framework and spans various levels of difficulty so that the entire pool of items measures performance across all component skills and a broad range of contexts and student abilities.

What students can do in reading

Percentage of students at different levels of reading proficiency

Figure I.3.4 shows the distribution of students across the eight levels of reading proficiency.

Figure I.3.4. Students' proficiency in reading



** Caution is required when comparing estimates based on PISA 2022 with other countries/economies as a strong linkage to the international PISA reading scale could not be established (see Reader's Guide and Annex A4).

Note: Cambodia, Guatemala, Paraguay and Viet Nam used a paper-based version of the PISA assessment (see Annex A5).

Countries and economies are ranked in descending order of the percentage of students who performed at or above Level 2.

Source: OECD, PISA 2022 Database, Table I.B1.3.2.

On average across OECD countries, the percentage of low performers in reading was 26%. 17% of students scored at proficiency Level 1a in reading, 8% at proficiency Level 1b, 2% at proficiency Level 1c, and 0.2% below proficiency Level 1c in PISA 2022.

Some educational systems have few low performers in reading. In Singapore, Ireland*, Macao (China), Japan, Estonia, and Korea (listed in ascending order of the proportion of low performers), 15% or less of students performed below baseline proficiency Level 2 in reading. In these countries, most of the relatively few low-performing students

scored at no lower than Level 1a, meaning that these systems are close to achieving universal basic proficiency in reading.

A larger number of educational systems have many low performers in reading. In 30 education systems, more than half of students performed below baseline proficiency Level 2 in reading. In 21 countries and economies, at least 30% of students performed at proficiency Level 1a; in 9 countries and economies, at least 30% of students performed at proficiency Level 1b; and in 10 countries and economies, at least 10% of students performed at proficiency Level 1c.

The percentage of students performing at Level 2 or above in reading in PISA 2022 is shown on the right side of the vertical axis in Figure I.3.4. On average across OECD countries, 74% of students scored at Level 2 or above. In 10 countries and economies, more than 80% of students scored at Level 2 or above but in another four countries and economies less than 20% of students reached baseline proficiency Level 2 in reading.

More students performed at proficiency Level 2 (24%) and Level 3 (25%) than at Level 4 (17%) on average across OECD countries. Moreover, only a small proportion of students scored at Level 5 (6%) and Level 6 (1%) on average across OECD countries.

Some 7% of students attained the highest proficiency levels, Level 5 or 6, in reading on average across OECD countries. In 13 countries/economies, the share of top performers in reading is higher than 10%.

Only in seven countries and economies (Canada*, Japan, Korea, New Zealand*, Singapore, Chinese Taipei and the United States*) is the share of students scoring at proficiency Level 5 higher than 10%. In 55 countries or economies, the share of students scoring at Level 5 is lower than 5%.

The share of students scoring at Level 6 in reading is zero in 11 countries and economies, and is 5% in Singapore. In 46 countries/economies the percentage of students scoring at Level 6 in reading is greater than zero but smaller than 1%, in five countries/economies it is 3%, and in the United States* it is 4%.

The range of proficiencies covered by the PISA reading test

The eight proficiency levels used in the PISA 2022 reading assessment are the same as those established for the PISA 2018 assessment. Table I.3.3 illustrates the range of reading competencies covered by the PISA test and describes the skills, knowledge and understanding required at each level of the reading scale.

Table I.3.3. Description of the eight levels of reading proficiency in PISA 2022 [1/2]

Level	Lower score limit	Percentage of students able to perform tasks at each level or above (OECD average)	Characteristics of tasks
6	698	1.2%	Readers at Level 6 can comprehend lengthy and abstract texts in which the information of interest is deeply embedded and only indirectly related to the task. They can compare, contrast and integrate information representing multiple and potentially conflicting perspectives, using multiple criteria and generating inferences across distant pieces of information to determine how the information may be used. Readers at Level 6 can reflect deeply on the text's source in relation to its content, using criteria external to the text. They can compare and contrast information across texts, identifying and resolving inter-textual discrepancies and conflicts through inferences about the sources of information, their explicit or vested interests, and other cues as to the validity of the information. Tasks at Level 6 typically require the reader to set up elaborate plans, combining multiple criteria and generating inferences to relate the task and the text(s). Materials at this level include one or several complex and abstract text(s), involving multiple and possibly discrepant perspectives. Target information may take the form of details that are deeply embedded within or across texts and potentially obscured by competing information.
5	626	7.2%	Readers at Level 5 can comprehend lengthy texts, inferring which information in the text is relevant even though the information of interest may be easily overlooked. They can perform causal or other forms of reasoning based on a deep understanding of extended pieces of text. They can also answer indirect questions by inferring the relationship between the question and one or several pieces of information distributed within or across multiple texts and sources. Reflective tasks require the production or critical evaluation of hypotheses, drawing on specific information. Readers can establish distinctions between content and purpose, and between fact and opinion as applied to complex or abstract statements. They can assess neutrality and bias based on explicit or implicit cues pertaining to both the content and/or source of the information. They can also draw conclusions regarding the reliability of the claims or conclusions o ffered in a piece of text. For all aspects of reading, tasks at Level 5 typically involve dealing with concepts that are abstract or counterintuitive, and going through several steps until the goal is reached. In addition, tasks at this level may require the reader to handle several long texts, switching back and forth across texts in order to compare and contrast information.
4	553	24.1%	At Level 4, readers can comprehend extended passages in single or multiple-text settings. They interpret the meaning of nuances of language in a section of text by taking into account the text as a whole. In other interpretative tasks, students demonstrate understanding and application of ad hoc categories. They can compare perspectives and draw inferences based on multiple sources. Readers can search, locate and integrate several pieces of embedded information in the presence of plausible distractors. They can generate inferences based on the task statement in order to assess the relevance of target information. They can handle tasks that require them to memorise prior task context. In addition, students at this level can evaluate the relationship between specific statements and a person's overall stance or conclusion about a topic. They can reflect on the strategies that authors use to convey their points, based on salient features of texts (e.g., titles and illustrations). They can compare and contrast claims explicitly made in several texts and assess the reliability of a source based on salient criteria. Texts at Level 4 are often long or complex, and their content or form may not be standard. Many of the tasks are situated in multiple-text settings. The texts and the tasks contain indirect or implicit cues.

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Source: OECD, PISA 2022 Database, Table I.B1.3.2.

Table I.3.3. Description of the eight levels of reading proficiency in PISA 2022 [2/2]

Level	Lower score limit	Percentage of students able to perform tasks at each level or above (OECD average)	Characteristics of tasks
3	480	49.4%	Readers at Level 3 can represent the literal meaning of single or multiple texts in the absence of explicit content or organisational clues. Readers can integrate content and generate both basic and more advanced inferences. They can also integrate several parts of a piece of text in order to identify the main idea, understand a relationship or construe the meaning of a word or phrase when the required information is featured on a single page. They can search for information based on indirect prompts, and locate target information that is not in a prominent position and/or is in the presence of distractors. In some cases, readers at this level recognise the relationship between several pieces of information based on multiple criteria. Level 3 readers can reflect on a piece of text or a small set of texts, and compare and contrast several authors' viewpoints based on explicit information. Reflective tasks at this level may require the reader to perform comparisons, generate explanations or evaluate a feature of the text. Some reflective tasks require readers to demonstrate a detailed understanding of a piece of text dealing with a familiar topic, whereas others require a basic understanding of less-familiar content. Tasks at Level 3 require the reader to take many features into account when comparing, contrasting or categorising information. The required information is often not prominent or there may be a considerable amount of competing information. Texts typical of this level may include other obstacles, such as ideas that are contrary to expectation or negatively worded.
2	407	73.7%	Readers at Level 2 can identify the main idea in a piece of text of moderate length. They can understand relationships or construe meaning within a limited part of the text when the information is not prominent by producing basic inferences, and/or when the text(s) include some distracting information. They can select and access a page in a set based on explicit though sometimes complex prompts, and locate one or more pieces of information based on multiple, partly implicit criteria. Readers at Level 2 can, when explicitly cued, reflect on the overall purpose, or on the purpose of specific details, in texts of moderate length. They can reflect on simple visual or typographical features. They can compare claims and evaluate the reasons supporting them based on short, explicit statements. Tasks at Level 2 may involve comparisons or contrasts based on a single feature in the text. Typical reflective tasks at this level require readers to make a comparison or several connections between the text and outside knowledge by drawing on personal experience and attitudes.
1a	335	90.3%	Readers at Level 1a can understand the literal meaning of sentences or short passages. Readers at this level can also recognise the main theme or the author's purpose in a piece of text about a familiar topic, and make a simple connection between several adjacent pieces of information, or between the given information and their own prior knowledge. They can select a relevant page from a small set based on simple prompts, and locate one or more independent pieces of information within short texts. Level 1a readers can reflect on the overall purpose and on the relative importance of information (e.g. the main idea vs. non-essential detail) in simple texts containing explicit cues. Most tasks at this level contain explicit cues regarding what needs to be done, how to do it, and where in the text(s) readers should focus their attention.
1b	262	97.9%	Readers at Level 1b can evaluate the literal meaning of simple sentences. They can also interpret the literal meaning of texts by making simple connections between adjacent pieces of information in the question and/or the text. Readers at this level can scan for and locate a single piece of prominently placed, explicitly stated information in a single sentence, a short text or a simple list. They can access a relevant page from a small set based on simple prompts when explicit cues are present. Tasks at Level 1b explicitly direct readers to consider relevant factors in the task and in the text. Texts at this level are short and typically provide support to the reader, such as through repetition of information, pictures or familiar symbols. There is minimal competing information.
1c	189	99.8%	Readers at Level 1c can understand and affirm the meaning of short, syntactically simple sentences on a literal level, and read for a clear and simple purpose within a limited amount of time. Tasks at this level involve simple vocabulary and syntactic structures.

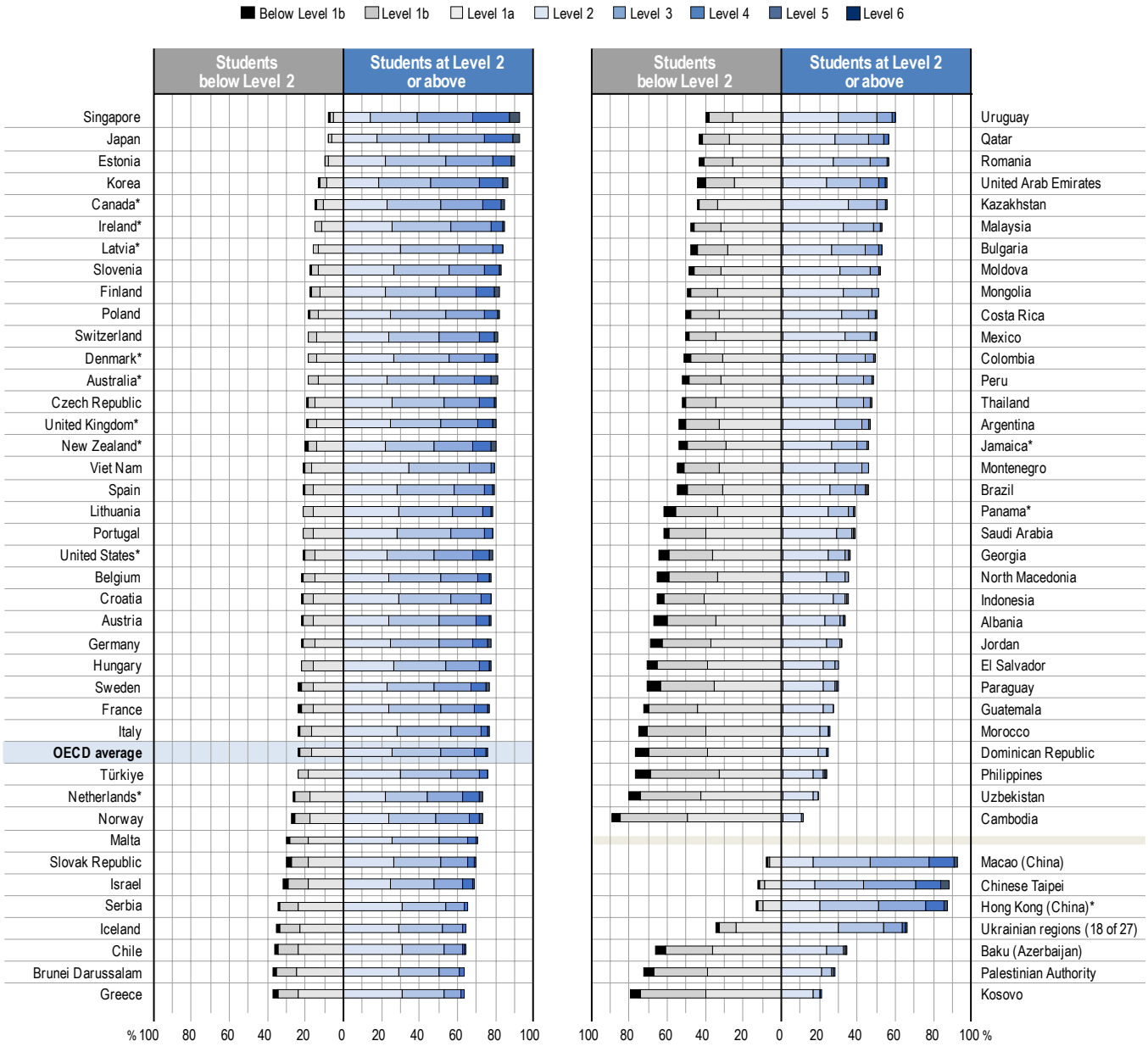
Source: OECD, PISA 2022 Database, Table I.B1.3.2.

What students can do in science

Percentage of students at different levels of science proficiency

Figure I.3.5 shows the distribution of students across the seven levels of science proficiency.

Figure I.3.5. Students' proficiency in science



Note: Cambodia, Guatemala, Paraguay and Viet Nam used a paper-based version of the PISA assessment (see Annex A5).
Countries and economies are ranked in descending order of the percentage of students who performed at or above Level 2.
Source: OECD, PISA 2022 Database, Table I.B1.3.3.

On average across OECD countries in PISA 2022, the percentage of low-performing students in science was 24%. 17% of students scored in science at proficiency Level 1a, 6% at proficiency Level 1b, and 1% below proficiency Level 1b.

A small number of educational systems have few low performers in science. In seven countries and economies, less than 15% of students performed below baseline proficiency Level 2 in science (Macao [China], Singapore, Japan, Estonia, Chinese Taipei, Hong Kong [China]* and Korea, in ascending order of the proportion of low performers). In these countries, most of the relatively few low-performing students scored at Level 1a, meaning that these systems are close to achieving universal basic proficiency in science.

A larger number of educational systems have many low performers in science. In 30 countries and economies, at least 30% of students performed at proficiency Level 1a; in 18 countries and economies, at least 20% of students performed at proficiency Level 1b.

The percentage of students performing at Level 2 or above in science in PISA 2022 is shown on the right side of the vertical axis in Figure I.3.5. On average across OECD countries, 76% of students scored at Level 2 or above. In 17 countries and economies, at least 80% of students scored at Level 2 or above but in another 10 countries and economies less than 30% of students reached baseline proficiency Level 2 in science.

More students performed in science at proficiency Level 2 (25%) and Level 3 (26%) than at Level 4 (17%) on average across OECD countries. Moreover, only a small proportion of students scored at Level 5 (6%) and Level 6 (1%) on average across OECD countries.

Some 7% of students attained the highest proficiency levels, Level 5 or 6, in science on average across OECD countries. In 14 countries/economies, the share of top performers in science was higher than 10%.

Only in five countries and economies was the share of students scoring at proficiency Level 5 higher than 10%. In 54 out of 81 countries or economies, the share of students scoring at Level 5 was lower than 5%.

The share of students scoring at Level 6 was as high as 6% only in Singapore. In 60 out of 81 countries or economies, the share of students scoring at Level 6 was no higher than 1%.

The range of proficiencies covered by the PISA science test

The seven proficiency levels used in the PISA 2022 science assessment were the same as those established for the PISA 2015 assessment and were used again in PISA 2018. Table I.3.4 illustrates the range of science competencies covered by the PISA test and describes the skills, knowledge and understanding required at each level of the science scale.

Table I.3.4. Description of the seven levels of science proficiency in PISA 2022

Level	Lower score limit	Percentage of students able to perform tasks at each level or above (OECD average)	Characteristics of tasks
6	708	1.2%	At Level 6, students can draw on a range of interrelated scientific ideas and concepts from the physical, life, and earth and space sciences and use content, procedural and epistemic knowledge in order to offer explanatory hypotheses of novel scientific phenomena, events and processes or to make predictions. In interpreting data and evidence, they are able to discriminate between relevant and irrelevant information and can draw on knowledge external to the normal school curriculum. They can distinguish between arguments that are based on scientific evidence and theory and those based on other considerations. Level 6 students can evaluate competing designs of complex experiments, field studies or simulations and justify their choices.
5	633	7.5%	At Level 5, students can use abstract scientific ideas or concepts to explain unfamiliar and more complex phenomena, events and processes involving multiple causal links. They are able to apply more sophisticated epistemic knowledge to evaluate alternative experimental designs and justify their choices, and use theoretical knowledge to interpret information or make predictions. Level 5 students can evaluate ways of exploring a given question scientifically and identify limitations in interpretations of data sets, including sources and the effects of uncertainty in scientific data.
4	559	24.6%	At Level 4, students can use more complex or more abstract content knowledge, which is either provided or recalled, to construct explanations of more complex or less familiar events and processes. They can conduct experiments involving two or more independent variables in a constrained context. They are able to justify an experimental design by drawing on elements of procedural and epistemic knowledge. Level 4 students can interpret data drawn from a moderately complex data set or less familiar context, draw appropriate conclusions that go beyond the data and provide justifications for their choices.
3	484	50.3%	At Level 3, students can draw upon moderately complex content knowledge to identify or construct explanations of familiar phenomena. In less familiar or more complex situations, they can construct explanations with relevant cueing or support. They can draw on elements of procedural or epistemic knowledge to carry out a simple experiment in a constrained context. Level 3 students are able to distinguish between scientific and non-scientific issues and identify the evidence supporting a scientific claim.
2	410	75.5%	At Level 2, students are able to draw on everyday content knowledge and basic procedural knowledge to identify an appropriate scientific explanation, interpret data and identify the question being addressed in a simple experimental design. They can use basic or everyday scientific knowledge to identify a valid conclusion from a simple data set. Level 2 students demonstrate basic epistemic knowledge by being able to identify questions that can be investigated scientificall y.
1a	335	92.6%	At Level 1a, students are able to use basic or everyday content and procedural knowledge to recognise or identify explanations of simple scientific phenomena. With support, they can undertake structured scientific enquiries with no more than two variables. They are able to identify simple causal or correlational relationships and interpret graphical and visual data that require a low level of cognitive demand. Level 1a students can select the best scientific explanation for given data in familiar personal, local and global contexts.
1b	261	98.9%	At Level 1b, students can use basic or everyday scientific knowledge to recognise aspects of familiar or simple phenomena. They are able to identify simple patterns in data, recognise basic scientific terms and follow explicit instructions to carry out a scientific procedure.

Source: OECD, PISA 2022 Database, Table I.B1.3.3.

Box I.3.2. PISA and Sustainable Development Goals: Monitoring progress towards minimum learning proficiency for all

In September 2015, world leaders gathered to set ambitious Sustainable Development Goals (SDGs) for the future of the global community. The fourth SDG (Goal 4) seeks to ensure "inclusive and equitable quality education and promote lifelong learning opportunities for all" and has ten targets, each of which has at least one global indicator designed to facilitate the analysis and the measurement of the target.

PISA data on student achievement is used to monitor progress towards two of the SDG 4 targets and their accompanying global indicators:

- Target 4.1.1: Ensure that all girls and boys complete free, equitable and quality primary and secondary education leading to relevant and effective learning outcomes
- Target 4.5: Eliminate gender disparities in education and ensure equal access to all levels of education and vocational training for the vulnerable, including persons with disabilities, indigenous peoples and children in vulnerable situations

SDG Target 4.1.1: Minimum proficiency level in reading and mathematics

PISA data is a primary source for monitoring progress against the SDG global indicator 4.1.1.c:

- Proportion of children and young people at the end of lower secondary education achieving at least a minimum proficiency level in (i) reading and (ii) mathematics, by sex.

In PISA, the minimum level of proficiency is defined as scoring at least Proficiency Level 2 in both reading and mathematics.

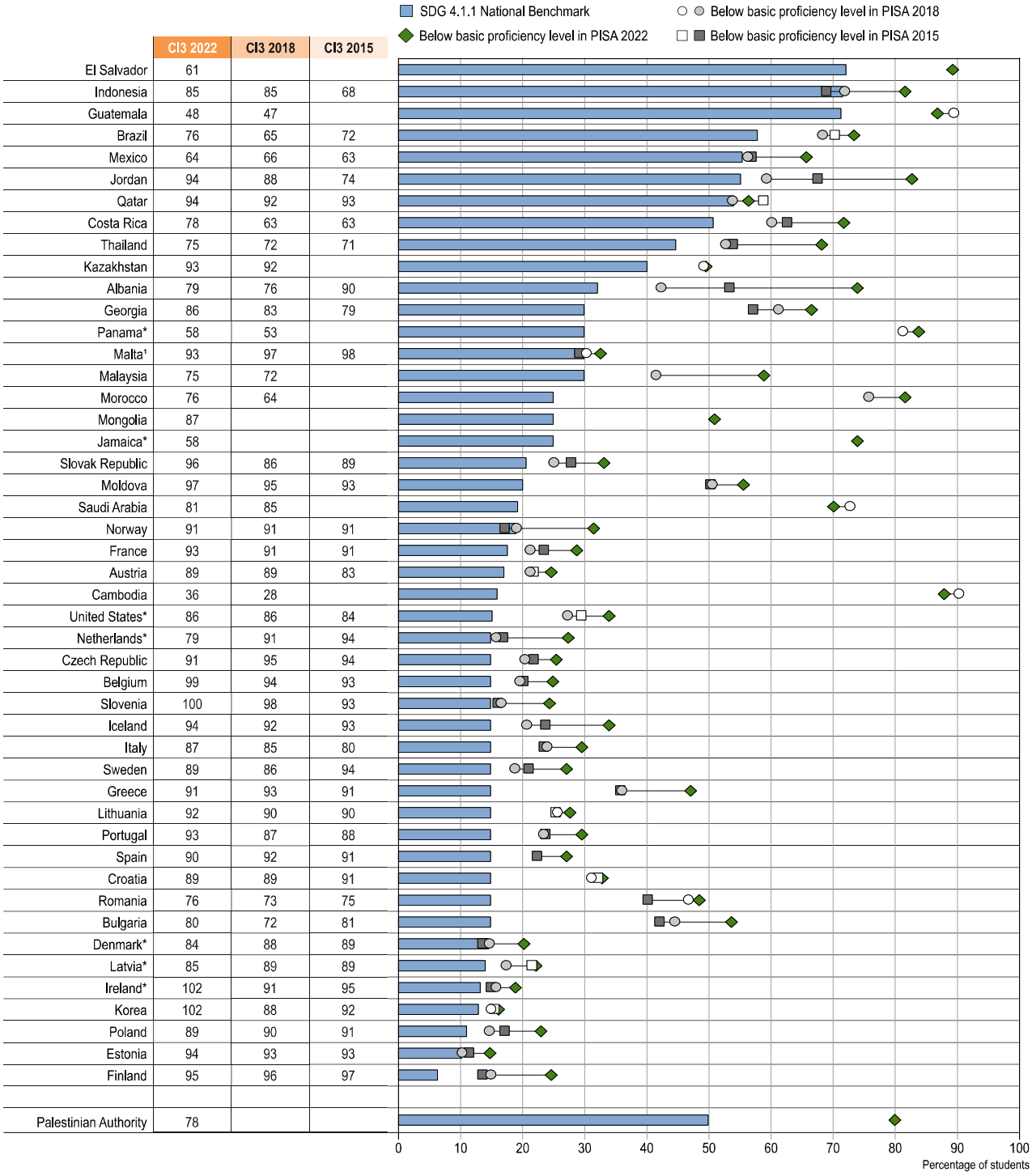
National benchmarks

The Education 2030 Framework for Action (UNESCO, 2016[5]) called on countries to establish "appropriate intermediate benchmarks for addressing the accountability deficit associated with longer-term SDG4 targets". According to UNESCO, about 58% of countries have established benchmarks for SDG 4 Targets (UNESCO, 2022[6]). These include 48 countries/economies that took part in PISA 2022. This box presents PISA data showing how countries and economies are progressing towards achieving their national benchmarks and international SDG 4 targets.

National benchmarks for Target 4.1.1 define the proportion of young people at the end of lower secondary education who are expected to achieve at least a minimum proficiency level in mathematics and reading by 2030, according to the commitments of each country. Figure I.3.6 shows national benchmarks expressed in terms of share of students scoring below proficiency Level 2 (i.e. low performers) in PISA and the actual share of low-performing students in mathematics in 2015, 2018 and 2022, according to PISA data.

The figures show wide variation in national benchmarks across countries, ranging from an expected share of low performers of over 70% in El Salvador, Guatemala and Indonesia, to less than 10% in Finland. Countries set national benchmarks based on national processes and challenges. In El Salvador and Indonesia, for example, enrolment rates in secondary education have been increasing since 2015 but there is still no universal coverage at this level of education (World Bank, 2023[7]). In Finland, on the other hand, coverage has been high for several decades. These factors influence how achievable national targets are defined.

Figure I.3.6. Low performers in mathematics since PISA 2015 and national benchmarks for 2030



1. 2025 benchmark for Malta.

Notes: Only countries and economies that have set SDG 4.1.1 national targets are shown.

Statistically significant changes between PISA 2015 and PISA 2022, and PISA 2018 and PISA 2022 are marked in darker tone (see Annex A3).

UIS data for national benchmarks stands for the "Proportion of children and young people at the end of lower secondary achieving at least a minimum proficiency level in mathematics and reading" and it is presented here as a share of low performers.

CI3: Coverage Index 3 (see Annex A2).

Countries and economies are ranked in descending order of the SDG 4.1.1 national benchmark.

Sources: OECD, PISA 2022 Database, Tables I.B1.4.1 and I.B1.5.1 and UIS.

None of the countries included in the figure have made net progress since 2015 when the SDG agenda was set. In 29 out of 39 countries with comparable data, the share of low performers in mathematics increased between 2015 and 2022. Of the 25 OECD countries shown in Figure I.3.6, the share of low performers increased significantly in 16 of them (by at least five percentage points). In five OECD countries the share of low performers has not changed significantly over this period.

While the COVID-19 pandemic explains some of the setbacks experienced by countries, PISA data clearly show that this downward trend began before the pandemic started in a number of countries.

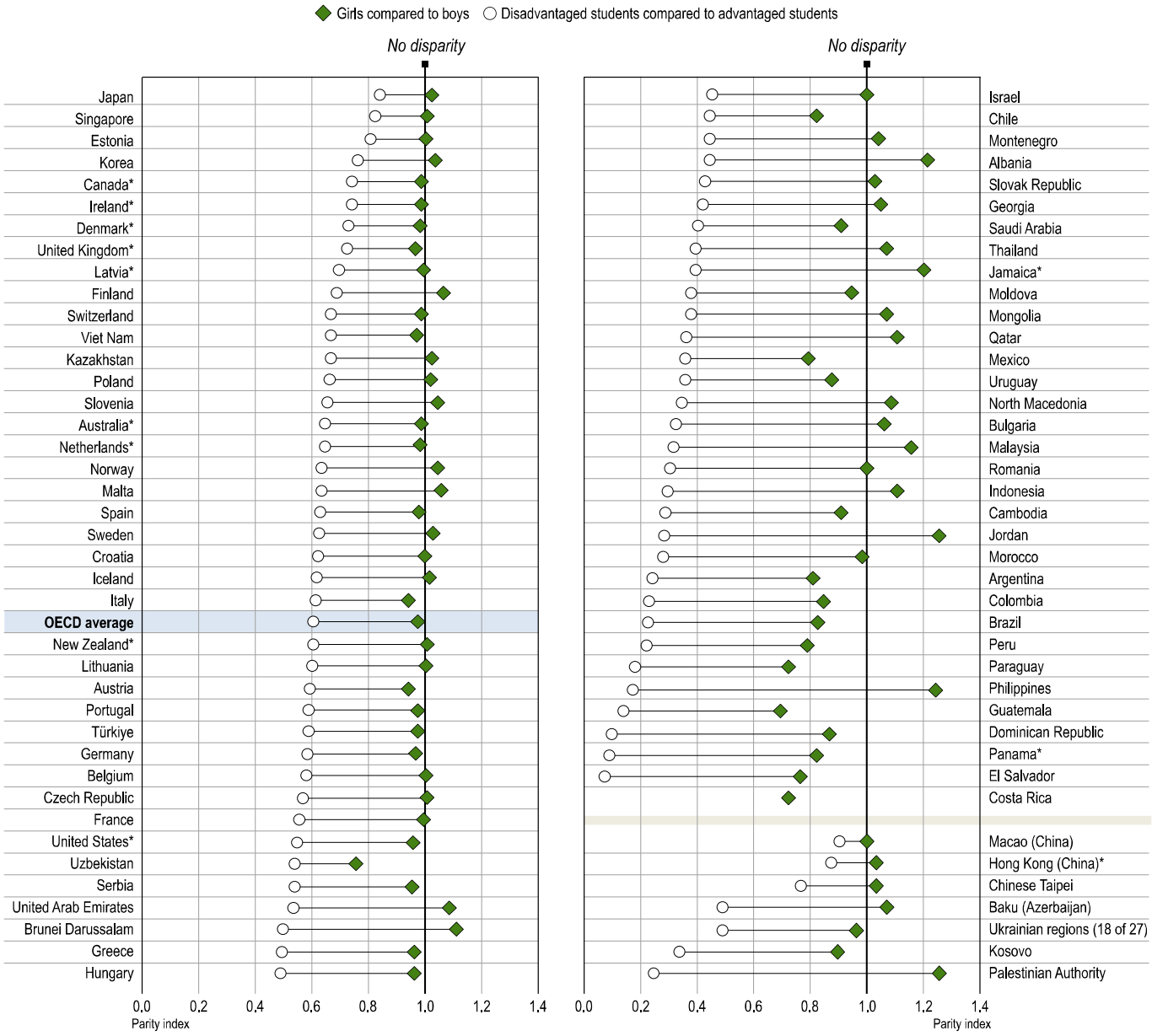
When analysing changes in the share of low performers across countries/economies, it is important to consider differences in the proportion of 15-year-olds represented by the PISA sample in each country in 2015, 2018 and 2022 (the Coverage Index 3, "CI3" in short). For example, in Indonesia, the percentage of low performers in mathematics increased by 13 percentage points between 2015 and 2022. However, part of this change is likely related to the increase in the coverage of the PISA sample from 68% to 85% over the same period. Lower coverage rates are often due to early dropout; late or discontinuous enrolment; or grade repetition. Therefore, an increase in the coverage of the PISA sample implies the expansion of education to more marginalised populations. Costa Rica, Jordan and Korea are examples of other countries/economies that increased coverage by over 10 percentage points between 2015 and 2022 (Table I.B1.4.1).

SDG Target 4.5: Gender and socio-economic parity in learning outcomes

While this target encompasses all types of inequalities across education outcomes, PISA 2022 data shed light specifically on gender and socio-economic inequalities. This is measured using "parity indices", which show a ratio between two populations. Figure I.3.7 shows the parity index for girls and boys, and for socio-economically disadvantaged and advantaged students (i.e. parity in the percentage of students scoring at or above proficiency Level 2 in mathematics).

On average, OECD countries are close to gender parity in mathematics proficiency but the ratio still favours boys over girls (0.98). In seven countries/economies, Belgium, Croatia, France, Israel, Latvia*, Macao (China) and Romania, there is no gap. In five countries/economies, Albania, Jamaica, Jordan, Palestinian Authority and the Philippines, the share of girls with minimum achievement in mathematics is more than 20 percentage points higher than that of boys (parity index at least 1.20). At the other extreme, in El Salvador, Guatemala, Peru, Paraguay, Uzbekistan, and OECD countries Costa Rica and Mexico, there were fewer than eight girls for every 10 boys performing above the minimum proficiency level in mathematics.

Figure I.3.7. Disparities in minimum achievement in mathematics (parity index), by gender and socio-economic background



Countries and economies are ranked in descending order of the parity index between socio-economically disadvantaged and advantaged students.
Source: OECD, PISA 2022 Database, Table I.B1.3.12.

Table I.3.5. What can students do in mathematics, reading and science? Chapter 3 figures and tables

Figure I.3.1	Students' proficiency in mathematics
Table I.3.1	Description of the eight levels of mathematics proficiency in PISA 2022
Table I.3.2	Map of selected mathematics questions, illustrating the proficiency levels
Figure I.3.2	Triangular Pattern unit, released item #2
Figure I.3.3	Forested Area unit, released item #3
Figure I.3.4	Students' proficiency in reading
Table I.3.3	Description of the eight levels of reading proficiency in PISA 2022
Figure I.3.5	Students' proficiency in science
Table I.3.4	Description of the seven levels of science proficiency in PISA 2022
Figure I.3.6	Low performers in mathematics since PISA 2015 and national benchmarks for 2030
Figure I.3.7	Disparities in minimum achievement in mathematics (parity index), by gender and socio-economic background

StatLink https://stat.link/2uzmxk

Notes

[1] In previous cycles, only six proficiency levels were used to describe mathematical proficiency. Proficiency Levels 1b and 1c are the two proficiency levels that are new to PISA 2022. Level 1a is equivalent to Level 1 in PISA 2018 as both have the same lower score limit (357.77 points).

[2] The description of the tasks that students are able to do at proficiency Level 1c is identical to the description used in PISA for Development (PISA-D) (OECD, 2018[8]). It has not been revised for PISA 2022 as there were no new items that scaled at this level.

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UNESCO (2022), *Setting commitments : national SDG 4 benchmarks to transform education*. [6]

UNESCO (2016), *Incheon Declaration and SDG4 – Education 2030 Framework for ActioN*. [5]

World Bank (2023), *World Development Indicators*, https://data.worldbank.org/. [7]

4 Equity in education in PISA 2022

This chapter reports on fairness in education by analysing performance differences by student socio-economic status, gender, and social and economic contexts across education systems. It also reports on educational inclusion by examining students' acquisition of basic proficiency skills in PISA core domains and the proportion of young people enrolled in school at age 15.

For Australia, Canada, Denmark, Hong Kong (China), Ireland, Jamaica, Latvia, the Netherlands, New Zealand, Panama*, the United Kingdom and the United States, caution is required when interpreting estimates because one or more PISA sampling standards were not met (see Reader's Guide, Annexes A2 and A4).

What the data tell us

- Education systems in Canada*, Denmark*, Finland, Hong Kong (China)*, Ireland*, Japan, Korea, Latvia*, Macao (China) and the United Kingdom* are highly equitable according to PISA's definition. They have achieved high levels of socio-economic fairness together with a large share of all 15-year-olds with basic proficiency in mathematics, reading and science (i.e. high level of inclusion).
- About 15% of the variation in mathematics performance on average across OECD countries can be attributed to students' economic, social and cultural background. In 8 of the 80 countries and economies with available data, students' socio-economic status accounts for 20% or more of the variation in performance. By contrast, students' socio-economic status accounts for less than 7% of the variation in performance in 14 countries.
- Boys outperformed girls in mathematics by nine score points and girls outperformed boys in reading by 24 score points on average across OECD countries. In science, the performance difference between boys and girls is not significant. In terms of low performers, the share of boys (31%) is larger than girls (22%) in reading but in mathematics the share is almost identical (32% for girls and 31% for boys). When it comes to top performers, the proportion of boys (11%) is larger than girls (7%) in mathematics whereas in reading it is slightly higher for girls (8%) than boys (6%) on average across OECD countries. In science, the share of low performers is larger for boys than girls by two percentage points; similarly, the share of top performers is larger for boys than girls by two percentage points.
- On average across OECD countries, 45% of all 15-year-olds have not acquired basic proficiency in at least one of the core subjects PISA assesses. In 38 countries and economies, more than 60% of all 15-year-olds scored below baseline proficiency Level 2 in at least one subject. By contrast, fewer than 25% of 15-year-olds were low performers in at least one subject in five countries/economies.

Equity is a fundamental value and goal of education policy. Equity in education is an ethical principle associated to the concept of justice and a normative term according to which all people, regardless of background, should have the opportunity to fulfil their potential.

As school enrolment expanded through the 20th century, this opened unprecedented educational opportunities to social groups previously excluded from formal education. Nonetheless, socio-economic inequalities in educational attainment and learning outcomes remain stubbornly persistent up to this day (Pfeffer, 2008[1]; Breen, 2010[2]; Torche, 2018[3]; OECD, 2018[4]; Chmielewski, 2019[5]). In the 21st century, enrolment in higher education and pre-primary education has increased greatly. At the same time, educational disparities linked to gender, immigration status, geographical location (e.g. urban vs. rural areas), disabilities, and other student background characteristics have gained visibility as sources of inequity in educational enrolment and learning (Buchmann, DiPrete and McDaniel, 2008[6]; Hillmert, 2013[7]; OECD, 2023[8]).

Importantly, international differences in the extent and types of educational inequity observed by PISA today can be traced back to the historical legacies of different nations. For example, in Central and South America, most countries passed compulsory school laws in the 19th century that were rarely enforced, and primary school enrolments did not substantially increase until the second half of the 20th century; this has made the universalisation of secondary schooling a contemporary challenge (Benavot, Resnik and Corrales, 2006[9]).

Equity in education does not mean that all students should achieve the same results; indeed, some degree of variation in student results is to be expected in any education system, even those with high levels of equity. The goal of equity-oriented policies is not to curtail the academic achievement of top-performing students nor "dumb down" education systems so that they produce homogeneous outcomes. Instead, equity-oriented policies should help all students become the best version of themselves.

This chapter analyses two dimensions of equity in education: fairness and inclusion. Only education systems that combine high levels of fairness and inclusion are considered highly equitable.

Fairness is the goal of all students being given the opportunity to realise their full learning potential, irrespective of their background: this is examined in the first three sections. The first of these sections looks at socio-economic disparities in student performance within countries; the second section looks at gender disparities in student performance; and the third section examines equality of opportunity by education system.

Inclusive education is examined in the fourth section of this chapter. In PISA, inclusion is the goal of all students having access to quality education and achieving at least the baseline level of skills in mathematics, reading and science.

Equal opportunity by student socio-economic status

Fairness in education means that all students, irrespective of their background, are given the opportunity to realise their full learning potential[1]. In a fair educational system, students' learning outcomes would be independent of background circumstances such as their family socio-economic status, immigration background or gender because these are circumstances over which students have no control. In PISA, education systems that better disassociate students' performance from background circumstances have a higher level of fairness. PISA data show, however, that personal circumstances such as socio-economic status; gender and the stereotypes that ensue; immigration status; and which education system students are in do, in practice, create privileges or barriers that make it easier for some students to perform better than others. Furthermore, these individual circumstances may contribute to shaping students' aspirations, motivation and effort, with consequences for their cognitive outcomes.

The effects of socio-economic status on student achievement are well-known, and specific economic and cultural mechanisms linking students' socio-economic status and achievement have been studied extensively (Bourdieu, 1986[10]; Coleman, 1988[11]; Paino and Renzulli, 2012[12]; Kao and Thompson, 2003[13]; Eriksson et al., 2021[14]). Students whose parents have higher levels of education, and more prestigious and better-paid jobs benefit from a wider range of financial (e.g. private tutoring, computers, books), cultural (e.g. extended vocabulary, time management skills) and social (e.g. role models and networks) resources. This makes it easier for them to succeed in school compared with students from families with lower levels of education or that are affected by chronic unemployment, low-paid jobs or poverty. Economic deprivation and adversity during early childhood undermine cognitive development (Richards and Wadsworth, 2004[15]; Duncan, Brooks-Gunn and Klebanov, 1994[16]).

In addition, several factors and experiences throughout students' lives mediate the relationship between socio-economic background and student performance, as measured by PISA at age 15. There is a socio-economic gap, for instance, in terms of whether children have taken part or not in early childhood education and care. This manifests as a demonstrable socio-economic gap in performance in students as young as 10 years old in primary school (OECD, 2018[4]). Recent international evidence also points to gaps in skills linked to socio-economic background among children of age 5 (OECD, 2020[17]). And, these gaps in performance can widen in later years. By age 15, socio-economic status has a large influence on students' performance in mathematics, reading and science. Disadvantaged students are more likely to repeat grades and enrol in upper secondary vocational rather than general programmes. They are also less likely to expect to complete a post-secondary degree. As students complete their compulsory education, disadvantaged students show lower rates of entry to higher education; reduced rates of study completion; and poorer labour market outcomes.

Student performance is related to socio-economic status but this relationship is far from deterministic. Previous evidence has shown that some students can break the cycle of disadvantage, beat the odds against them and achieve better performance in PISA than would have been expected given their socio-economic status (OECD, 2011[18]). In this volume, these students with academic resilience ("resilience students") are defined as those who are socio-economically disadvantaged yet score among the highest in PISA in their own country or economy.

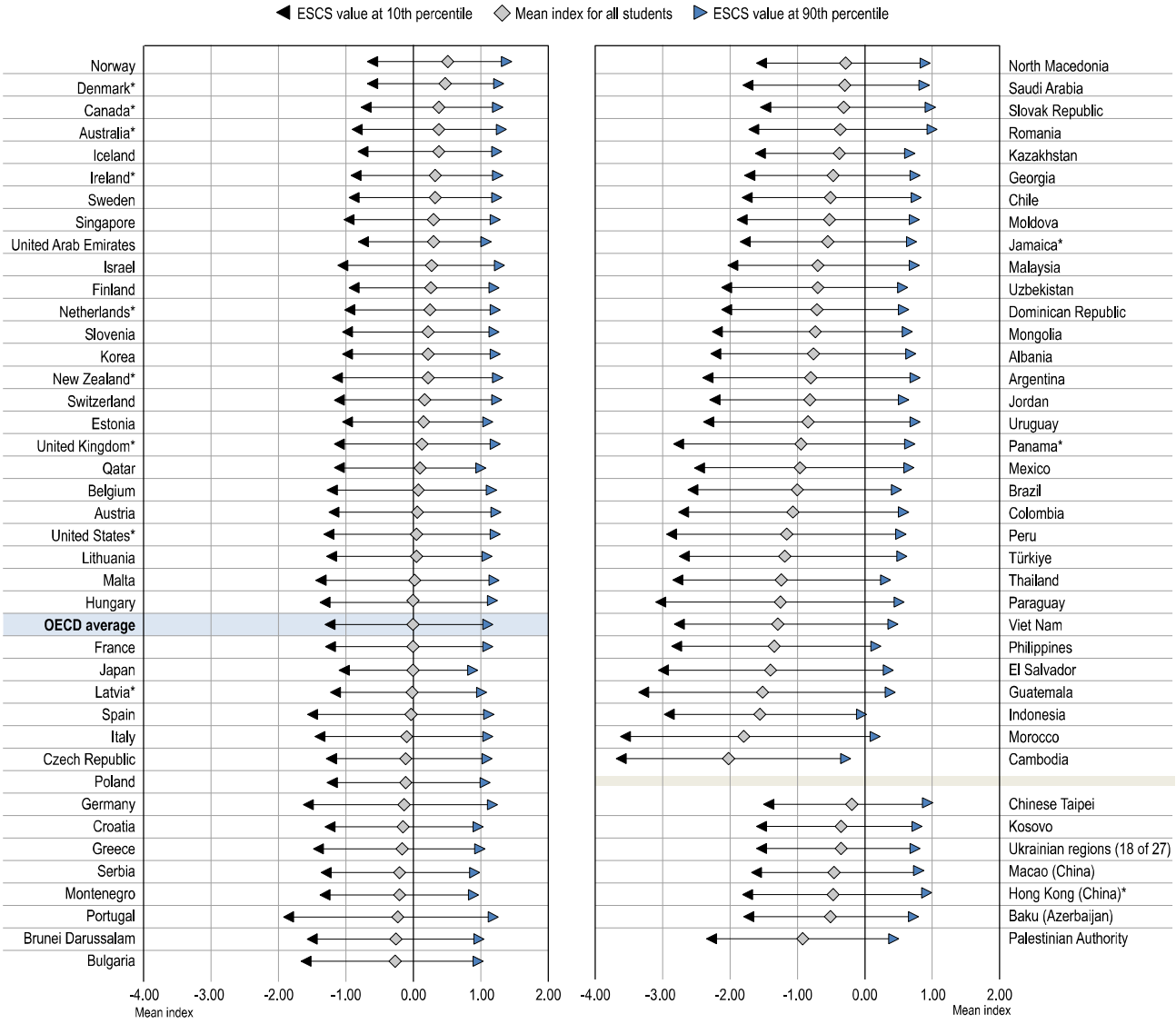
Students' socio-economic status

PISA-participating countries and economies vary markedly in their levels of wealth and per-capita income (see Figure I.4.14 below). This translates into differences in the socio-economic status of the students who take the PISA test in various countries and economies.[2]

Figure I.4.1 shows the average socio-economic status of students in each country and economy that participated in PISA 2022, as measured by the PISA index of economic, social and cultural status (ESCS) (see Box I.4.1 and Annex A3 for a detailed definition of this index). By design, the average student socio-economic status across OECD countries approximates zero. Across all countries and economies, the average student socio-economic status is the highest in Norway, Denmark*, Canada*, Australia*, and Iceland (in descending order of their mean ESCS index). It is the lowest in Guatemala, Indonesia, Morocco and Cambodia (in descending order).

Figure I.4.1. Student socio-economic status

PISA index of economic, social and cultural status (ESCS)



Notes: Only countries and economies with available data are shown.

All differences between the 90th and the 10th percentiles are statistically significant (see Annex A3).

Countries and economies are ranked in descending order of the mean PISA index of economic, social and cultural status of students for all students.

Source: OECD, PISA 2022 Database, Table I.B1.4.2.

Figure I.4.1 also shows how students' socio-economic status varies within countries/economies. On average across OECD countries, the difference between the socio-economically most advantaged students (i.e. 90th percentile of ESCS) and the most disadvantaged students (i.e. 10th percentile of ESCS) within countries is 2.34 points in the PISA index of economic, social and cultural status (hereafter, this difference will be referred to as the inter-decile range of student socio-economic status). By this measure, the range of socio-economic inequality within countries/economies is the widest in Morocco, Guatemala, Paraguay, Panama* and Peru (in descending order). It is the narrowest in the United Arab Emirates, Denmark*, Japan, Canada*, Iceland and Norway (in ascending order).

Socio-economic disparities within countries/economies tend to be smaller in countries/economies where the average socio-economic status of the student population is higher (Figure I.4.1). Across all countries and economies in PISA 2022 with data available[3], the correlation between the mean and the inter-decile range of student socio-economic status is very strong (correlation coefficient = -0.89). Examples of this pattern in PISA 2022 are Canada*, Denmark*, Iceland and Norway, which stand out as countries with the highest average socio-economic status and some of the narrowest socio-economic differences between the most and least advantaged students. Inversely, Guatemala and Morocco stand out as countries with the lowest average student socio-economic status and the widest socio-economic differences between the most and least advantaged students.

In about one-third of countries and economies, differences in socio-economic status are larger *within* countries/economies than *between* countries/economies participating in PISA 2022, as measured by the inter-decile range of student socio-economic status. While the gap between the country/economy with the highest (i.e. Norway) and lowest (i.e. Cambodia) mean socio-economic status is equal to 2.5 points in the PISA index of economic, social and cultural status, the difference between the top and the bottom decile of student socio-economic status within a country/economy (i.e. the inter decile range) is more than 2.6 points in 28 countries/economies.

Box I.4.1. Definition of socio-economic status in PISA

Socio-economic status is a broad concept that aims to capture students' access to family resources (i.e. economic capital, social capital, and cultural capital) and the social position of the student's family/household (Cowan et al., 2012[19]; Willms and Tramonte, 2015[20]; Avvisati, 2020[21]).

In PISA, a student's socio-economic status is measured by the PISA index of economic, social and cultural status (ESCS). The higher the value of ESCS, the higher the socio-economic status. The ESCS scale has a mean of 0 and a standard deviation of 1 across OECD countries.

ESCS is a composite score that combines into a single score information from three components: parents' highest level of education (PARED index[1]); parents' highest occupational status (HISEI index[1]); and home possessions (HOMEPOS index[1], which is a proxy for family wealth). Information about these three components for each student was collected through the student questionnaire, a survey that students answered after completing the PISA cognitive assessment.

For a more technical description of how the index is computed, please see *PISA 2022 Technical Report* (OECD, Forthcoming[22])

Socio-economically advantaged and disadvantaged students

In this report, the PISA index of economic, social and cultural status (ESCS) is used to distinguish between socio-economically disadvantaged students (i.e. those among the 25% of students with the lowest values on the ESCS index in their country or economy) and socio-economically advantaged students (i.e. those among the 25% of students with the highest values on the ESCS in their own country or economy).

Notes: 1. See Annex A1 for detailed information on this index.
Source: PISA 2022 Technical Report (OECD, Forthcoming[22])

Students' socio-economic status and mean performance[4]

In PISA, the socio-economic gradient is used to examine the relationship between students' socio-economic status and student performance in each country and economy. This is a measure of the relationship between student socio-economic status and student performance whereby a stronger association means less fairness (thus, less equity) (Willms, 2006[23]). The socio-economic gradient offers two key pieces of information: the *strength* of the gradient and the *slope* of the gradient.

The *strength* of the gradient is measured by the proportion of the variation in student performance that is accounted for by differences in student socio-economic status. When the relationship between socio-economic status and performance is strong, socio-economic status predicts performance well. In other words, a system is fairer when the relationship between socio-economic status and performance is weaker.

On average across OECD countries in 2022, students' socio-economic status accounts for a significant share of the variation in their performance in PISA; as shown in Figure I.4.2, 15% of the variation in mathematics performance within each country is associated with socio-economic status. In 8 of the 80 countries and economies with available data, students' socio-economic status accounts for 20% or more of the variation in performance. By contrast, students' socio-economic status accounts for less than 7% of the variation in performance in 14 countries.

While a weak association between student socio-economic status and performance within countries/economies is necessary for achieving fairness in education, it is not, of itself, a sufficient condition. It is also important to consider fairness in terms of education systems' overall levels of performance (performance disparities across education systems are discussed later in this chapter). A country/economy that combines high levels of fairness in terms of

student socio-economic status with low mean performance – indicating poor achievement across the board regardless of students' socio-economic status – should not be taken as a desirable outcome.

As shown in Figure I.4.2, countries and economies with higher levels of fairness by socio-economic status are not often those with strong student performance[5].

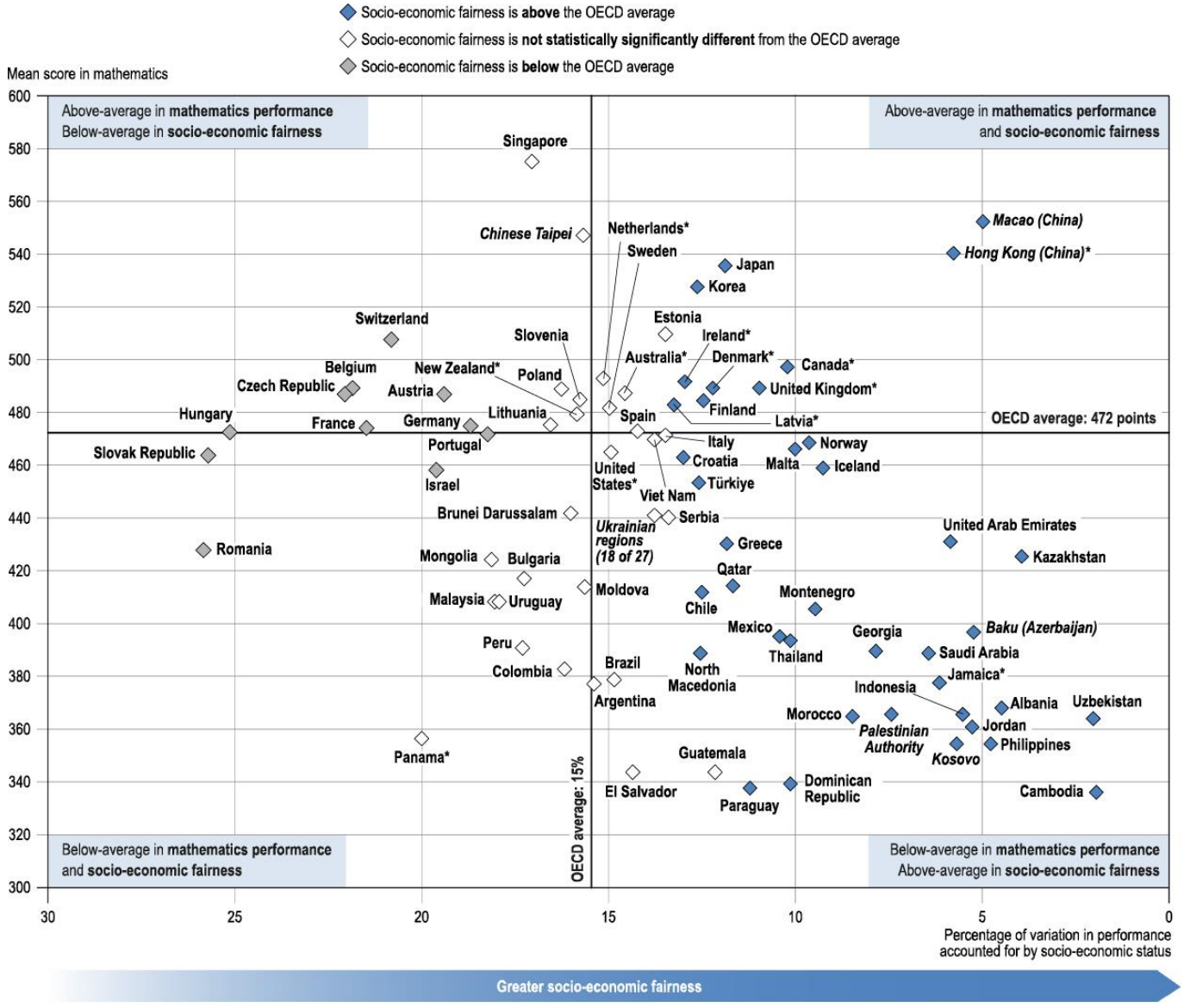
Mean performance in mathematics varies greatly among education systems with a high level of socio-economic fairness in student performance. Out of the 40 countries and economies where the strength of the relationship between performance and socio-economic status is weaker than the OECD average, 10 show a mean performance in mathematics that is higher than the OECD average of 472 points (Macao [China], Hong Kong [China]*, Japan, Korea, Canada*, Ireland*, Denmark*, the United Kingdom*, Finland, and Latvia*, in descending order of their mean score in mathematics) (Figure I.4.2). One education system with a high level of fairness in terms of socio-economic status has a mean performance in mathematics that is not statistically significantly different from the OECD average (Norway). The remaining 29 countries and economies show a mean performance in mathematics that is statistically significantly lower than the OECD average.

Hong Kong (China)* and Macao (China) are particularly remarkable because they combine very high levels of student performance (mean score in mathematics equal to 540 points or higher) and very high levels of fairness in mathematics performance by socio-economic status (less than 6% of variation in mathematics performance accounted for by student socio-economic status). As shown in Figure I.4.2, all other 11 countries/economies that have such a weak relationship between student socio-economic status and mathematic performance (i.e. less than 6% of variation in mathematics performance accounted for by student socio-economic status) show a mean performance in mathematics that is statistically significantly lower than the OECD average.

Out of the 29 countries and economies that show a level of fairness in terms of socio-economic status that is not statistically significantly different from the OECD average, nine have a mean performance in mathematics that is higher than the OECD average; five a mean performance in mathematics that is not different from the OECD average, and 15 a mean performance in mathematics that is lower than the OECD average.

Similar to what is observed in mathematics, differences in students' socio-economic status account for 13% of the variation in reading and 14% of the variation in science performance on average across OECD countries (Table I.B1.4.4 and Table I.B1.4.5).

Figure I.4.2. Strength of socio-economic gradient and mathematics performance



Notes: Only countries and economies with available data are shown.
Socio-economic status is measured by the PISA index of economic, social and cultural status.
Source: OECD, PISA 2022 Database, Tables I.B1.2.1 and I.B1.4.3.

The *slope* of the socio-economic gradient indicates the degree of the disparity in average performance between two students whose socio-economic status differs by one unit in the PISA index of economic, social and cultural status. A positive value for the slope of the socio-economic gradient signals that advantaged students generally performed better than disadvantaged students in PISA 2022.

On average across OECD countries in 2022, a one-unit increase in the PISA index of economic, social and cultural status is associated with an increase of 39 score points in the mathematics assessment (Table I.B1.4.3). This is almost twice what 15-year-old students typically learn in a year (see Box I.5.1).

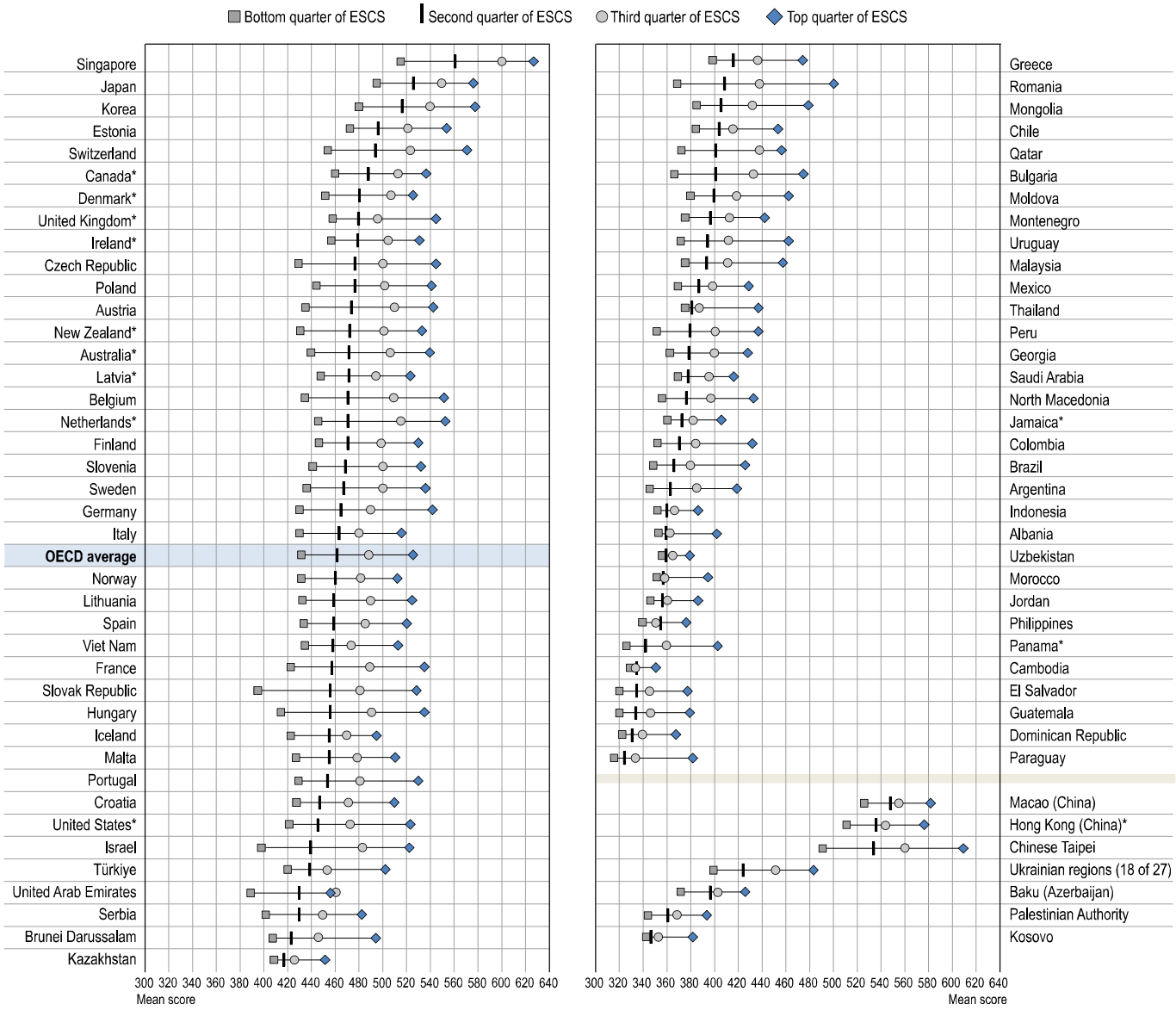
The performance gap related to students' socio-economic status is widest in the Slovak Republic where a one-unit increase in the index is associated with a difference of 53 score points in mathematics. In the Czech Republic, Israel and Singapore, the increase in the index is associated with a difference of 51 score points. By contrast, the associated

change in performance amounts to less than 20 score points in 17 countries and economies. While the slope varied between countries/economies, in all countries/economies participating in PISA 2022 more advantaged students performed better than more disadvantaged ones.

However, socio-economic gradients do not give information about the *size* of performance gaps related to differences in socio-economic status between the most and least advantaged students within a country/economy. This metric is shown, instead, by the mean performance of students belonging to the top and bottom quarters of socio-economic status in a country/economy, as shown in Figure I.4.3.

Figure I.4.3. Mean performance in mathematics, by national quarter of socio-economic status

PISA index of economic, social and cultural status (ESCS)



Note: Only countries and economies with available data are shown.

Countries and economies are ranked in descending order of mathematics performance for students in the second quarter of national socio-economic status.

Source: OECD, PISA 2022 Database, Table I.B1.4.3.

On average across OECD countries, socio-economically advantaged students (those in the top quarter of the distribution in the ESCS index) scored 93 points more in mathematics than disadvantaged students (those in the bottom quarter of the distribution). The gap between these two groups of students is higher than 93 score points in 22 countries or economies while the gap is 50 points or less in 13 countries or economies (Figure I.4.3).

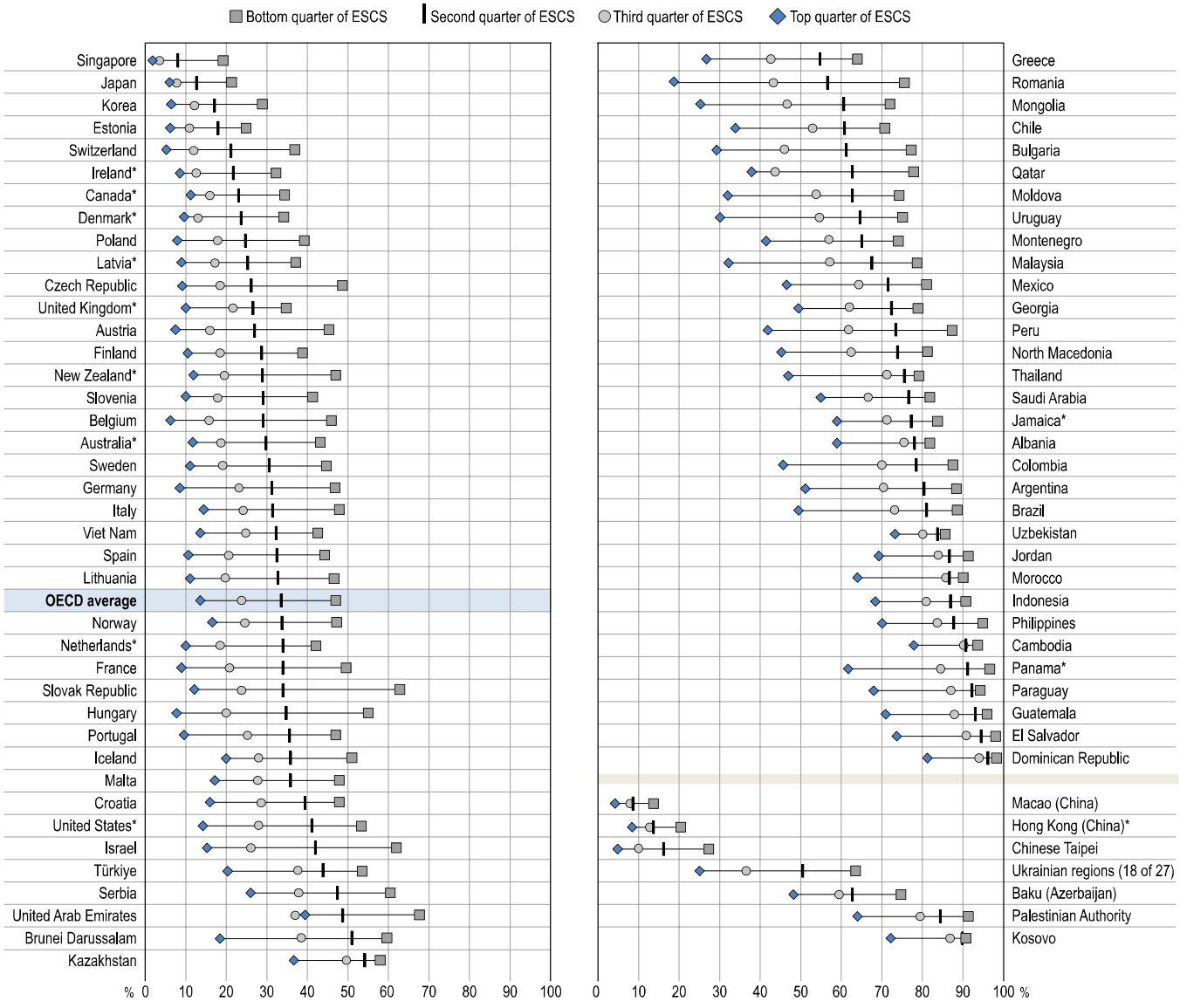
Low performance and socio-economic status

As shown in Figure I.4.4, 47% of socio-economically disadvantaged students but only 14% of advantaged students scored below proficiency Level 2 in mathematics (33 percentage-point difference) on average across OECD countries. The gap in the percentage of low performers in mathematics between advantaged and disadvantaged students is 30 percentage points or more in most countries and economies; in Romania and the Slovak Republic it is more than 50 percentage points.

Socio-economically disadvantaged students are seven times more likely than advantaged students to score below Level 2 in mathematics on average across OECD countries (Table I.B1.4.10). When it comes to reading and science, the odds of low performance are also more than five times higher for disadvantaged students compared to their advantaged peers on average across OECD countries (Table I.B1.4.11 and Table I.B1.4.12).

Figure I.4.4. Low performers in mathematics, by socio-economic status

Percentage of students who scored below proficiency Level 2, by national quarters of the PISA index of economic, social and cultural status (ESCS)



Note: Only countries and economies with available data are shown.

Countries and economies are ranked in ascending order of the share of low performers in mathematics for students in the second quarter of national socio-economic status.

Source: OECD, PISA 2022 Database, Table I.B1.4.14.

Disadvantaged students who are academically resilient

Academically resilient students are defined in PISA as students who are in the bottom quarter of the PISA index of economic, social and cultural status (ESCS) in their own country/economy but scored in the top quarter in that country/economy. These students are academically resilient because, despite their socio-economic disadvantage, they have attained educational excellence by comparison with students in their own country.

As shown in Figure I.4.5, the percentage of academically resilient students in mathematics varies from less than 8% in some countries (Bulgaria, the Czech Republic, France, Israel, Panama*, Peru, Qatar, Romania and the Slovak

Republic) and) to more than 15% in others (Albania, Cambodia, Hong Kong [China]*, Indonesia, Jamaica*, Kazakhstan, Kosovo, Macao [China], Morocco, the United Kingdom* and Uzbekistan). On average across OECD countries, 10% of disadvantaged students scored in the top quarter of mathematics performance in their own countries and thus can be considered academically resilient. In reading and science, the percentage of academically resilient students is 11% on average across OECD countries (Table I.B1.4.4 and Table I.B1.4.5).

Figure I.4.5. Resilient students in mathematics

Percentage of socio-economically disadvantaged students who scored in the top quarter of mathematics performance in their own country/economy

Notes: Only countries and economies with available data are shown.
Socio-economic status is measured by the PISA index of economic, social and cultural status.
Countries and economies are ranked in descending order of the percentage of resilient students.
Source: OECD, PISA 2022 Database, Table I.B1.4.3.

Box I.4.2. Food insecurity: how often do students not eat because they do not have money?

A new question about food insecurity was included in the student questionnaire in PISA 2022. Shockingly, results show that in all PISA-participating countries there are 15-year-old students who suffer from food insecurity, i.e. who had to skip one or more meals a week in the month prior to PISA because they did not have enough money to buy food.

Food insecurity among PISA-participating countries in 2022

According to a recent international study in 83 low- and middle-income countries, the number of food insecure people in 2023 is about 1.14 billion (Zereyesus et al., 2023[24]). Personal income, food prices, and economic inequality are among the major factors affecting people's ability to access food, according to this study. Furthermore, research shows that food insecurity impairs children's learning and educational progress (Argaw et al., 2023[25]).

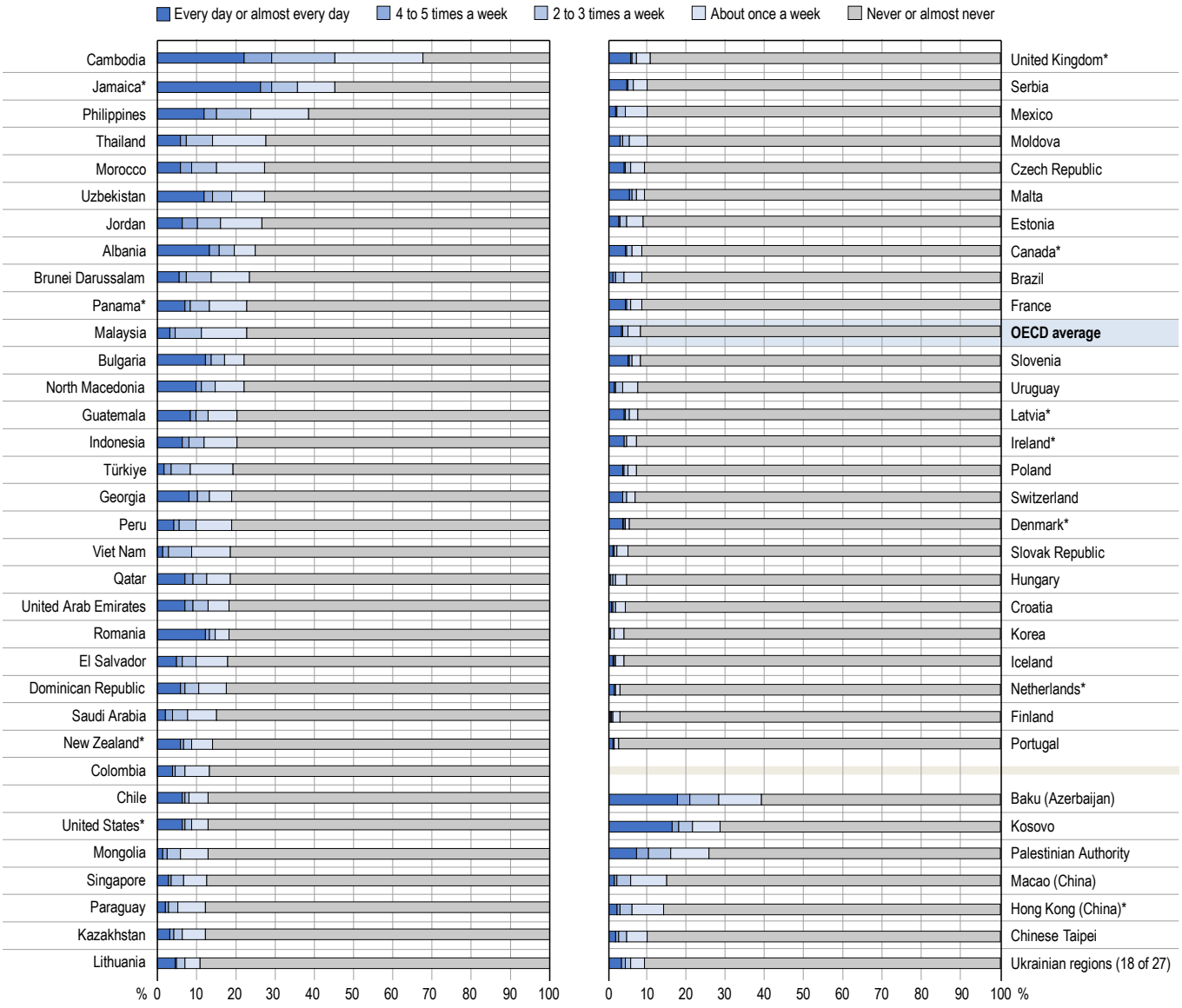
In PISA 2022, the following question was included in the student questionnaire: "In the past 30 days, how often did you not eat because there was not enough money to buy food?" Response categories were: "Never or almost never", "About once a week", "2 to 3 times a week", "4 to 5 times a week", and "Every day or almost every day".

On average across OECD countries, 8.2% of students reported not eating at least once a week in the past 30 days because there was not enough money to buy food. Some OECD countries have some of the lowest proportions (below 3%), notably Portugal (2.6%), Finland (2.7%) and the Netherlands* (2.8%). However, there are OECD countries where the proportion of students suffering from food insecurity exceed 10%, including the United Kingdom* (10.5%), Lithuania (11%), the United States* (13%), Chile (13.1%), Colombia (13.3%), New Zealand* (14.1%) and Türkiye (19.3%).

In 18 countries/economies, more than 20% of students reported not eating at least once a week due to lack of money. In Baku (Azerbaijan), Jamaica* and the Philippines, more than a third of students reported this but only in Cambodia is this the case for more than half of students (67.8%). All countries where at least a quarter of students reported not eating at least once a week due to lack of money are among the lowest-performing countries/economies in mathematics in PISA 2022 (i.e. average performance below 400 score points).

Given the known relationship between performance and students' socio-economic status, it is not surprising that there is a negative correlation between food insecurity and mathematics performance in PISA 2022 (Pearson's r = -0.61)[6]. Food insecurity can affect not only students' physical well-being but their educational opportunities and overall quality of life as well.

Figure I.4.6. Percentage of students that did not eat at least once a week in the past 30 days, because there was not enough money to buy food



Note: Only countries and economies with available data are shown.

Countries and economies are ranked in descending order of the percentage of students who did not eat at least once a week in the past 30 days, because there was not enough money to buy food.

Source: OECD, PISA 2022 Database, Tables I.B1.4.46

Equal opportunity in terms of student gender[7]

Another indicator of fairness considered in this volume are disparities in student performance between boys and girls.

Gender disparities in performance at age 15 may have long-term consequences for girls' and boys' personal and professional future (OECD, 2015[26]). Boys who lag behind and lack basic proficiency in reading may face difficulties

in gaining access to further education, desirable positions in the labour market and full personal development. Equally, the under-representation of girls among top performers in science and mathematics can partly explain the persistent gender gap in careers in science, technology, engineering, and mathematics (STEM) fields – which are often among the highest-paying occupations.

Gender differences in achievement are not explained by innate ability; instead, social and cultural contexts reinforce stereotypical attitudes and behaviours that, in turn, are associated with gender differences in student performance (OECD, 2015[27]). For example, boys are significantly more likely than girls to be disengaged from school, get lower marks, repeat grades, and play video games in their free time. Girls tend to behave better in class, get higher marks, spend more time doing homework, and read for enjoyment, particularly complex texts such as fiction, in their free time (OECD, 2019[28]). Girls are also less likely to repeat grades. But girls are more likely than boys to feel anxious about mathematics. And they are less likely than boys to believe they can successfully perform mathematics and science tasks at designated levels; to enrol in technical and vocational programmes or gain "hands-on" experience in potential careers through internships or job shadowing (OECD, 2015[26]).

Gender-related disparities in achievement thus appear to be neither innate nor inevitable. The magnitude of the gender gap in student performance varies across countries. Over the past few decades many countries have made significant progress in narrowing, and even closing, the gender gap in educational attainment (Van Bavel, Schwartz and Esteve, 2018[29]).

Gender and mean performance

In PISA 2022, boys outperformed girls in mathematics by nine score points on average across OECD countries (mean score difference in Figure I.4.7). While boys outperformed girls in mathematics in 40 countries and economies, girls outperformed boys in another 17 countries or economies. The widest gaps in mathematics performance in favour of boys (15 score points or more) were observed in Costa Rica, Peru, Macao (China), Chile, Austria and Italy (in ascending order); the widest gaps in favour of girls (15 score points or more) were observed in Palestinian Authority and Albania. In 24 countries and economies, the difference in mathematics performance between boys and girls is not statistically significant.

Figure I.4.7 shows not only differences in the average performance of boys and girls, but also differences at the extreme ends of the performance distribution. The 10th percentile is the point in the performance scale below which 10% of students score; these are the weakest-performing students in each country/economy. The 90th percentile is the point in the scale above which only 10% of students score; these are the highest-performing students.

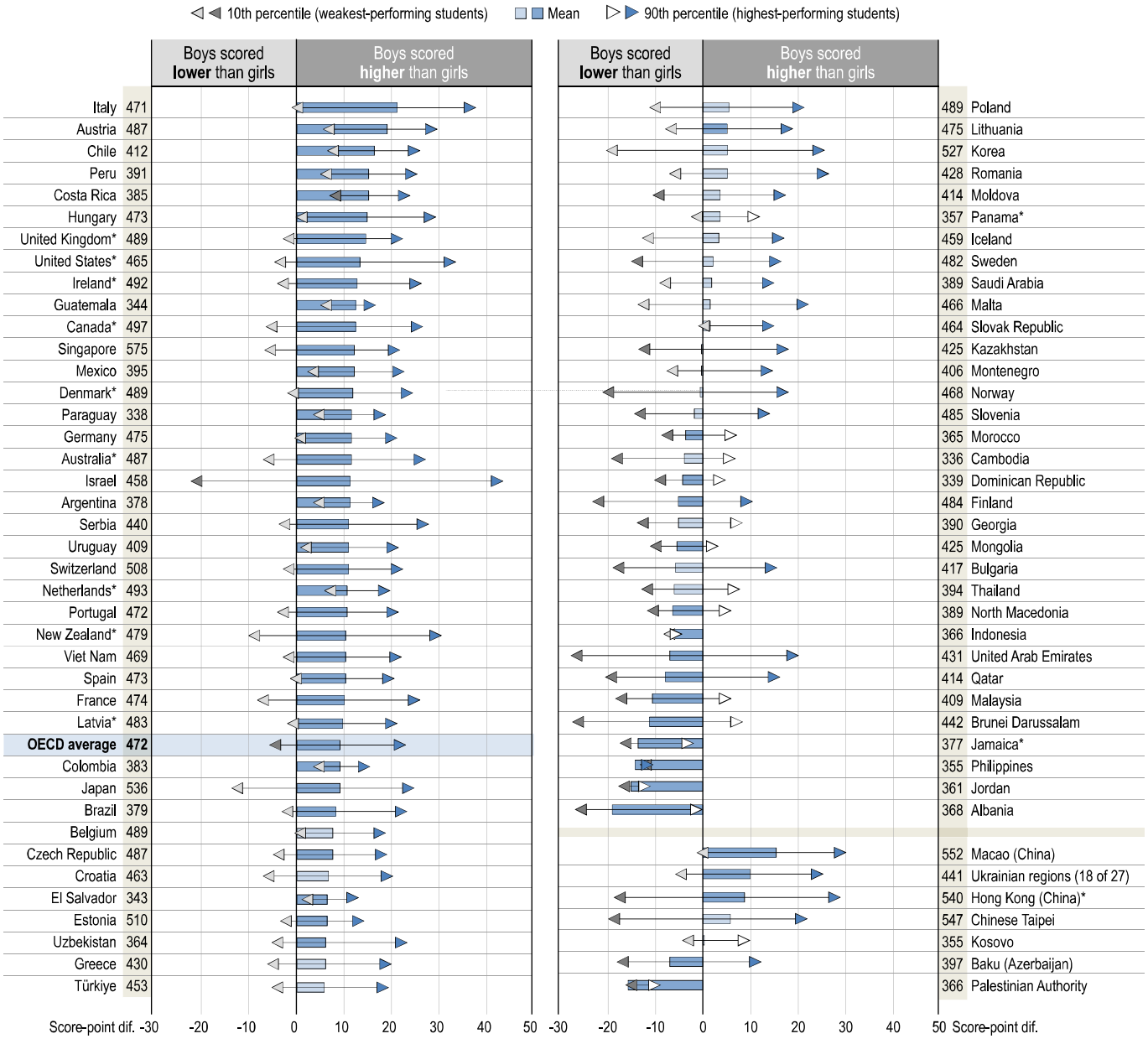
It is important to consider performance differences at these extremes because variability in student performance (as measured by the standard deviation) is greater among boys than girls in all subjects measured by PISA on average across OECD countries and in most countries/economies (Tables I.B1.4.17. I.B1.4.18 and I.B1.4.19).

In mathematics, the highest-performing boys outperformed the highest-performing girls on average across OECD countries (22 score points difference) and in most countries/economies (Figure I.4.7). In Israel, Italy and the United States*, the highest-performing boys outperformed the highest-performing girls by more than 30 score points.

Among the 10% weakest-performing students, girls outperformed boys on average across OECD countries (4 score points difference) and in 27 out of the 80 countries/economies (Figure I.4.7). In Brunei Darussalam and the United Arab Emirates, the weakest-performing girls outperformed the weakest-performing boys by more than 25 but less than 30 score points.

Figure I.4.7. Gender gap in mathematics performance

Score-point difference in mathematics between boys and girls



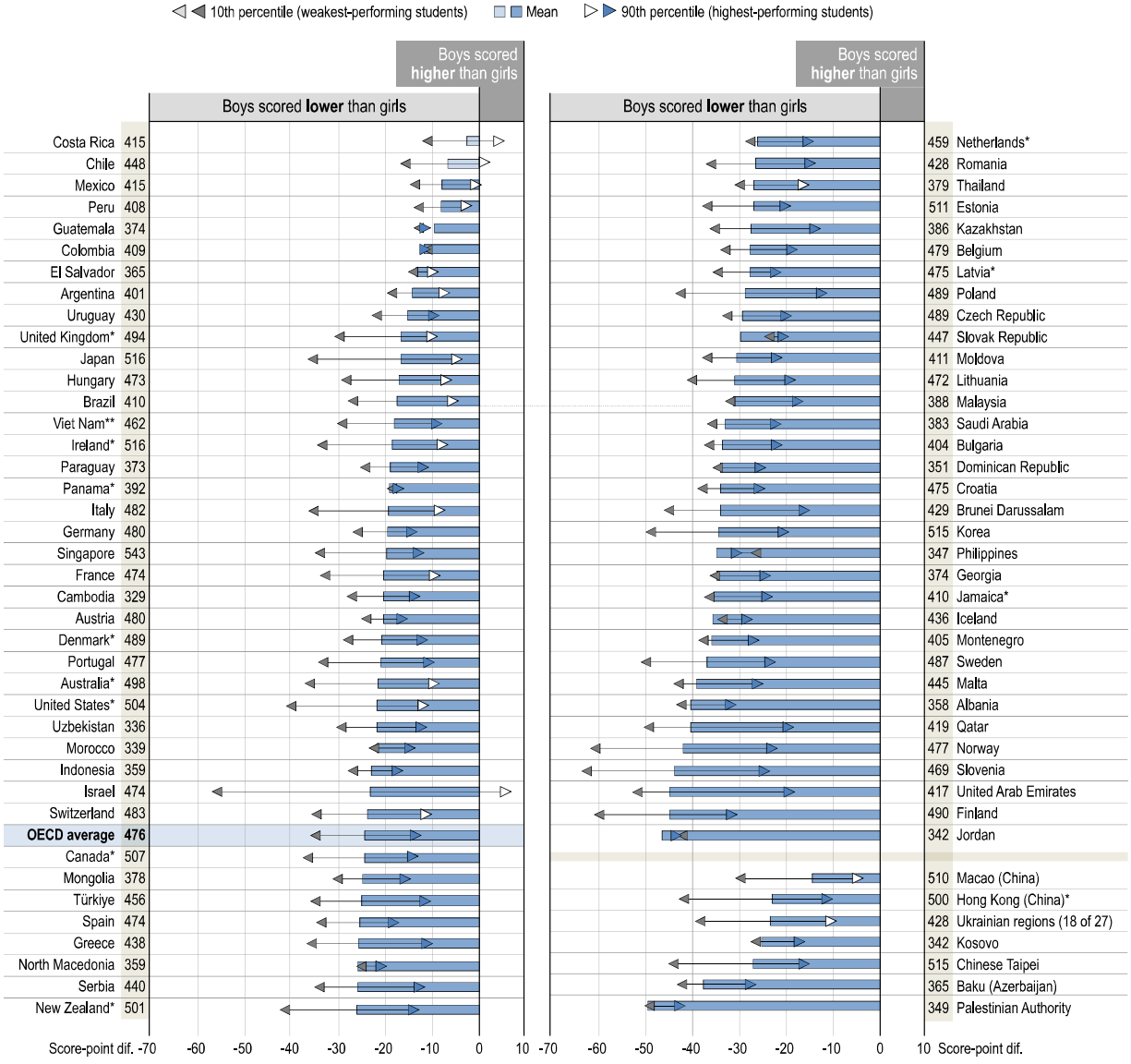
Notes: The mean score in mathematics is shown next to the country/economy name.
Statistically significant differences are shown in a darker tone (see Annex A3).
Countries and economies are ranked in descending order of the score-point difference in mathematics related to gender (boys minus girls).
Source: OECD, PISA 2022 Database, Tables I.B1.2.1 and I.B1.4.17.

In contrast to mathematics, girls performed better than boys in reading. On average across OECD countries, girls outperformed boys in reading by 24 score points (mean score difference in Figure I.4.8). Girls outperformed boys in reading in all countries and economies, with two exceptions (in Chile and Costa Rica the difference in reading performance between boys and girls is not statistically significant). The widest gaps in reading performance in favour of girls (40 score points or more) were observed in Albania, Qatar, Norway, Slovenia, United Arab Emirates, Finland, Jordan and Palestinian Authority (in ascending order).

In addition, girls outperformed boys in reading at both extremes of the performance distribution. The weakest-performing girls outperformed the weakest-performing boys on average across OECD countries (34 score points difference) and in all countries/economies. Similarly, the highest-performing girls outperformed the highest-performing boys on average across OECD countries (14 score points difference) and in most countries/economies (Figure I.4.8).

Figure I.4.8. Gender gap in reading performance

Score-point difference in reading between boys and girls



** Caution is required when comparing estimates based on PISA 2022 with other countries/economies as a strong linkage to the international PISA reading scale could not be established (see Reader's Guide and Annex A4).

Notes: The mean score in reading is shown next to the country/economy name.

Statistically significant differences are shown in a darker tone (see Annex A3).

Countries and economies are ranked in descending order of the score-point difference in reading related to gender (boys minus girls).

Source: OECD, PISA 2022 Database, Tables I.B1.2.2 and I.B1.4.18.

Gender and low performance

Figure I.4.9 and Figure I.4.10 show the percentage of low performers in mathematics and reading by gender, respectively.

On average across OECD countries in 2022, 31% of boys and 32% of girls are low performers in mathematics (Figure I.4.9). In 17 countries and economies, more boys than girls are low performers in mathematics whereas more girls than boys scored below proficiency Level 2 in mathematics in 15 countries and economies.

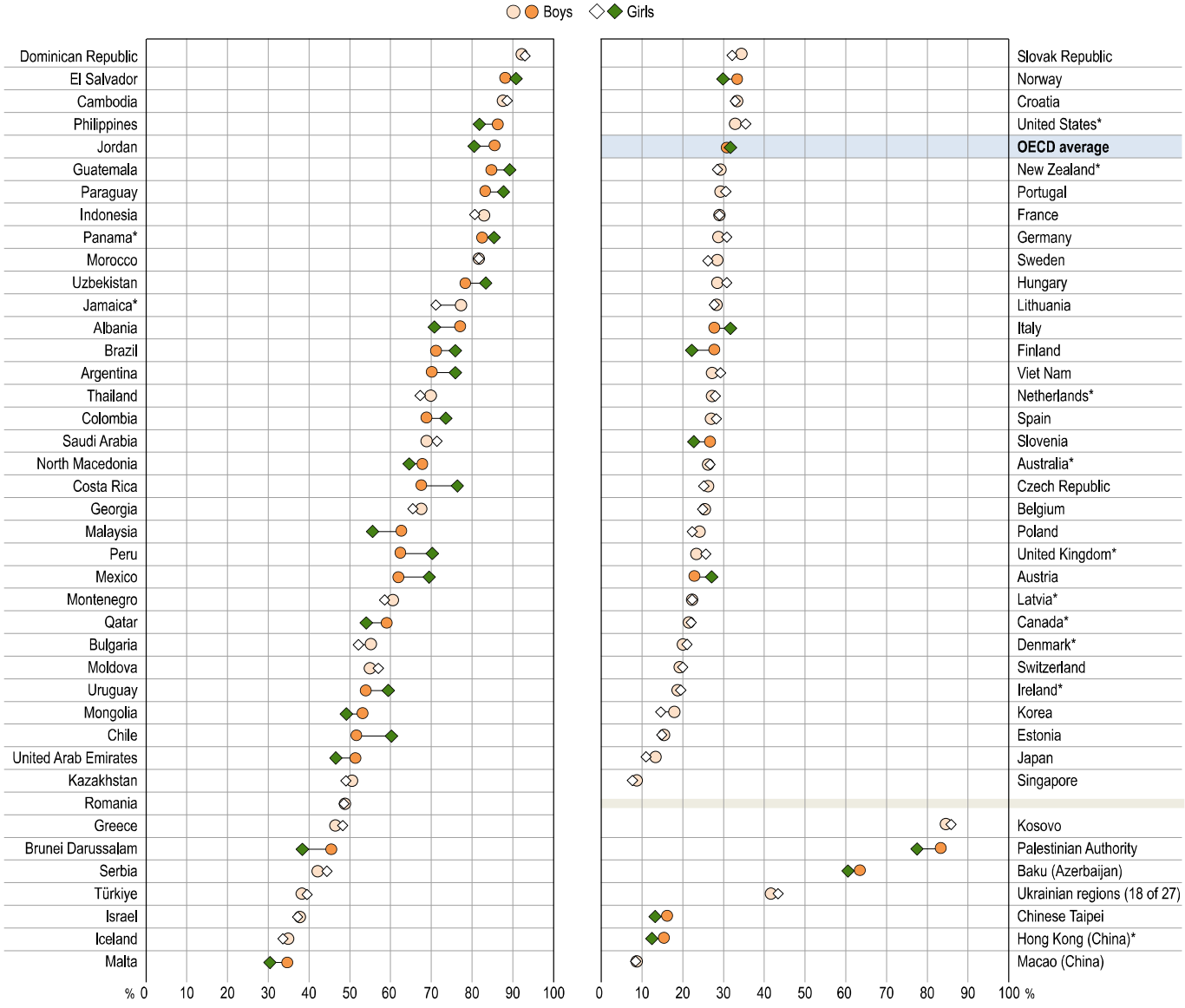
Gender gaps in the share of low performers in mathematics are relatively small. The widest gender gaps in low mathematics performance were observed in:

- Three countries and economies (Albania, Brunei Darussalam and Malaysia, in ascending order) where the share of boys who did not attain proficiency Level 2 is greater than the corresponding share of girls by more than six but less than nine percentage points.
- Four countries and economies (Mexico, Peru, Chile and Costa Rica, in ascending order) where the share of boys who did not attain proficiency Level 2 is smaller than the corresponding share of girls by more than six but less than nine percentage points.

In all other countries and economies, the difference between boys and girls in the share of low performers in mathematics is six percentage points or smaller, or is not statistically significant.

Figure I.4.9. Low performers in mathematics, by gender

Percentage of students who score below proficiency Level 2 in mathematics, by gender



Note: Statistically significant differences are shown in a darker tone (see Annex A3).

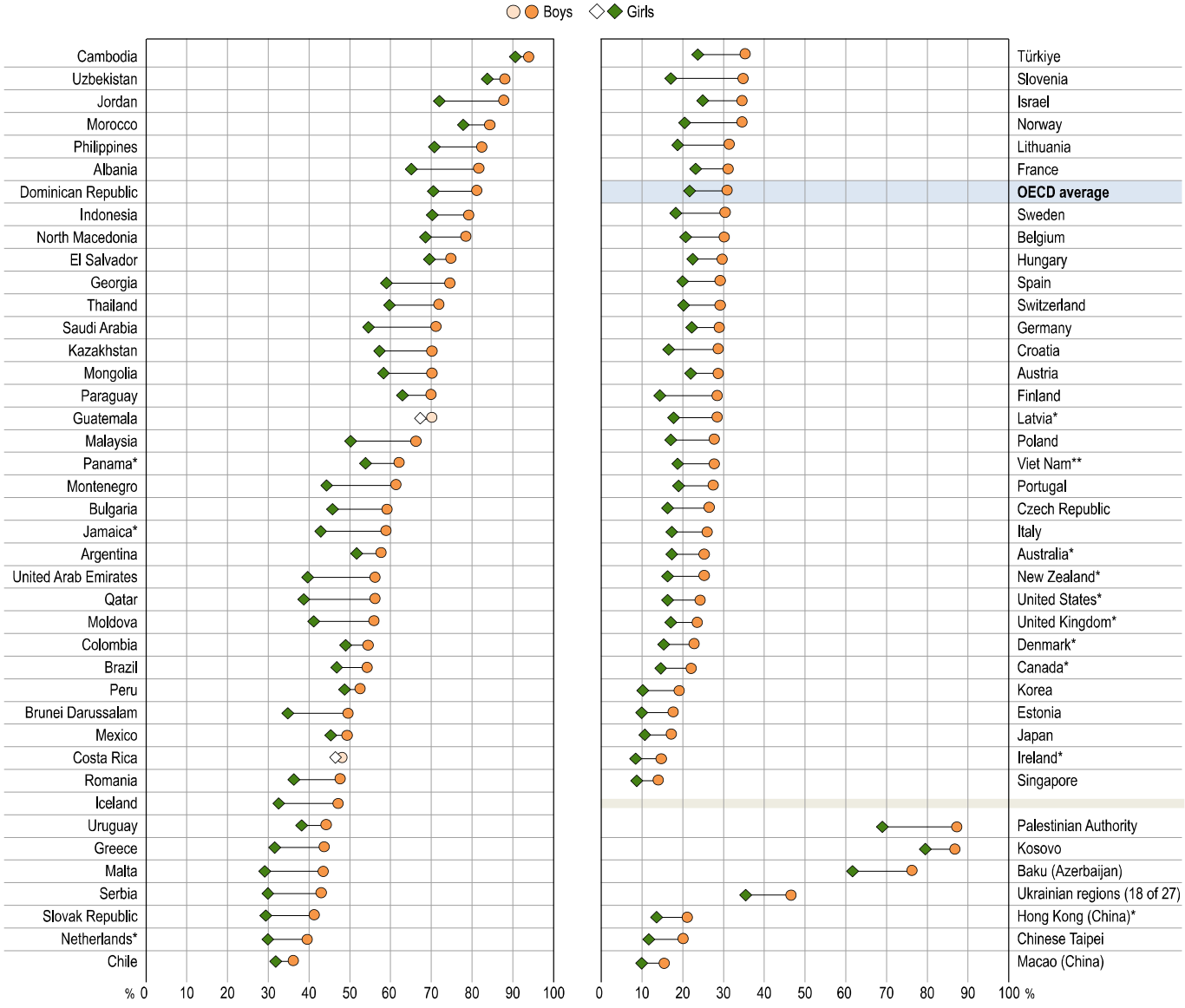
Countries and economies are ranked in descending order of the percentage of low-performing boys in mathematics.

Source: OECD, PISA 2022 Database, Table I.B1.4.31.

In reading, however, the picture is inverted and differences are more pronounced: boys performed significantly worse than girls in reading. On average across OECD countries in PISA 2022, 31% of boys and 22% of girls did not attain the baseline level of proficiency in reading, Level 2 (Figure I.4.10). In 78 out of 80 countries and economies in PISA 2022, a larger share of boys than girls are low performers in reading; in Montenegro, Qatar, Slovenia and Palestinian Authority (in ascending order) this difference is equal to or larger than 17 percentage points.

Figure I.4.10. Low performers in reading, by gender

Percentage of students who score below proficiency Level 2 in reading, by gender



Note: Statistically significant differences are shown in a darker tone (see Annex A3).
Countries and economies are ranked in descending order of the percentage of low-performing boys in reading.
Source: OECD, PISA 2022 Database, Table I.B1.4.32.

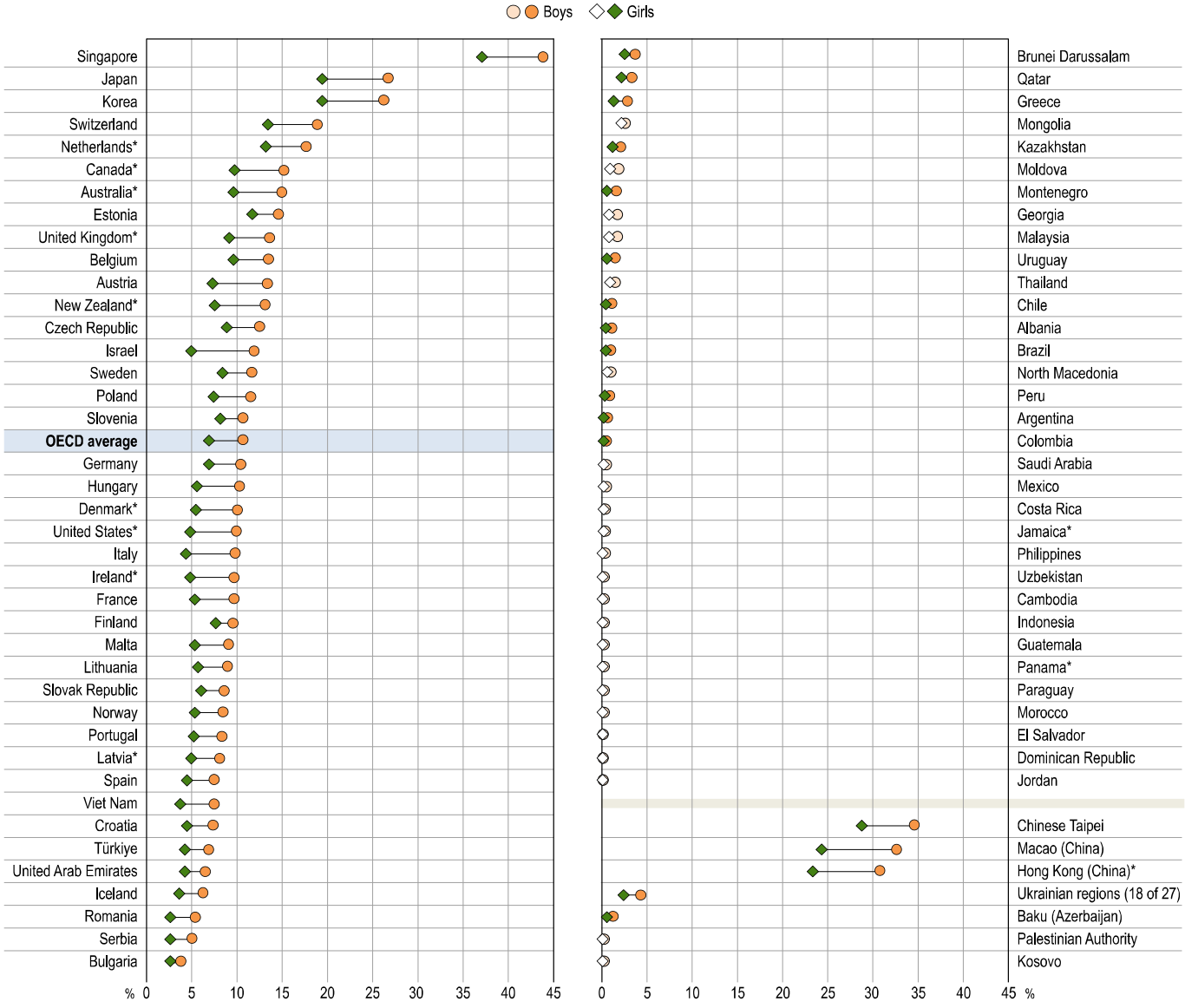
Gender and top performance

Some 11% of boys and 7% of girls scored at proficiency Level 5 or above in mathematics (Figure I.4.11) on average across OECD countries. In most countries and economies in PISA 2022, a larger share of boys than girls are top performers in mathematics. In most of these countries and economies the difference is small (i.e. equal to or lower than four percentage points) but in Japan, Hong Kong (China)* and Macao (China) (in ascending order) the share of top performers is between seven and nine percentage points more among boys than girls.

There is no country in PISA 2022 where the share of top performers in mathematics is larger among girls than boys.

Figure I.4.11. Top performers in mathematics, by gender

Percentage of students who score at proficiency Level 5 or above in mathematics, by gender



Note: Statistically significant differences are shown in a darker tone (see Annex A3).

Countries and economies are ranked in descending order of the percentage of top-performing boys in mathematics.

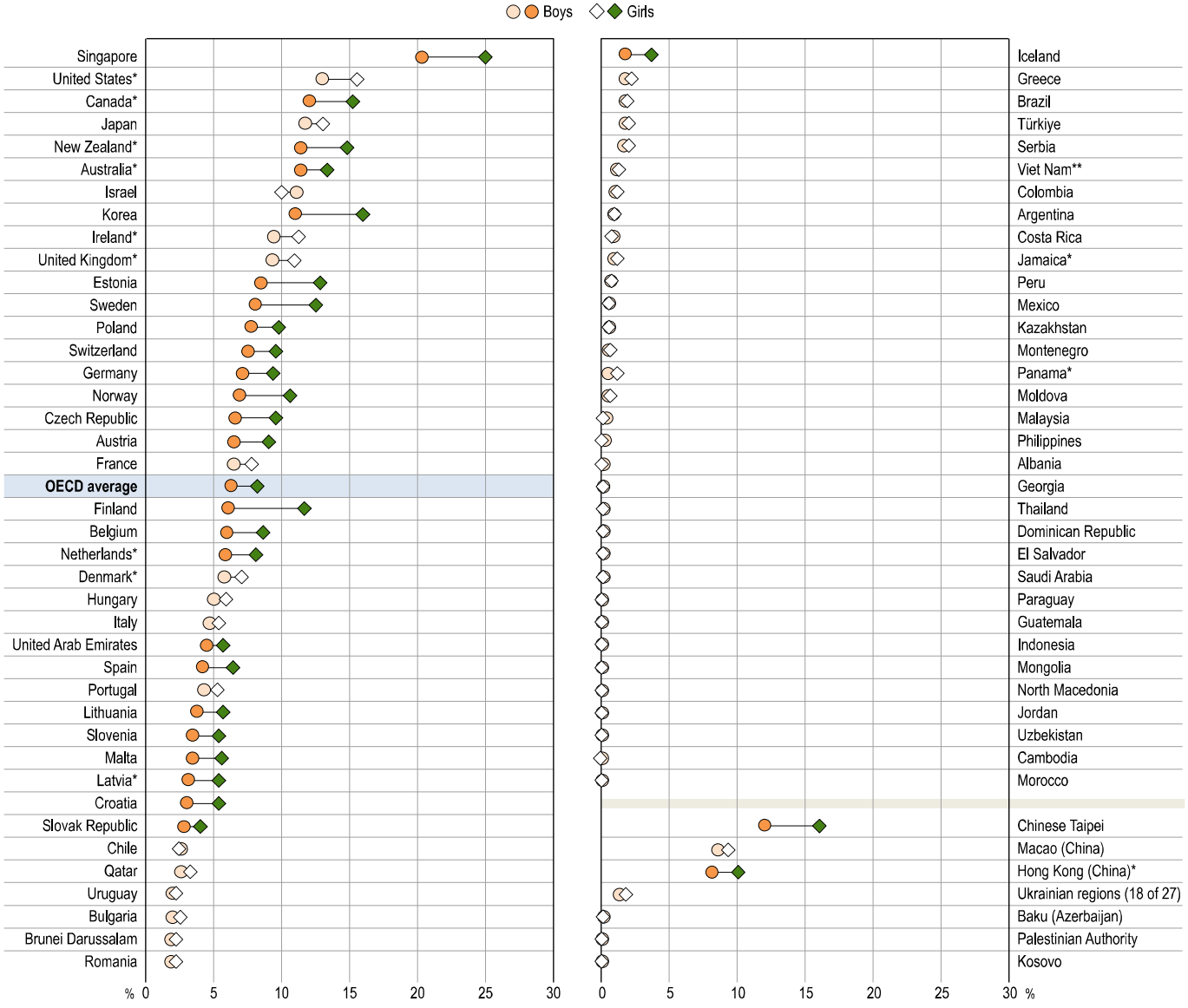
Source: OECD, PISA 2022 Database, Table I.B1.4.31

An average of 6% of boys and 8% of girls scored at proficiency Level 5 or above in reading (Figure I.4.12) in OECD countries. In 28 countries and economies a larger share of girls than boys are top performers in reading; only in Finland and Korea is this difference larger than five percentage points.

In most countries and economies, the difference between boys and girls in the share of top performers in reading is not statistically significant. In no country/economy is the share of top performers in reading larger among boys than girls.

Figure I.4.12. Top performers in reading, by gender

Percentage of students who score at proficiency Level 5 or above in reading, by gender



** Caution is required when comparing estimates based on PISA 2022 with other countries/economies as a strong linkage to the international PISA reading scale could not be established (see Reader's Guide and Annex A4).

Note: Statistically significant differences are shown in a darker tone (see Annex A3).

Countries and economies are ranked in descending order of the percentage of top-performing boys in reading.

Source: OECD, PISA 2022 Database, Table I.B1.4.32

Box I.4.3. Should education policies target students or schools?

PISA can help policy makers design evidence-based strategies and interventions to raise performance and improve equity in their education systems. According to a policy framework developed in previous PISA reports (hereafter, this will be referred to as "PISA policy framework") (OECD, 2004[30]; OECD, 2004[31]; OECD, 2016[32]), PISA data can inform whether *universal* or *targeted* policies are more likely to have a stronger impact on a particular education system. It can also indicate whether targeted policies might want to focus on low-performing or socio-economically disadvantaged students or both.

This box builds on the PISA policy framework by addressing a question that policy makers interested in targeted policies are confronted with: should students or schools be targeted? This requires examining the level of concentration of low-performing and disadvantaged students in schools.

The PISA policy framework: Universal or targeted education policies?

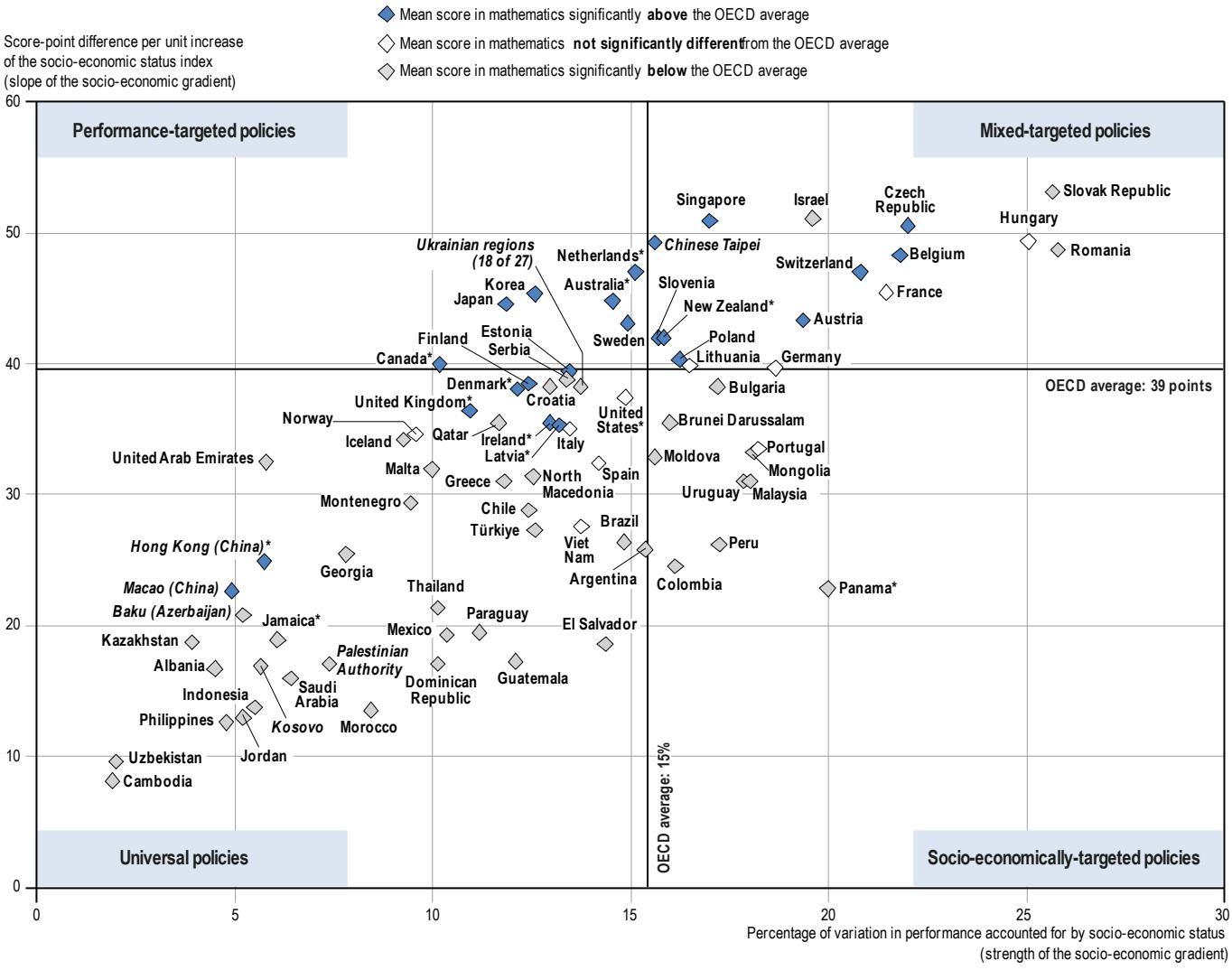
The PISA policy framework identifies education systems that can benefit the most from universal or targeted policies. To do this, two key pieces of information are used: (1) the strength of the socio-economic gradient, i.e. the proportion of the variation in student performance that is accounted for by differences in student socio-economic status and the (2) the slope of the socio-economic gradient, i.e. the score-point difference in student performance associated with an increase of one unit in the PISA index of socio-economic status. Understanding how these two aspects interact can inform educational policies and interventions.

Table I.4.1 shows four types of policy according to each possible combination of slope and strength. Figure I.4.13 locates into this typology the countries/economies that took part in PISA 2022.

Table I.4.1. The PISA policy framework

		Strength of the socio-economic gradient	
		Low	**High**
Slope of the socio-economic gradient	**Steep**	**Performance-targeted** policies	**Mixed targeted** policies
	Flat	**Universal** policies	**Socio-economically-targeted** policies

Figure I.4.13. Strength and slope of the socio-economic gradient



Notes: Only countries and economies with available data are shown.
The socio-economic status is measured by the PISA index of economic, social and cultural status.
Source: OECD, PISA 2022 Database, Tables I.B1.2.1 and I.B1.4.3.

The framework is built around the OECD average. As Figure I.4.13 shows, it is not always easy to describe strength as strong or weak, or slope as flat or steep. Whether systems fall into one category or another is sometimes not clear-cut as many countries are close to the OECD average. In such cases, a mix of approaches or policies may be most appropriate.

Universal policies are more appropriate in education systems where student socio-economic status does not have a great impact on student performance; that is, where the strength of the relationship between student performance and socio-economic background is comparatively weak (i.e. the proportion is lower than the OECD average) and the slope is flat (i.e. the score-point difference is smaller than the OECD average). Universal policies aim to improve performance across the board and raise educational attainment for all children through reforms that are applied equally across the system. This includes, for example, the development and implementation of comprehensive curricula or the provision of continuous professional development and training for teachers to improve their subject knowledge, pedagogical skills and strategies for teaching students of different abilities. Ensuring that all schools have

access to quality teaching materials, textbooks, digital resources and technology to support effective teaching is essential. As shown in Figure I.4.13, 47 countries/economies that took part in PISA 2022 can benefit from universal policies. Among high-performing countries/economies, they are most likely to be effective in Hong Kong (China)* and Macao (China).

By contrast, targeted policies are those that focus on particular groups of students. Three types of targeted policies are considered in the PISA policy framework: those that focus resources and efforts on low-performing students ("performance-targeted") or socio-economically disadvantaged students ("socio-economically-targeted") or both ("mixed"). Examples of these policies are given below, but they need to be weighed up against each national context and, if necessary, adapted.

Targeted policies: Students or schools?

Effective education policies strike a balance between targeting schools and individuals. While schools play a crucial role in delivering education and ensuring equitable opportunities, addressing the diverse needs of individual students is equally important. Yet, as education systems face new challenges in the wake of the COVID-19 pandemic, there is a need to invest resources efficiently. One way to do so is to identify whether targeted policies should, as a first step, prioritise individual students or whole schools.

To distinguish priorities within countries, two PISA 2022 indices are used: the index of academic inclusion and the index of social inclusion. A higher value in the index of academic inclusion indicates that students with different levels of performance tend to be more evenly distributed across schools, hence, that academic diversity within schools is greater. A lower value in the index of academic inclusion indicates that students are less evenly distributed, i.e. that low performers and top performers tend to be concentrated in particular schools within the education system (Table I.B1.2.13). Likewise, when the index of social inclusion is higher, social inclusion at school is greater and schools tend to be more socially heterogeneous. The opposite is true when the index is low (Table I.B1.4.41). Based on these two indices, this box identifies priority groups for each of the following targeted policies.

Table I.4.2. Targeted policies by level of social and academic inclusion within schools

Performance-targeted policies		Socio-economically-targeted policies		Mixed targeted policies	
Target low-performing schools (IAI < OECD average)	**Target low-performing students** (IAI > OECD average)	**Target disadvantaged schools** (ISI < OECD average)	**Target disadvantaged students** (ISI > OECD average)	**Schools** (ISI & IAI < OECD average)	**Students and schools** (ISI > OECD average & IAI < OECD average)
Japan, Lithuania, the Netherlands*, Poland, Slovenia, Chinese Taipei	Australia*, Canada*, Korea, New Zealand*, Sweden	Bulgaria, Colombia, Malaysia, Mongolia, Panama*, Peru, Uruguay	Portugal	Austria, Belgium, the Czech Republic, France, Hungary, Israel, Romania, the Slovak Republic	Singapore, Switzerland

Note: IAI is the index of academic inclusion and ISI is the index of social inclusion.
Source: OECD, PISA 2022 Database, Tables I.B1.2.13 and I.B1.4.41.

Performance-targeted policies: These policies aim to improve the performance of the lowest performers, regardless of their socio-economic status. The goal is to provide equal learning opportunities for all students and specialised or additional teaching resources based on students' academic performance. Performance-targeted policies start by setting specific, measurable, and achievable academic performance goals for students, schools or groups of schools. Once areas for improvement have been identified, schools implement targeted interventions – and early intervention is important. These can take a variety of forms, including additional instructional support (extra tutoring, mentoring or academic support for struggling students) or professional development for teachers and staff. While in-school interventions are the most common approaches, evidence suggests that reducing student tardiness and absenteeism has important results in some countries (OECD, 2018[33]). For this, parental involvement is key. In

other contexts, targeted academic support combined with merit-based scholarship programmes have success in motivating low-achieving students. They also have positive spin-off effects in classrooms and schools (Kremer, Miguel and Thornton, 2009[34]).

As shown in Table I.4.2, 11 education systems that took part in PISA 2022 would benefit from performance-targeted-policies. Yet, would it make more sense for them to target low-performing students or low-performing schools? The PISA index of academic inclusion suggests that countries in this group are almost equally divided between those who might focus on schools first (i.e. the concentration of low-performing students in particular schools is higher than on average across OECD countries) and those that might want to focus on individual students first (i.e. the concentration of low-performing students in particular schools is lower than on average across OECD countries).

Socio-economically-targeted policies: These policies aim to compensate for educational inequalities by providing additional resources, support or assistance to disadvantaged students and schools. In some countries, for example, increased teaching hours and teacher-student contact time have been used to compensate for the support disadvantaged students may lack at home (Rodríguez Navarro, Ríos González and Racionero Plaza, 2012[35]). These also accelerate learning. Other policy levers are more holistic and target inequalities beyond the classroom ranging from free school meals and free textbooks for disadvantaged students to direct financial support for disadvantaged families.

As shown in Table I.4.2, eight education systems would likely benefit the most from socio-economically-targeted policies. These are systems in which the socio-economic profile of students is strongly associated with their performance in school even though the score-gap is not too large. Would it make more sense for them to target disadvantaged students or schools with a disadvantaged socio-economic profile? In seven out of the eight countries in this group, the school concentration of disadvantaged students is higher than average: policies targeting disadvantaged schools are likely to have a stronger impact. The exception is Portugal, where disadvantaged students are spread more widely across the school system.

Mixed targeted policies: The aim of these policies is to reduce the achievement gap through targeted policies that provide adapted teaching resources to address both low achievement and socio-economic disadvantages. For example, some countries in this group could benefit from better support for teachers and professional development, including efforts to attract and retain qualified teachers in schools in disadvantaged areas. Funding policies that allocate more resources to schools in low-income neighbourhoods are also important, as is the implementation of school integration programmes that promote diversity; that is, where schools are attended by pupils with different learning paths and from different socio-economic backgrounds. For example, evidence suggests that the composition of the student body in a classroom can academically motivate and improve the well-being of socio-economically disadvantaged students (Hornstra et al., 2015[36]). Schools that succeed in addressing the specific educational needs of socio-economically disadvantaged and/or low-performing students are often those that succeed in creating a positive mixed learning environment in addition to programmes that provide material or financial support to pupils who need it. Other strategies that could be relevant in some countries include specialised teacher training and professional development programmes as well as continuous monitoring of changes in academic performance and the overall impact of policies.

Ten education systems that took part in PISA 2022 would likely benefit the most from a mix of performance-targeted and socio-economically-targeted policies. In these systems, socio-economically disadvantaged pupils are particularly at risk, as there is a strong relationship between mathematics performance and socio-economic background, and the performance loss (slope) is pronounced. Evidence from PISA 2022 suggests that eight countries in this group may find more value in targeting schools, as both indices suggest high levels of social and academic segregation. Only in two high-performing countries in this group, Switzerland and Singapore, are students from disadvantaged backgrounds more evenly distributed across schools than on average across OECD countries.

Equal opportunity in terms of education system

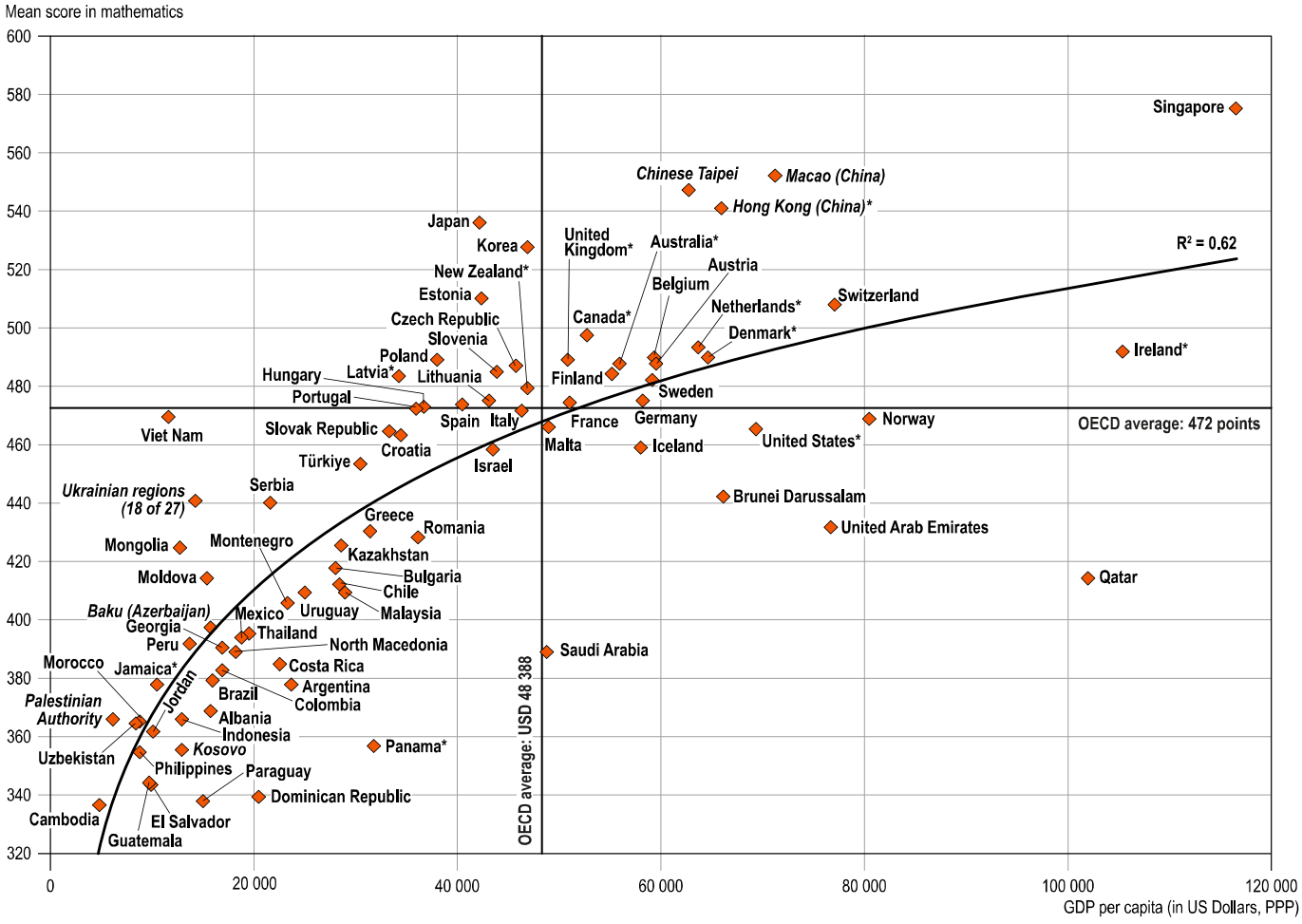
Barriers to student performance that compromise fairness arise not only within countries/economies but also between countries/economies. Opportunities for students to fulfil their potential differ greatly across countries and economies that participated in PISA. Students who are born and attend school in education systems that are more conducive for learning are more likely, on average, to perform at higher levels than students in systems that are less so. As most students cannot select an education system they are enrolled in for better opportunity, equality of opportunity by education system is examined in this report as an attribute of fairness in education.

Countries' economic and social conditions, and student performance

The economic and social conditions of different countries/economies, which are often beyond the control of education policy makers and educators, can influence student performance. For example, the relative prosperity of some countries allows them to spend more on education while other countries find themselves constrained by a lower national income. It is therefore important to keep the national wealth of countries in mind when interpreting the performance of education systems across countries.

Figure I.4.14 shows the relationship between national income as measured by per capita GDP and students' average mathematics performance. The figure also shows a trend line that summarises this relationship. The relationship suggests that 62% of the variation in countries'/economies' mean scores is related to per capita GDP (47% in OECD countries). Countries with higher national incomes tend to score higher in PISA. However, the relationship is not linear and it flattens towards the right. When interpreting this chart, keep in mind that it provides no indications about the causal nature of this relationship.

Figure I.4.14. Mathematics performance and per capita GDP



Source: OECD, PISA 2022 Database, Tables I.B1.2.1 and I.B3.2.1.

While per capita GDP reflects the potential resources available for education in each country, it does not directly measure the financial resources actually invested in education. Figure I.4.15 compares countries' cumulative spending per student from the age of 6 up to 15 after accounting for purchasing power parities (hereafter, spending per student) with average student performance in mathematics.

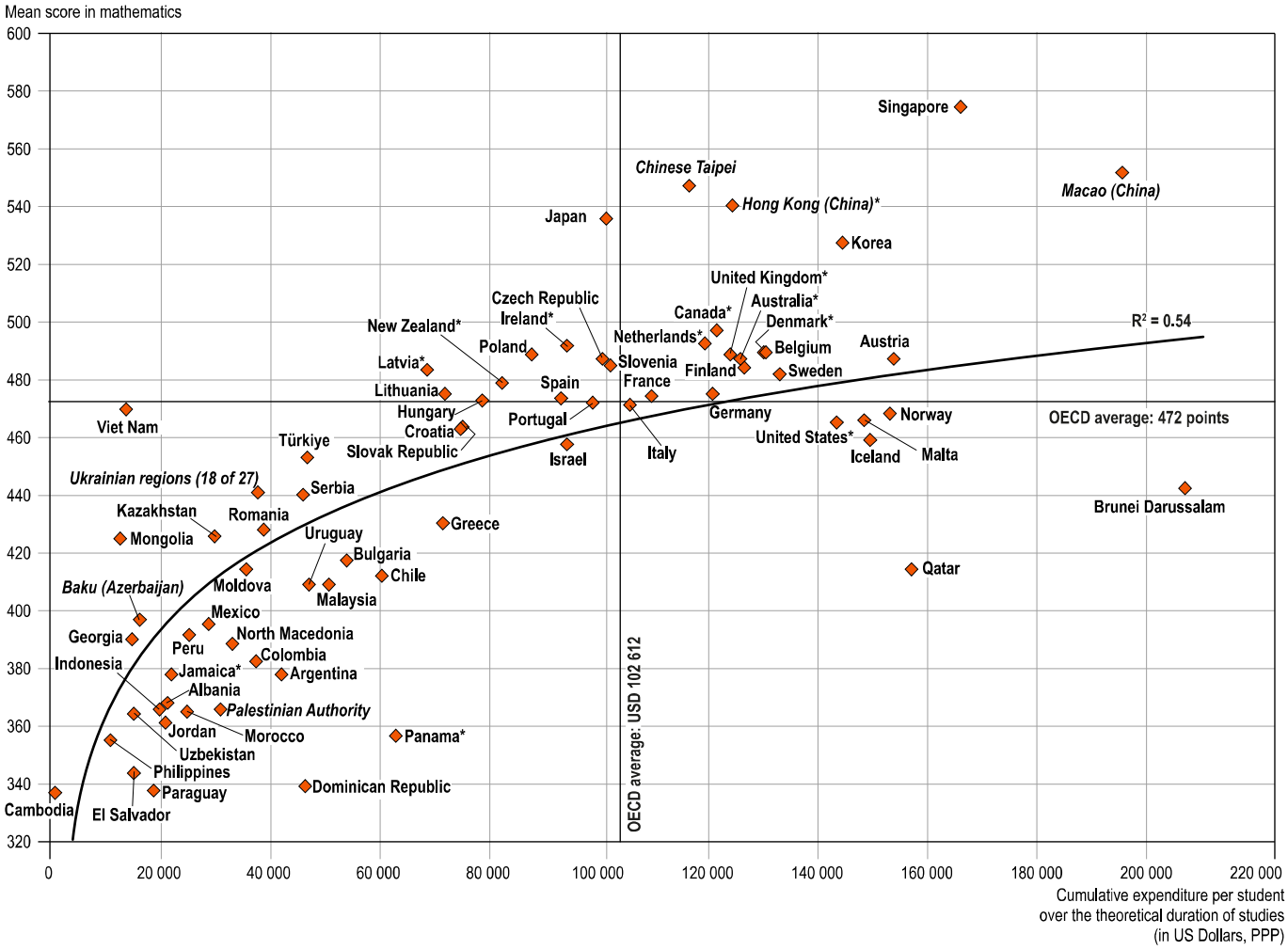
The figure shows a positive relationship between spending per student and mean mathematics performance until a certain threshold. Spending per student accounts for 54% of the variation in mean performance between countries/economies (51% in OECD countries). As spending per student increases, so does a country's mean performance. But this rate of increase diminishes quickly. Above USD 75 000 per student, a level of cumulative expenditure reached by all OECD countries except Chile, Colombia, Greece, Latvia, Lithuania, Mexico and Türkiye, spending is much less related to performance.

Low spending per student needs to be taken into account when interpreting the poor performance of students in developing countries. Average spending per student across OECD countries (USD 102 612) is about seven times greater than in El Salvador, more than eight times greater than in Mongolia, and more than nine times greater than in the Philippines. This shows that education needs to be adequately resourced and is often under-resourced in developing countries.

At the same time, after a certain threshold of spending, a higher level of spending per student does not automatically translate into excellence in education. For example, the six East Asian education systems (Hong Kong [China]*,

Japan, Korea, Macao [China], Singapore and Chinese Taipei) that outperformed all other countries/economies in mathematics in PISA 2022 differ markedly in their spending per student (yet all of them spend more than USD 100 000 per student). Similarly, countries and economies with the highest levels of spending per student differ widely in their mean student performance; in Brunei Darussalam and Qatar, mean performance in mathematics is below the OECD average despite high levels of spending per student.

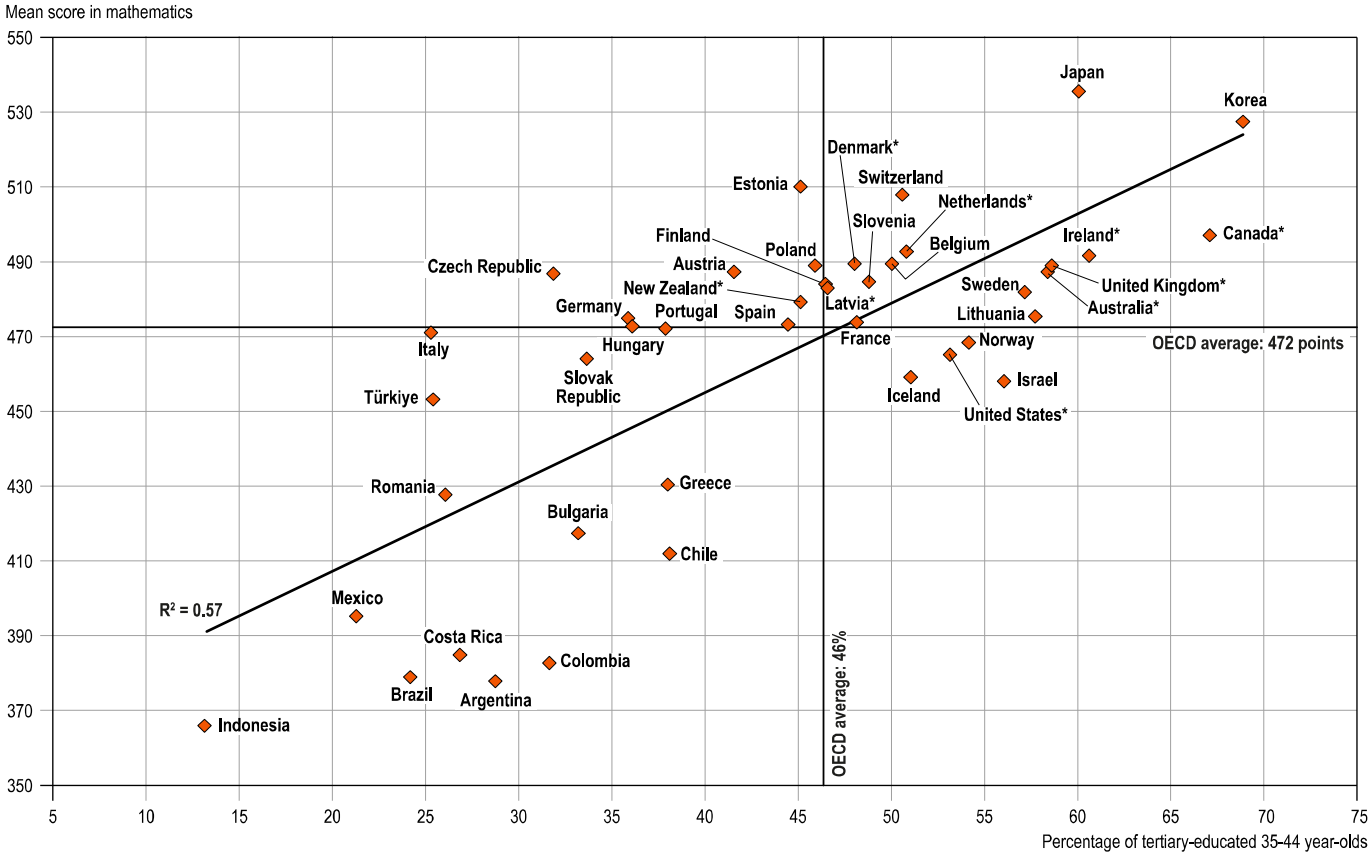
Figure I.4.15. Mathematics performance and spending on education



Note: Only countries and economies with available data are shown.
Source: OECD, PISA 2022 Database, Tables I.B1.2.1 and I.B3.2.2.

Given the strong relationship between a student's performance in PISA and his or her parents' level of education (as measured by their education qualifications), the education attainment of adult populations should be taken into account when comparing student performance across countries. Countries with more highly educated adults are at an advantage over countries where parents have less education. Figure I.4.16 shows the relationship between mean mathematics performance and the percentage of 35-44 year-olds who have attained tertiary education. This group corresponds roughly to the age group of parents of the 15-year-olds assessed in PISA. According to this analysis, the share of tertiary-educated 35-44 year-olds accounts for 57% of the variation in 15-year-old students' mean mathematics performance across 42 countries/economies with available data (43% across 37 OECD countries).

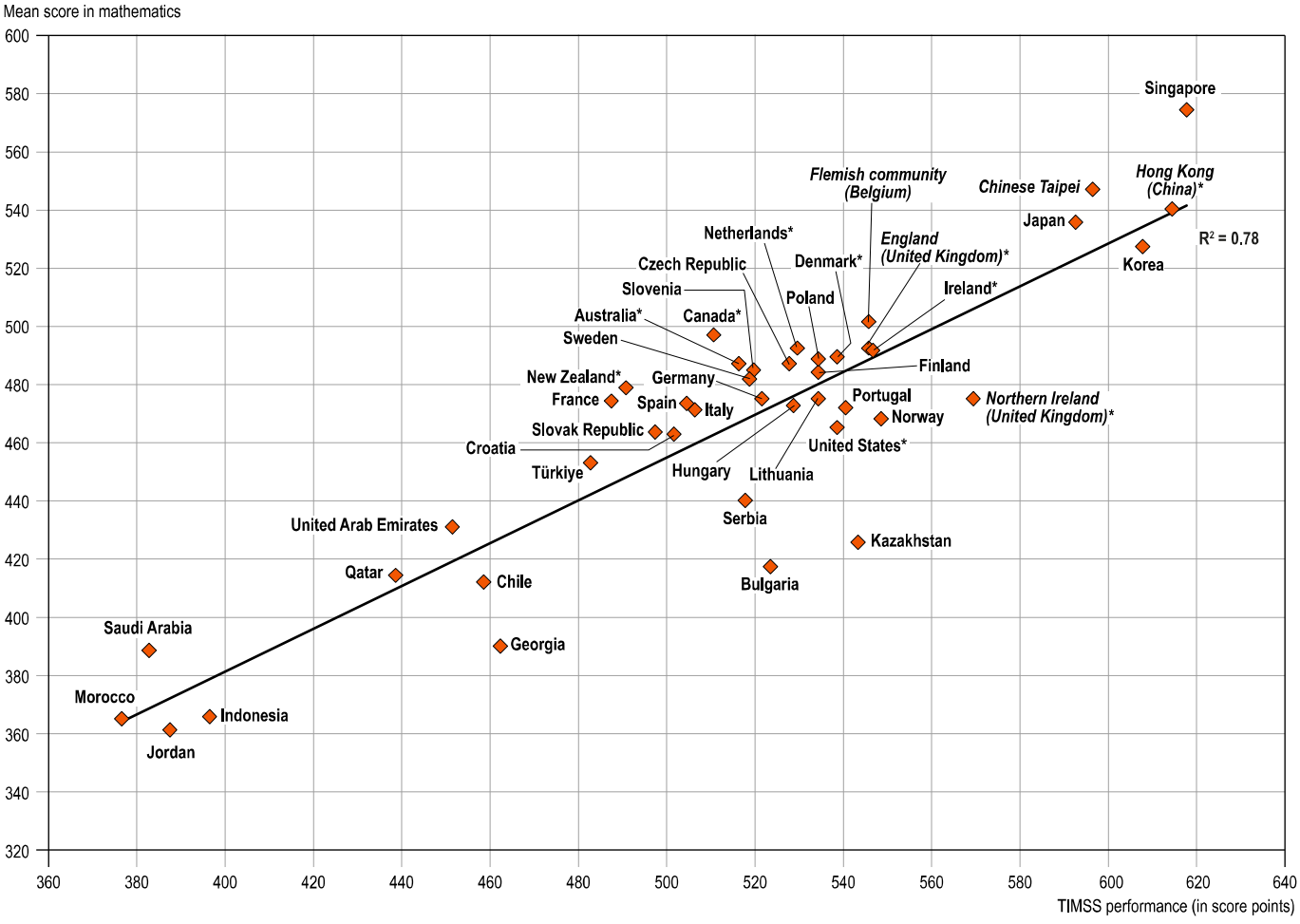
Figure I.4.16. Mathematics performance and educational attainment among 35-44 year-olds



Notes: Only countries and economies with available data are shown.
For Chile, year 2020 was used rather than year 2022.
For Argentina, year 2021 was used rather than year 2022.
Source: OECD, PISA 2022 Database, Tables I.B1.2.1; OECD (2023) Education at a Glance 2023: OECD Indicators, OECD Publishing, Paris, https://doi.org/10.1787/e13bef63-en.

When interpreting the performance of 15-year-olds in PISA, it is important to consider that the results reflect more than the quality of secondary schooling. They also reflect the quality of learning in earlier stages of schooling, and the cognitive, emotional and social competences students had acquired before they even entered school. A clear way of showing this is to compare the mean mathematics performance of 15-year-olds in PISA 2022 with the average mathematics performance achieved towards the end of primary school by students from a similar birth cohort who participated in the Trends in International Mathematics and Science Study (TIMSS) in 2015, a study developed by the International Association for the Evaluation of Educational Achievement (Mullis et al., 2016[37])[8]. Some 43 countries, economies and subnational entities that participated in PISA 2022 also participated in TIMSS 2015. Figure I.4.17 shows a strong correlation between the results of the mathematics test for fourth-grade students in TIMSS 2015 and the results of the PISA 2022 mathematics assessment among 15-year-old students. Differences in TIMSS results can account for about 78% of the variation in PISA mathematics results across the 43 countries and economies that participated both in TIMSS 2015 and PISA 2022. Despite this clear relationship, countries that scored at similar levels in TIMSS – such as Hungary and the Netherlands – can have very different mean scores in PISA. Differences between PISA and TIMSS in countries' relative standing may reflect the influence of the intervening grades on performance but could also be related to differences in what is measured and who is assessed.

Figure I.4.17. Mathematics performance and fourth-graders' performance in TIMSS 2015



Notes: Only countries and economies with available data are shown.
For Norway, 5th-grade achievement was used rather than 4th-grade achievement.
Source: OECD, PISA 2022 Database, Table I.B1.2.1, (Mullis et al., 2016[37]), TIMSS 2015 International Results in Mathematics, http://timss2015.org/timss-2015/mathematics/student-achievement/distribution-of-mathematics-achievement/

International deciles of student socio-economic status and mean performance

The PISA index of economic, social and cultural status (ESCS index) is computed in such a way that all students taking the PISA test, regardless of the country where they live, can be placed on the same socio-economic scale. This means that it is possible to use this index to compare the performance of students of similar socio-economic background in different countries. Figure I.4.18 shows performance differences by international deciles of the ESCS index. The figure illustrates that though students may have similar socio-economic status, their performance is very much linked to the country or economy in which they live.

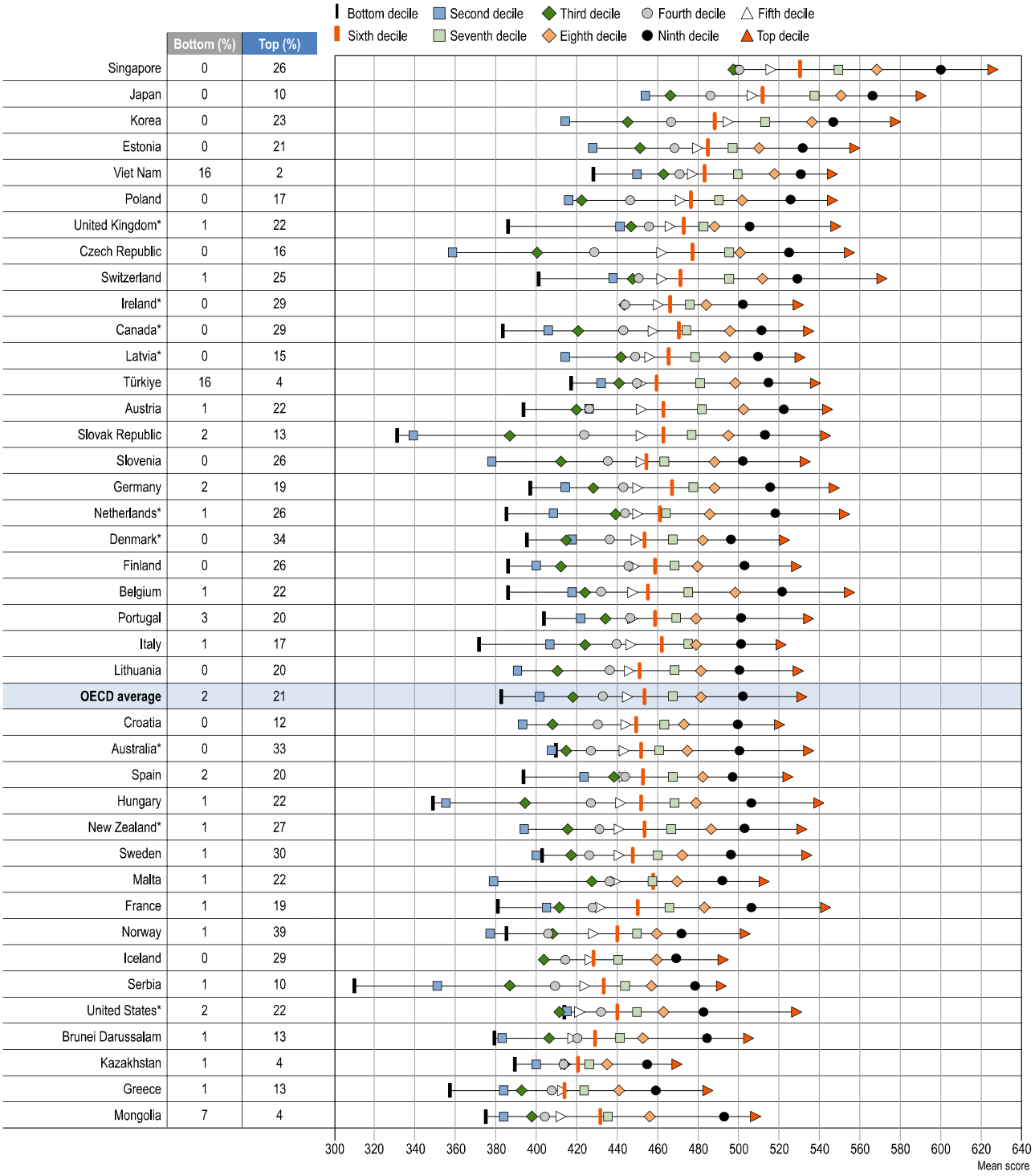
For instance, in Macao (China), students with the greatest disadvantages (i.e. those in the bottom decile of the international distribution of the ESCS index) have an average score of 495 points in the mathematics assessment (1% of students in Macao [China] are in the bottom decile of the international distribution of the ESCS index). This is significantly above the OECD mean score of 472 points, which reflects the performance of students from all socio-economic backgrounds. Such a high level of performance also means that disadvantaged students in Macao (China) outperformed even the most advantaged students (i.e. those in the top decile of the international distribution of the ESCS index) in many other PISA-participating countries and economies.

Large differences in performance can also be observed between countries where similar percentages of students have similar socio-economic status. For instance, in Finland, the Netherlands*, New Zealand* and Slovenia, between 26% and 27% of students are in the internationally most socio-economically advantaged group. Yet, the average mathematics score of these most advantaged students in the Netherlands (551 score points) is about 20 points higher than in the other three countries.

Possible explanations for why students of a similar socio-economic status perform better in some countries are the differences in how education systems are organised and use the resources available to them. *PISA 2022 Results, Volume II* analyses education policies and practices in PISA-participating countries/economies.

Figure I.4.18. Mean performance in mathematics, by international decile of socio-economic status [1/2]

PISA index of economic, social and cultural status (ESCS)



	Bottom (%)	Top (%)
Singapore	0	26
Japan	0	10
Korea	0	23
Estonia	0	21
Viet Nam	16	2
Poland	0	17
United Kingdom*	1	22
Czech Republic	0	16
Switzerland	1	25
Ireland*	0	29
Canada*	0	29
Latvia*	0	15
Türkiye	16	4
Austria	1	22
Slovak Republic	2	13
Slovenia	0	26
Germany	2	19
Netherlands*	1	26
Denmark*	0	34
Finland	0	26
Belgium	1	22
Portugal	3	20
Italy	1	17
Lithuania	0	20
OECD average	2	21
Croatia	0	12
Australia*	0	33
Spain	2	20
Hungary	1	22
New Zealand*	1	27
Sweden	1	30
Malta	1	22
France	1	19
Norway	1	39
Iceland	0	29
Serbia	1	10
United States*	2	22
Brunei Darussalam	1	13
Kazakhstan	1	4
Greece	1	13
Mongolia	7	4

Notes: Only countries and economies with available data are shown.

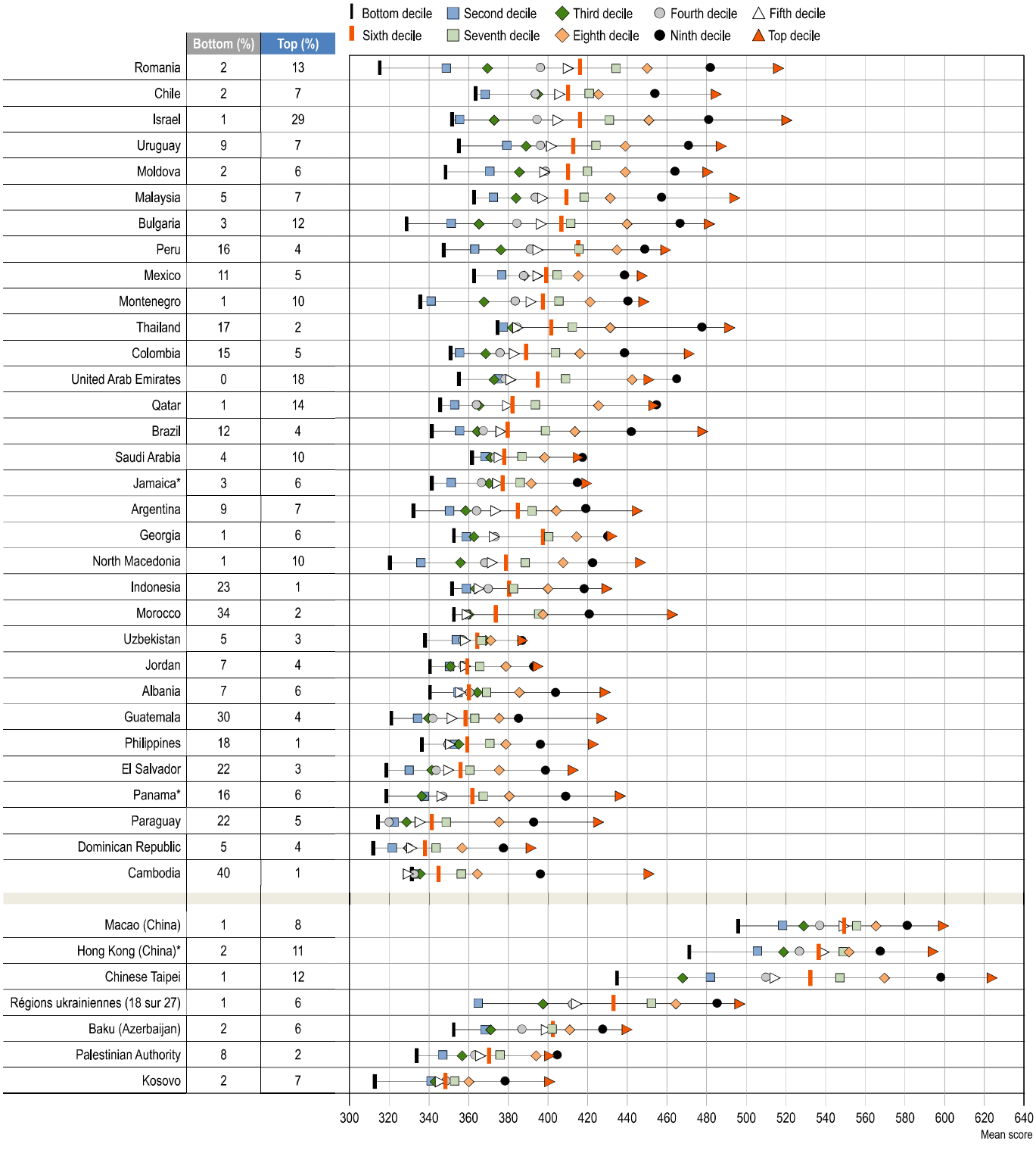
Percentage of students who are in the top/bottom international decile of the PISA index of economic, social and cultural status are shown next to the country/economy name.

Countries and economies are ranked in descending order by fifth decile of international students' socio-economic status.

Source: OECD, PISA 2022 Database, Tables I.B1.4.7 and I.B1.4.11.

Figure I.4.18. Mean performance in mathematics, by international decile of socio-economic status [2/2]

PISA index of economic, social and cultural status (ESCS)



Notes: Only countries and economies with available data are shown.

Percentage of students who are in the top/bottom international decile of the PISA index of economic, social and cultural status are shown next to the country/economy name.

Countries and economies are ranked in descending order by fifth decile of international students' socio-economic status.

Source: OECD, PISA 2022 Database, Tables I.B1.4.7 and I.B1.4.11.

Inclusive education

In PISA, inclusion is the goal that all students have access to quality education and achieve at least the baseline level of skills in mathematics, reading and science. To attain equity in education, inclusion is necessary but not sufficient; inclusion needs to be combined with fairness to achieve equity in education.

Students who graduate from compulsory education without acquiring basic knowledge and skills are unlikely to do well in their adult life; and, when a large share of the population lacks basic skills, social and economic capital can be compromised (Pelinescu, 2015[38]). Therefore, in this report, the incidence of low-performance among 15-years olds (i.e. students who have not attained a baseline level of proficiency as measured by PISA) is examined. Similarly, students who drop out of school without completing secondary education are likely to be excluded from the benefits that education can provide.

While educational inclusion is a value that applies to all students regardless of their background, in practice it is more crucial for students from disadvantaged backgrounds or traditionally marginalised groups who are more likely to suffer from low educational attainment (i.e. early dropout) and poor proficiency in mathematics, reading and science. Education systems where most 15-year-olds are enrolled at school and have learned the basic skills needed to fully participate in society are considered as sufficiently inclusive.

In this report, the share of low-performing students in each country/economy is adjusted by the rate of school enrolment among 15-year-olds to produce estimates of acquisition of basic skills among all 15-year-olds, not only those who are in school. The acquisition of basic skills and the coverage of educational systems define the level of educational *inclusiveness* in a country and economy.

Percentage of 15-year-olds enrolled in school (coverage of education systems)

For children to benefit from education they must, at the very least, of course, have access to schooling. While enrolling all 15-year-olds in school does not guarantee that every student will develop the skills needed to thrive in an increasingly knowledge-intensive economy, it is a necessary step towards building a fairer and more inclusive education system.

Access is mainly reflected in school enrolment rates and dropout rates are an important metric. Students who have already left formal schooling by the age of 15 tend to perform less well on cognitive tests than those who remain at school (Spaull and Taylor, 2015[39]; Taylor and Spaull, 2015[40]; Hanushek and Woessmann, 2008[41]). Systems that have a smaller share of school-age children dropping out early or significantly delayed in their progression through school are considered more inclusive.

While PISA is not designed to estimate enrolment rates, it provides a range of indices that measure the coverage of the population of 15-year-olds enrolled in Grade 7 or above in each country and economy. Specifically, Coverage Index 3 in PISA captures the proportion of the national population of 15-year-olds (enrolled and not enrolled in school) represented by the PISA sample. Low values of Coverage Index 3 may be attributed to 15-year-olds who are no longer enrolled in school or who were held back in primary school. Coverage Index 3 may also be lower due to student exclusions from the PISA test and dropouts during the school year.

The proportion of 15-year-olds in each country/economy covered by the PISA sample (Coverage Index 3) ranges from 36% in Cambodia and 48% in Guatemala to 90% or more in 34 countries and economies (Table I.B1.4.1). While the PISA results are representative of the target population in all adjudicated countries/economies, they cannot be readily generalised to the entire population of 15-year-olds in countries where many young people of that age are not enrolled in lower or upper secondary school.

Basic proficiency in mathematics, reading and science

Up to this point in the report, low performance has been considered by examining each subject separately (see Chapter 3 and sections earlier in this chapter). However, students who perform poorly in one subject can and often

do perform poorly in other subjects as well. Understanding the true extent of low performance requires looking at the overlap of low performance across subjects.

Furthermore, performance results presented up to this point are based on 15-year-old students covered by the PISA target population in 2022. However, in most countries/economies in PISA there is a certain number of 15-year-olds that were not covered by the PISA sample (see data on Coverage Index 3 in previous section). It is not possible to know for certain how 15-year-olds who are not represented by the PISA sample would have scored had they sat the assessment. To estimate the possible impact of the 15-year-olds not covered by the PISA sample on skills distribution, it is necessary to estimate who they are, and how they would have scored had they sat the PISA test. Household surveys often show that children from poor households, ethnic minorities or rural areas face a greater risk of not attending or completing lower secondary education (UNESCO, 2015[42]). Research has also suggested that out-of-school 15-year-olds, and students who are retained below grade 7, would have scored in the bottom part of a country's performance distribution (Spaull, 2018[43]; Spaull and Taylor, 2015[39]; Taylor and Spaull, 2015[40]). Rather than attributing an exact score to these 15-year-olds, it is possible to estimate lower and upper bounds for most results of interest, including the mean score, the median score and other percentiles, or the proportion of 15-year-olds reaching minimum levels of proficiency (Avvisati, 2017[44]; OECD, 2019[45]). Under a best-case scenario (the distribution of reading, mathematics and science skills in the population not covered by the sample is the same as that of the covered population), the estimates of mean scores and percentiles derived from PISA samples represent an upper bound on the means, percentiles and proportions of students reaching minimum proficiency amongst the entire population of 15-year-olds. A lower bound can be estimated by assuming a plausible worst-case scenario, such as that all 15-year-olds not covered by the sample would score below a certain point in the distribution. For example, if all of those 15-year-olds had scored below Level 2, then the lower bound on the proportion of 15-year-olds reaching minimum levels of proficiency would simply be this proportion in the PISA target population multiplied by Coverage Index 3.

Figure I.4.19 presents the proportion of 15-year-olds reaching minimum levels of proficiency reflecting the assumption that all 15-year-olds not covered by the PISA sample would score below Level 2 in each subject. In the figure, 15-year-olds are grouped according to whether they scored below the baseline level of proficiency in one subject only, in two subjects, or in all three of the core subjects PISA assesses (i.e. mathematics, reading and science) in addition to students not covered in the PISA sample, who are assumed to be low performers in the three subjects. The figure shows that all countries and economies that participated in PISA 2022, even those with the highest performance and equity levels, have a sizeable share of low performers.

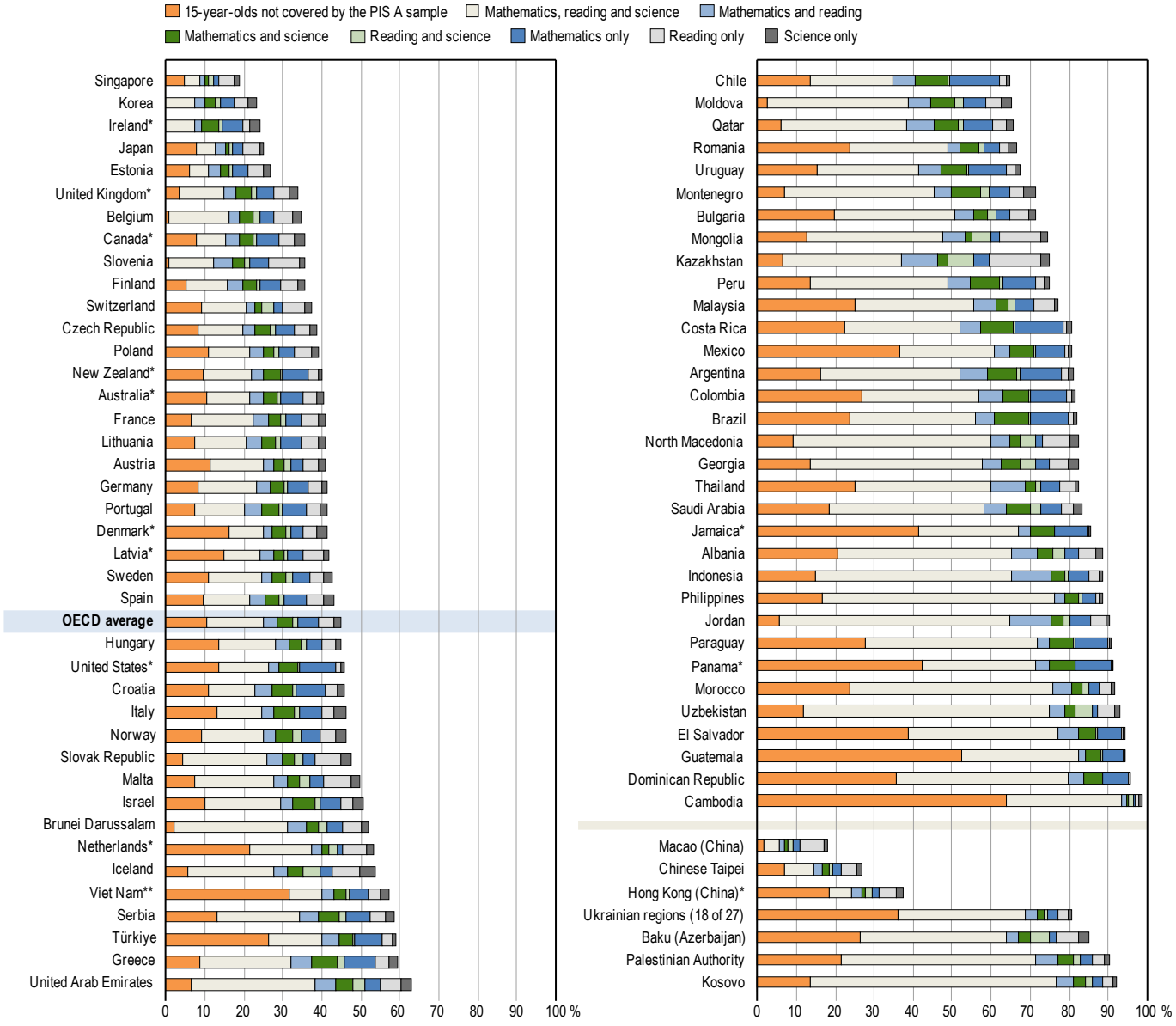
The largest category of low-performing students is the group of 15-year-olds who scored below the baseline level of proficiency in all three subjects: one in four students (25%) are low performers in mathematics, reading and science on average across OECD countries (i.e. this percentage includes 15-year-olds who are not covered by PISA, which on average across OECD countries is 11%, plus students who took the PISA test). In 18 countries and economies, more than 60% of 15-year-olds are low performers in all three subjects.

Some 5% of students across OECD countries are low performers in mathematics only; 4% are low performers in reading only; 4% are low performers in mathematics and science but not in reading; 4% are low performers in mathematics and reading but not in science; 2% of students are low performers in science only; and 1% are low performers in reading and science but not in mathematics.

The sum of all the categories of low performers included in Figure I.4.19 is the share of 15-year-olds who are low performers in at least one subject (whether it be mathematics, reading or science) and those outside the PISA target population. On average across OECD countries, 45% of 15-year-olds are low performers in at least one subject but the shares vary significantly across countries. In 38 countries and economies, more than 60% scored below baseline proficiency Level 2 in at least one subject. By contrast, in five countries/economies fewer than 25% of 15-year-olds were low performers in at least one subject.

Figure I.4.19. Overlap of low performers in mathematics, reading and science among all 15-year olds

Percentage of students who score below proficiency Level 2



** Caution is required when comparing estimates based on PISA 2022 with other countries/economies as a strong linkage to the international PISA reading scale could not be established (see Reader's Guide and Annex A4).

Note: 15-year-olds not covered by the PISA sample are 15-year-olds who are not enrolled in school; or who are in school but in grade 6 or below, or who were excluded from the PISA sample due to student or school-level exclusions.

Countries and economies are ranked in ascending order of the total percentage of students who are low performers in at least one subject.

Source: OECD, PISA 2022 Database, Tables I.B1.4.1 and I.B1.4.45.

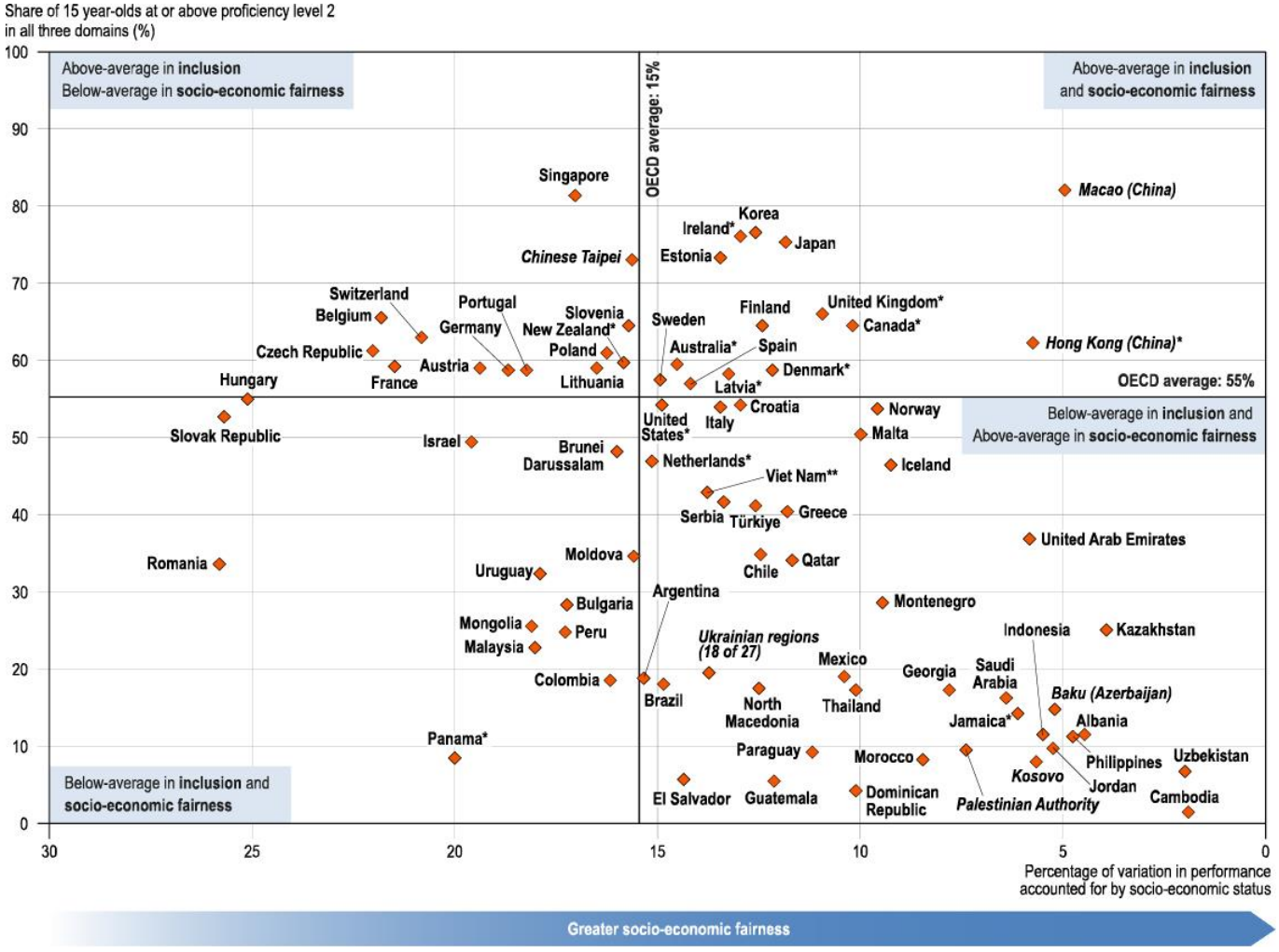
From fairness and inclusion to equity in education

PISA 2022 defined equity in education in terms of two components: fairness and inclusion. Only education systems that combine high levels of fairness and inclusion are considered highly equitable. Figure I.4.20 shows countries and economies according to their levels of inclusion and fairness. The level of inclusion is measured by the percentage

of low performers in at least one subject among all 15-year-olds. The level of fairness is measured by the percentage of variance in mathematics performance accounted for by student socio-economic status.

In 10 out of the 27 countries/economies that had a level of inclusion above the OECD average (i.e. 55% of students who scored at or above proficiency Level 2 in mathematics, reading and science), the level of fairness by socio-economic status was significantly above the OECD average (i.e. 15% of variance in mathematics performance accounted for by student socio-economic status). Education systems in Canada*, Denmark*, Finland, Hong Kong (China)*, Ireland*, Japan, Korea, Latvia*, Macao (China) and the United Kingdom* achieved high inclusion and high fairness; thus, they can be considered highly equitable. In addition, the average score in mathematics, reading and science was higher than the OECD average in all these countries (except for Latvia* where the mean score in reading was not statistically significantly different from the OECD average).

Figure I.4.20. Strength of the socio-economic gradient and share of 15 year-olds at or above proficiency level 2 in mathematics, reading and science



Notes: Only countries and economies with available data are shown.
The socio-economic status is measured by the PISA index of economic, social and cultural status.
Source: OECD, PISA 2022 Database, Tables I.B1.4.3 and I.B1.4.45.

Table I.4.3. Equity in education in PISA 2022 figures and tables

Figure I.4.1	Student socio-economic status
Figure I.4.2	Strength of socio-economic gradient and mathematics performance
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Figure I.4.20	Strength of the socio-economic gradient and share of 15-year-olds at or above proficiency level 2 in mathematics, reading and science

StatLink https://stat.link/4q3apj

Notes

[1] When interpreting results in this chapter, keep in mind that the coverage of the population of 15-year-olds enrolled in school varies significantly across countries/economies (PISA's Coverage Index 3 [CI3] measures the proportion of the national population of 15-year-olds represented in the PISA sample). For analysis on equity, low coverage is an issue because research suggests that socio-economically disadvantaged and low-performing students are less likely to be enrolled in school by age 15 (UNESCO, 2015[42]; Spaull, 2018[43]; Taylor and Spaull, 2015[40]). This means that in countries/economies with lower coverage, the most disadvantaged 15-year-olds might not be represented in the PISA sample. This, in turn, might introduce a bias in the estimation of the students' socio-economic status and in the analysis of the relationship between socio-economic status and student performance.

[2] Across countries and economies that took part in PISA 2022, per-capita GDP and average student socio-economic status (as measured by mean value in the ESCS index) are strongly correlated (correlation coefficient = 0.74). Across OECD countries, the correlation is also strong (correlation coefficient = 0.69).

[3] The number of countries and economies that took part in PISA 2022 is 81. However, data for the PISA ESCS index is not available for Costa Rica. Therefore, only 80 countries and economies are included in this correlation, and any other analysis involving ESCS index data.

[4] In this section, performance in mathematics by socio-economic status is examined. Results on performance in reading and science are available in Tables included in Annex B1 (see Tables I.B1.4.4 and I.B1.4.5).

[5] Across all countries and economies in PISA 2022 with available data, the correlation coefficient between mean score in mathematics and the level of (un)fairness of the education system (i.e. as measured by the strength of the socio-economic gradient) is 0.36. Across OECD countries, an equivalent correlation coefficient is 0.07.

[6] The relationship between food insecurity and mean score in mathematics is not driven by countries/economies where food insecurity is extremely high. After taking out of the analysis the four countries/economies where the percentage of "students that did not eat at least once a week in the past 30 days because there was not enough money to buy food" was higher than 35% (Baku [Azerbaijan], Cambodia, Jamaica* and the Philippines), the strength of the relationship between food insecurity and mean score in mathematics across the remaining 63 countries and economies does not change much (correlation coefficient=-0.63) compared to when all 67 countries with available data are included in the analysis (correlation coefficient=-0.61).

[7] In this section, performance in mathematics and reading by gender are examined. Results on performance in science by gender are available in Annex B1, in Tables I.B1.4.19 and I.B1.4.33.

[8] The average age at time of testing among 4th grade students who participated in TIMSS 2015 was typically around 10 years old (students born in 2005). PISA 2022 assessed students who were aged between 15 years and 3 months and 16 years and 2 months at the beginning of the assessment period (students born in students born in 2006). Thus, students in TIMSS 2015 and PISA 2022 are of a similar but not identical cohort.

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5 Changes in performance and equity in education between 2018 and 2022

This chapter discusses short-term changes in student mean performance and the performance of high- and low-achieving students between 2018 and 2022. The chapter also analyses how these changes relate to students' gender and socio-economic advantage.

For Australia, Canada, Denmark, Hong Kong (China), Ireland, Jamaica, Latvia, the Netherlands, New Zealand, Panama, the United Kingdom and the United States, caution is required when interpreting estimates as one or more PISA sampling standards were not met (see Reader's Guide, Annexes A2 and A4).

This chapter examines changes in performance between the previous PISA assessment, which took place in 2018, and the latest 2022 assessment. The next chapter discusses long-term trends in student performance stretching over a decade or more.

What the data tell us

- Between 2018 and 2022, and on average across 35 OECD countries, mean performance dropped by almost 15 score points in mathematics and 10 score points in reading but did not change significantly in science. In mathematics and reading, most countries and economies that can compare PISA 2022 results to PISA 2018 dropped in mean performance (41 countries/economies in mathematics, 35 in reading). In contrast, science performance remained broadly stable in many countries/economies (33 out of 71) between 2018 and 2022, and even improved in 18.
- Only four countries and economies improved their performance between PISA 2018 and 2022 in all three subjects: Brunei Darussalam, Cambodia, the Dominican Republic and Chinese Taipei. Performance improved in reading and science but not in mathematics in Japan, Panama* and Qatar. Performance improved in mathematics but declined in reading and remained stable in science in Saudi Arabia.
- The gap between the highest-scoring students (10% with the highest scores) and the weakest students (10% with the lowest scores) increased only modestly in reading and mathematics on average across OECD countries: performance dropped in these subjects to a similar extent for both high- and low-achievers. In contrast, in science the average gap widened by about 10 score points between 2018 and 2022 on average across OECD countries: declines in science performance were only observed among lower-achieving students. The range of performance observed among 15-year-olds widened significantly in all three subjects in Finland and the Netherlands*; it narrowed significantly in the Republic of Moldova, the Republic of North Macedonia, Qatar and Saudi Arabia.
- The socio-economic gap in mathematics performance did not change between 2018 and 2022 in 51 out of the 68 countries/economies with available PISA data; it widened on average across OECD countries and in 12 countries/economies; and it narrowed in five countries/economies (Argentina, Chile, the Philippines, Saudi Arabia and the United Arab Emirates).
- The gender gap in mathematics performance did not change between 2018 and 2022 in most countries/economies (57 out of the 72 with comparable data). The gender gap in mathematics performance widened on average across OECD countries (by four score points in favour of boys) and in 11 countries/economies, and narrowed in four (Albania, Baku [Azerbaijan], Colombia and Montenegro).

When interpreting these comparisons, it is important to remember that the most recent years have been marked by the COVID-19 pandemic as well as other changes in education and society. First, children born around 2002 and 2006 who took the PISA test in 2018 and 2022 likely had different educational and life experiences from previous cohorts, but not all differences are due to the pandemic. Differences in the educational experiences of 15-year-olds across countries and over recent years are discussed in Volume II. Second, social and demographic trends such as international migration and widening participation in secondary education may have altered the student population that sat the most recent PISA assessments. Such changes are described and analysed in later chapters of this volume. Chapter 6 compares not only children born around 2006 to those born four years before them but explores how education performance and equity have changed over the past decade and more. The final chapter focuses on students with an immigrant background.

Three benchmarks for interpreting performance changes over time

What represents a small or large change in PISA test scores? Test scores, unlike physical units such as metres or grams, do not have meaning that readers can relate to in their own life experience. Describing a difference in test scores in terms that are familiar to most readers is not easy.

In this report, we propose three benchmarks for interpreting test-score differences.

A first benchmark, which defines a "large" change, is 20 score points. This is approximately equivalent to the typical annual learning gain by students around the age of 15 (Box I.5.1). Put differently, 20 points represents the *average* pace of learning of 15-year-olds in countries that participate in PISA.

A second benchmark, which distinguishes between "small" differences and differences that are "medium" or "large", is 10 score points. Changes of up to 10 points have been routinely observed in PISA over periods of three years, the typical interval between two consecutive assessments (Box I.5.2).

The third benchmark considers the statistical uncertainty intrinsic to PISA indicators. This uncertainty produces variation in mean scores over time, even in the absence of any real change in how students perform on the test (see Box I.5.3). Differences likely to be observed in the data even in a perfectly controlled setting due to this intrinsic uncertainty are described as "non-significant" differences. Countries/economies whose results do not differ significantly between two consecutive assessments are classified as having "stable" results.

These three benchmarks help interpret score differences. However, significant differences in PISA scores, whether small, medium, or even, large, do not automatically mean that such differences reflect real differences in what PISA intends to measure – namely, what students know and can do. For example, PISA results may also reflect differences in student motivation and effort on testing day or more generally, the conditions that surrounded the administration of the test, which can affect how students engage with the test. Appendix A8 reports on a number of analyses to monitor student engagement in PISA 2022 and how it compares to PISA 2018. Throughout this chapter, these analyses are mentioned whenever they provide meaningful context for interpreting comparisons between 2018 and 2022 results.

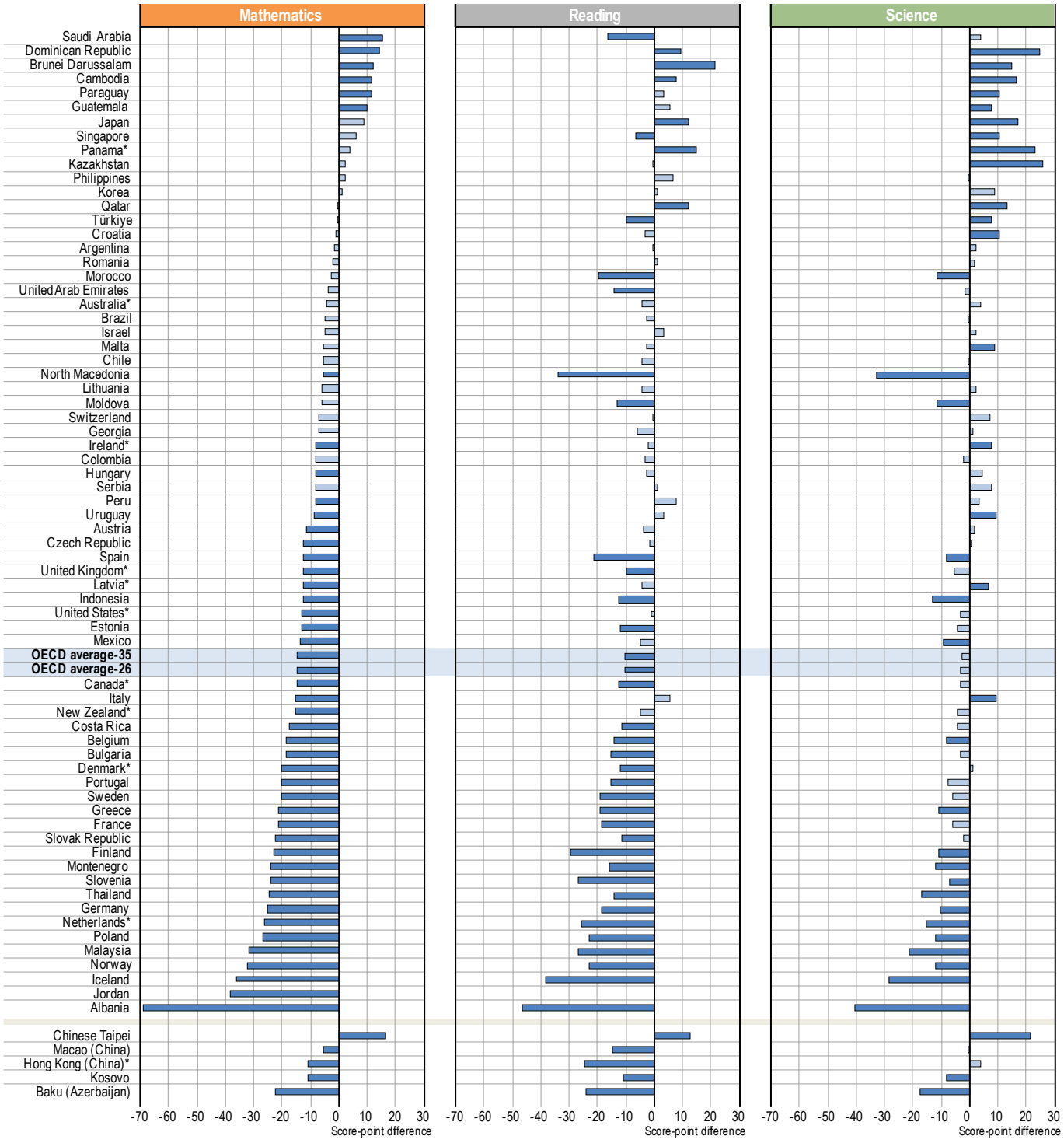
Changes in performance between 2018 and 2022

Changes in mean performance between 2018 and 2022

Figure I.5.1 shows the changes in mean performance between 2018 and 2022 in mathematics, reading and science. On average across 35 OECD countries, mean performance dropped by almost 15 score points in mathematics and about 10 score points in reading. However, it did not change significantly in science. Given that change in the OECD average over consecutive PISA assessments up to 2018 had never exceeded four score points in mathematics and five score points in reading, these 2022 results are unprecedented. They point to a shock that pushed down performance in many countries over the 2018-2022 period.

In mathematics and reading, about half of countries/economies that can compare PISA 2022 and 2018 (or 2017) results showed a drop in mean performance (41 out of 72 in mathematics; 35 out of 71 in reading). A drop in performance was also observed in Spain (where the most recent comparison is to 2015 results). In contrast, science performance remained broadly stable in many countries and economies (33 out of 71) between 2018 and 2022.

Figure I.5.1. Change between 2018 and 2022 in mean mathematics, reading and science performance



Notes: Only countries and economies that participated and have available data in both 2018 and 2022 PISA assessments are shown.
For Spain, the change between 2015 and 2022 is reported in the figure. For Cambodia, Guatemala and Paraguay, the change between 2017 and 2022 is reported in the figure.
Trend comparisons for Jordan are not reported in reading and science (see Annex A4).
Statistically significant differences are shown in a darker tone (see Annex A3).
OECD average-35 refers to the average across OECD countries, excluding Costa Rica, Luxembourg and Spain. OECD average-26 refers to the average across OECD countries, excluding Luxembourg, Spain and any countries where the violation of exclusion- and/or response-rate standards may have introduced bias in the sample in either 2018 or 2022.
Countries and economies are ranked in descending order of the change in mathematics performance between 2018 and 2022.
Source: OECD, PISA 2022 Database, Tables I.B1.5.4, I.B1.5.5 and I.B1.5.6.

In many cases, the drop exceeded 20 score points, i.e. the yearly gain in test scores that is typically observed among students around the age of 15. This means that 15-year-olds in these countries in 2022 scored at or below the level expected of 14-year-olds in 2018.

- In mathematics, the decline in performance was most pronounced in Albania, Jordan, Iceland, Norway and Malaysia (in descending order), where it exceeded 30 score points. Drops of more than 20 score points in mean mathematics scores were also observed in Baku (Azerbaijan), Denmark*, Finland, France, Germany, Greece, Montenegro, the Netherlands*, Poland, Portugal, the Slovak Republic, Slovenia, Sweden and Thailand.
- In reading, the decline in performance exceeded 30 score points in Albania, Iceland and North Macedonia (in descending order). Drops between 20 and 30 score points were observed in Baku (Azerbaijan), Finland, Hong Kong (China)*, Malaysia, Morocco, the Netherlands*, Norway, Poland and Slovenia, as well as (between 2015 and 2022) in Spain.
- In science, the decline in performance exceeded 20 score points in Albania, Iceland, Malaysia and North Macedonia.

Many more countries/economies that are not listed in previous paragraphs experienced performance declines between 2018 and 2022. In contrast, four countries and economies improved their performance in all three subjects: Brunei Darussalam, Cambodia, the Dominican Republic and Chinese Taipei. Performance improved in reading and science but not mathematics in Japan, Panama* and Qatar. Performance improved in mathematics but declined in reading and remained stable in science in Saudi Arabia (Table I.5.1).

Box I.5.1. How much do 15-year-olds learn over one year of schooling?

Two recent publications (Avvisati and Givord, 2023[1]; Avvisati and Givord, 2021[2]) estimate the average yearly learning gain of students based on data sets from 2018 and earlier PISA assessments of more than 30 countries and economies. These studies show that around the age of 15, students' test scores in mathematics, reading and science increase by about one-fifth of a standard deviation over a year of schooling (and age) on average across countries, a gain equivalent to about 20 score points in PISA (Avvisati, 2021[3]). They also show that yearly learning gains can vary significantly across countries: in mathematics, for example, the estimates reported in Avvisati and Givord (2023[1]) imply that the test scores of students in Austria, Scotland* and Singapore increase about twice as fast as those of students in Brazil and Malaysia, which increase by about 12 points over a 12-month period.

In this report, a single, round number (20 score points) is used as a common benchmark for all countries, reflecting approximately the *average* pace of learning of 15-year-olds in countries that participate in PISA. Readers should avoid using this to convert any difference in terms of years-of-schooling equivalents (or months-of-schooling equivalents): first, because there are significant differences in the pace of learning at a given age across countries. This reflects differences in how schooling is organised, the resources invested in education, and the quality of education itself. And second, because there is no reason to expect the pace of learning to remain constant over time: the average pace of learning measured at age 15 may give only a limited indication of the test-score gains that can be expected in a particular country over two or three years.

Table I.5.1. Change between 2018 and 2022 in mean performance in mathematics, reading and science

		Mean performance improved in **mathematics**	Non-significant change in **mathematics**	Mean performance declined in **mathematics**
Mean performance improved in **reading**	Mean performance improved in **science**	Brunei Darussalam, Cambodia, the Dominican Republic, Chinese Taipei	Japan, Panama*, Qatar	Jordan
	Non-significant change in **science**			
	Mean performance declined in **science**			
Non-significant change in **reading**	Mean performance improved in **science**	Guatemala, Paraguay	Croatia, Kazakhstan, Malta	Ireland*, Italy , Latvia*, Uruguay
	Non-significant change in **science**		Argentina, Australia*, Brazil, Chile, Colombia, Georgia, Israel, Korea, Lithuania, the Philippines, Romania, Serbia, Switzerland	Austria, the Czech Republic, Hungary, New Zealand*, Peru, the United States*
	Mean performance declined in **science**			Mexico
Mean performance declined in **reading**	Mean performance improved in **science**		Singapore, Türkiye	
	Non-significant change in **science**	Saudi Arabia	The United Arab Emirates	**OECD average-26** , **OECD average-35** , Bulgaria, Canada*, Costa Rica, Denmark*, Estonia, France, Hong Kong (China)*, Macao (China), Portugal, the Slovak Republic, Sweden, the United Kingdom*
	Mean performance declined in **science**		Moldova, Morocco	Albania, Baku (Azerbaijan), Belgium, Finland, Germany , Greece, Iceland, Indonesia, Kosovo, Malaysia, Montenegro, the Netherlands*, North Macedonia, Norway , Poland, Slovenia, Spain, Thailand

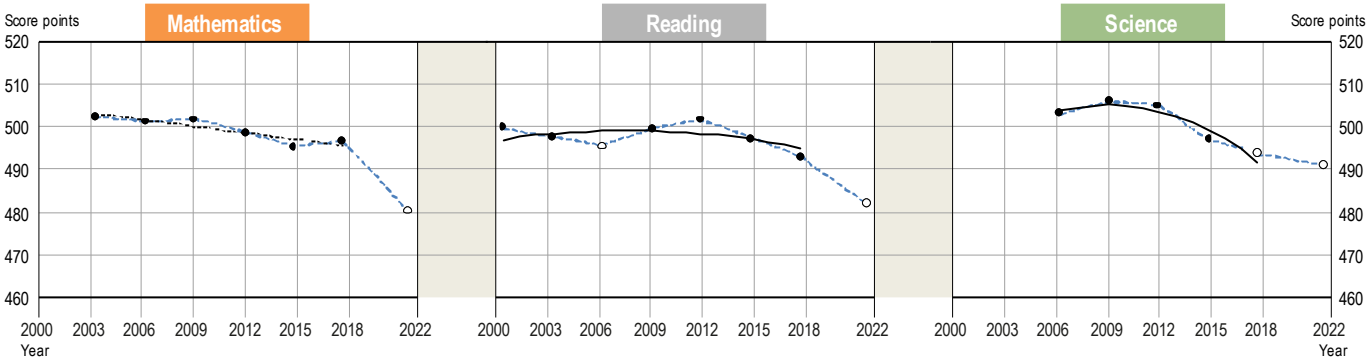
Notes: Only countries and economies that can compare PISA 2018 and 2022 results in all three subjects are shown.
For Spain, the comparison is between 2015 and 2022. For Cambodia, Guatemala and Paraguay, the comparison is between 2017 and 2022.
OECD average-35 refers to the average across OECD countries, excluding Costa Rica, Luxembourg and Spain. OECD average-26 refers to the average across OECD countries, excluding Luxembourg, Spain and any countries where the violation of exclusion- and/or response-rate standards may have introduced bias in the sample in either 2018 or 2022.
Cells with the darkest background indicate positive (blue) or negative (grey) changes in all three subjects; cells with lighter background indicate one or two significant changes, all in the same direction (see Annex A3).
Source : OECD, PISA 2022 Database, Tables I.B1.5.4, I.B1.5.5 and I.B1.5.6.

Changes between 2018 and 2022 in the context of previous trends in mean performance

For some countries and economies, the changes in PISA performance observed between 2018 and 2022 deviate significantly from the trend observed over earlier assessments; for others, they confirm or reinforce a trend which already began before 2018. Figure I.5.2 shows the average trend up to 2018 across 23 OECD countries that can compare performance across all PISA assessments together with the mean performance observed in 2022 in these same countries.

Figure I.5.2. Trends in mathematics, reading and science performance up to 2018

OECD average-23



Note: White dots indicate mean-performance estimates that are not statistically significantly above/below PISA 2022 estimates. Black lines indicate the best-fitting trend lines; a dotted black line indicates a non-significant (flat) trend (see Annex A3).
Source: OECD, PISA 2022 Database, Tables I.B1.5.4, I.B1.5.5 and I.B1.5.6

Figure I.5.3 provides similar information for all participants in PISA 2022, PISA 2018, and at least one assessment prior to 2018. The pre-2018 trends reported in Figure I.5.3 correspond to the average change observed between the earliest available measurement in PISA and PISA 2018, calculated using a linear regression: they represent the slope of the trend line. The average change is reported over a four-year period to facilitate comparisons with the change observed between 2018 and 2022. Countries and economies at the top of each chart improved in mean performance in the corresponding subject between their first participation in PISA and 2018; countries at the bottom of each chart experienced a declining trend in mean performance up to 2018.

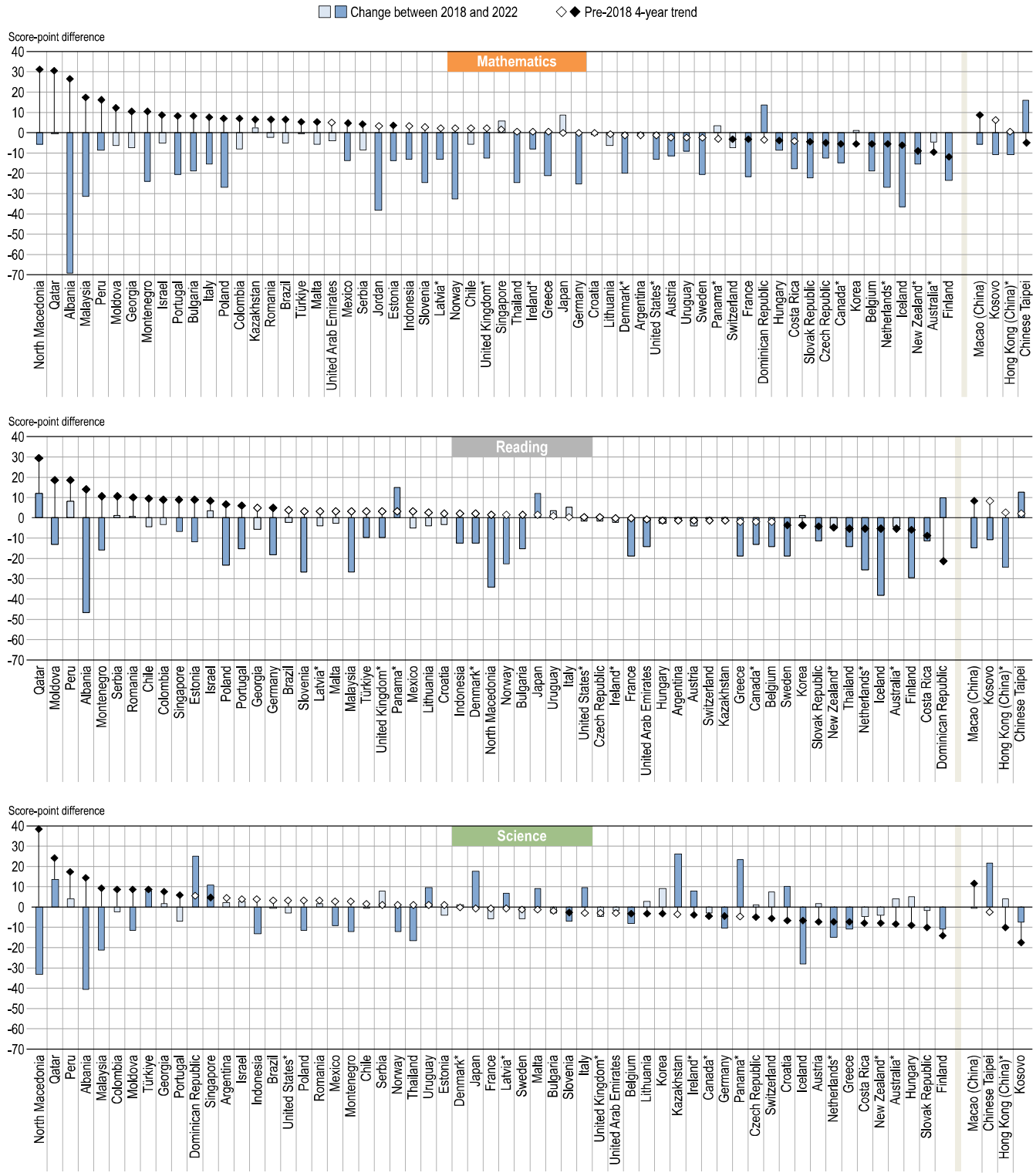
Among countries and economies where the pre-2018 trend was positive, several experienced a full or partial reversal of these gains in 2022:

- In mathematics, such a reversal was observed in Albania, Bulgaria, Estonia, Italy, Macao (China), Malaysia, Mexico, Montenegro, North Macedonia, Peru, Poland and Portugal;
- In reading, in Albania, Estonia, Germany, Macao (China), Moldova, Montenegro, Poland, Portugal and Singapore;
- In science, in Albania, Malaysia, Moldova and North Macedonia.

Many other countries/economies which improved performance over earlier cycles, however, were able to maintain their 2018 performance level despite the shock of the COVID-19 epidemic:

- In mathematics, mean scores in 2022 remained close to their 2018 level in Argentina, Australia*, Brazil, Chile, Colombia, Croatia, Georgia, Israel, Japan, Kazakhstan, Korea, Lithuania, Malta, Moldova Panama*, Qatar, Romania, Serbia, Singapore, Switzerland, Türkiye and the United Arab Emirates;
- In reading, Argentina, Australia*, Austria, Brazil, Chile, Colombia, Croatia, the Czech Republic, Georgia, Hungary, Ireland*, Israel, Italy, Kazakhstan, Korea, Latvia*, Lithuania, Malta, Mexico, New Zealand*, Peru, Romania, Serbia, Switzerland, the United States* and Uruguay;
- In science, in Argentina, Australia*, Austria, Brazil, Bulgaria, Canada*, Chile, Colombia, Costa Rica, the Czech Republic, Denmark*, Estonia, France, Georgia, Hong Kong (China)*, Hungary, Israel, Korea, Lithuania, Macao (China), New Zealand*, Peru, Portugal, Romania, Serbia, the Slovak Republic, Sweden, Switzerland, the United Arab Emirates, the United Kingdom*and the United States*.
- In reading and/or science, three countries even improved their results in 2022, extending their positive pre-2018 trend. This is the case of Qatar (in both subjects) and in Singapore and Türkiye (in science only).

Figure I.5.3. Changes in performance between 2018 and 2022 in the context of pre-2018 performance trends



Notes: Only countries and economies that can compare PISA 2018 results with both 2022 and prior results are shown. Trend comparisons for Jordan are not reported in reading and science (see Annex A4). Statistically significant differences are shown in a darker tone (see Annex A3).
Countries and economies are ranked, within each chart, in descending order of the pre-2018 trend for the corresponding subject.
Source: OECD (2019), PISA 2018 Results (Volume I): What Students Know and Can Do, Tables I.B1.10, I.B1.11 and I.B1.12 and OECD, PISA 2022 Database, Tables I.B1.5.4, I.B1.5.5 and I.B1.5.6

Among countries where the pre-2018 trend was neither improving nor declining (in the long term and on average), results turned to the negative in most cases. This pattern, which corresponds to what was observed on average across OECD countries in mathematics (see Figure I.5.2), also held in:

- mathematics in Austria, Costa Rica, Denmark*, Germany, Greece, Hong Kong (China)*, Indonesia, Ireland*, Jordan, Kosovo[1], Latvia*, Norway, Slovenia, Sweden, Thailand, the United Kingdom*, the United States* and Uruguay;
- reading in Belgium, Bulgaria, Canada*, Denmark*, France, Greece, Hong Kong (China)*, Indonesia, Kosovo, Malaysia, North Macedonia, Norway, Slovenia, Türkiye, the United Arab Emirates and the United Kingdom*;
- science in Indonesia, Mexico, Montenegro, Norway, Poland and Thailand.

Other countries and economies were experiencing a decline in mean performance already prior to 2018. These negative trends were often confirmed and reinforced over the most recent period in:

- mathematics in Belgium, Canada*, the Czech Republic, Finland, France, Hungary, Iceland, the Netherlands*, New Zealand* and the Slovak Republic
- reading in Costa Rica, Finland, Iceland, the Netherlands*, the Slovak Republic, Sweden and Thailand;
- science in Belgium, Finland, Germany, Greece, Iceland, Kosovo, the Netherlands*, and Slovenia.

A small number of previously declining countries and economies, however, experienced positive changes in 2022, and bounced back: this rebound was observed in mathematics in Chinese Taipei, reading in the Dominican Republic, and science in Croatia and Ireland*.

Box I.5.2. How large are typical test-score changes in PISA between two consecutive assessments?

To get a sense of how unique the changes observed between 2018 and 2022 are, it is useful to compare them to typical changes that were reported in previous years over similarly short periods of time (three years). Of the 81 countries and economies that participated in PISA 2022, data allow 73 to compare their mathematics results to PISA 2018 (or to the results of PISA for Development in 2017); and of these, 60 can compare their PISA 2015 and PISA 2018 results (Tables I.B1.5.4, I.B1.5.5, I.B1.5.6). In mathematics, only about half of these 60 countries/economies had a difference in mean scores larger than (plus or minus) five score points (this corresponds to the median absolute difference). Fewer than one out of four countries reported positive or negative changes in mean scores in mathematics that were larger than nine score points.

When considering the full set of results for countries that participated in PISA 2022 and all three subjects, more than 200 score-point differences across two consecutive PISA assessments can be computed (257 in mathematics, 281 in reading, and 218 in science) over the 2000-2018 period:

- In mathematics, the median difference observed across consecutive assessments is 6.2 score points and only one out of four showed a difference larger than 11.1 score points.
- In reading, the median difference observed is 7.4 score points and only one out of four showed a difference larger than 14.4 score points.
- In science, the median difference observed is 6.4 score points and only one out of four showed a difference larger than 10.9 score points.

In other words, for individual countries/economies, increases or decreases of up to 10 score points have been relatively common in PISA and certainly not unprecedented – even over short time intervals.

[1] This designation is without prejudice to positions on status, and is in line with United Nations Security Council Resolution 1244/99 and the Advisory Opinion of the International Court of Justice on Kosovo's declaration of independence.

In larger aggregates such as the OECD average, the typical changes observed in the past are much smaller than for individual countries/economies. Indeed, score differences for individual countries/economies typically result from improvements or deteriorations unique to each country/economy as well as the uncertainty intrinsic in statistical indicators (see Box I.5.3). However, idiosyncratic changes and statistical uncertainty tend to cancel out in larger aggregates such as the OECD average: changes in one direction, for one country, are compensated by opposite changes for other countries. As a result, the change observed in the OECD average over consecutive assessments up to 2018 has never exceeded four score points in mathematics and five score points in reading. Changes in the OECD average that are more pronounced are unprecedented. They point to a shock affecting many countries simultaneously and in the same direction.

Changes in performance distributions between 2018 and 2022

The decline in mean mathematics and reading performance across OECD countries (on average) and in most PISA-participating education systems was not uniform in terms of the distribution of student performance. One way this can be seen is by examining performance trends for low- and high-achieving students. The 10th percentile is the point on the scale below which 10% of students score. In other words, if all students were ranked from lowest- to highest-scoring, the 10th percentile would be the highest-scoring of the lowest-performing 10% of students. Likewise, the 90th percentile is the point on the scale below which 90% of students score (or, conversely, above which only 10% of students score). The median or 50th percentile divides the performance distribution into two equal halves, one above and one below that position on the scale.

In mathematics, mean performance was about 15 score points lower in 2022 compared to 2018 on average across OECD countries. But the performance decline was slightly less pronounced at the 90th percentile (-11 score points): almost all students performed worse but low-achieving students declined by slightly more than high-achieving students did. A similar pattern is observed in reading. As a result, learning gaps between the highest- and lowest-performing students widened. That said, the difference between the 10th and 90th percentiles increased only by about four score points in reading between 2018 and 2022, and even less in mathematics on average across OECD countries.[1]

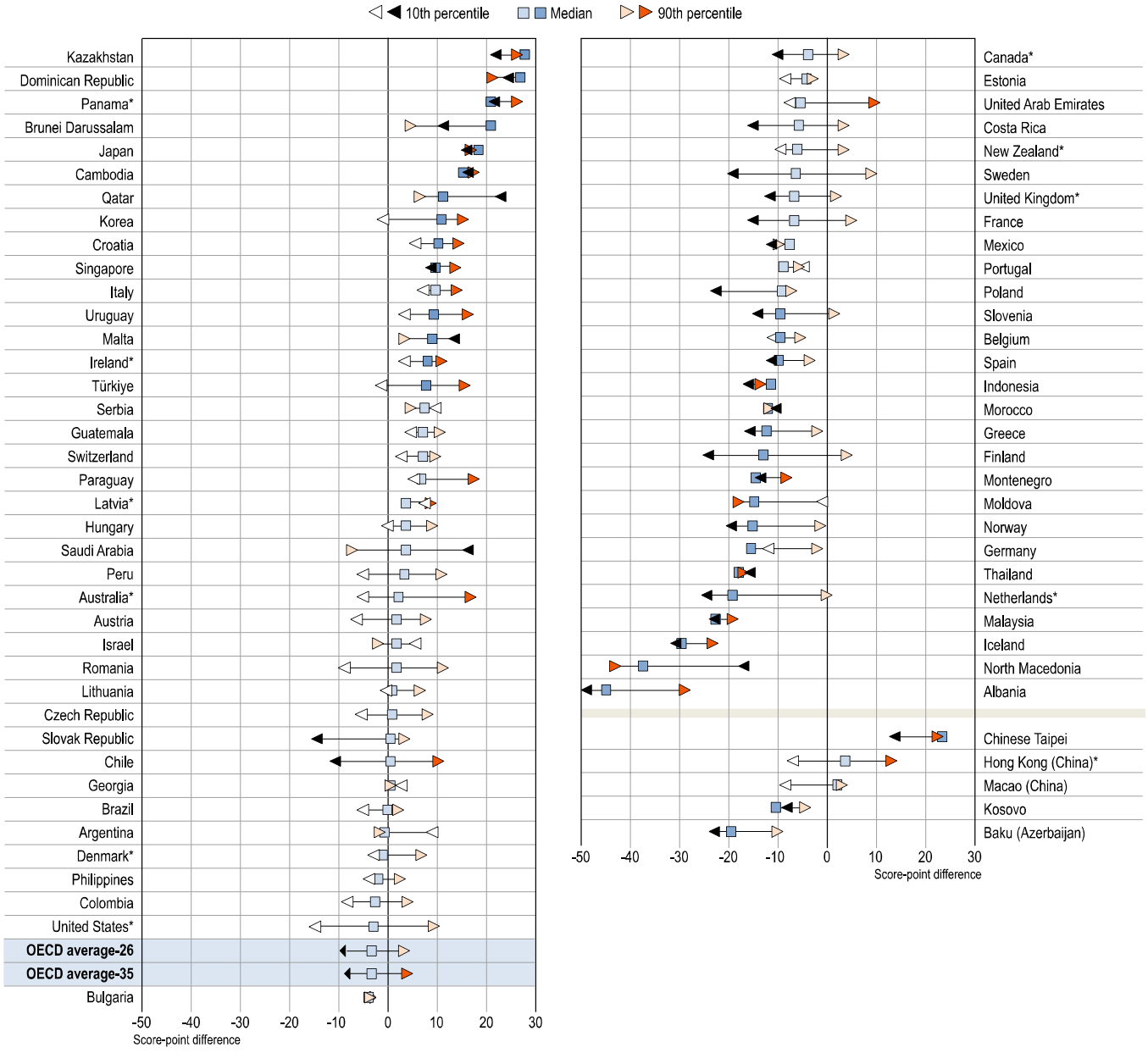
In science, no change was observed in average mean scores across OECD countries. But significant declines were observed among the weakest students (at the 10th and 25th percentile) on average (Table I.B1.5.9). As a result, the gap between the highest- and lowest-performing students widened by more than 10 score points in science (as measured by the inter-decile range, i.e. the difference between the 10th and 90th percentiles) (Figure I.5.4).

The previous paragraphs refer to the average trend across OECD countries; often, the distribution in performance in individual countries and economies evolved differently. For example, in mathematics, the inter-decile range widened significantly in 12 countries and economies (as did the OECD average); narrowed significantly in 26 countries/economies; and did not change significantly in the remaining 35 countries/economies for which comparable data for 2018 (or 2017) and 2022 are available (Table I.5.2). In reading and science, the inter-decile range did not change significantly in most countries/economies (i.e. 55 countries/economies in reading and 44 countries/economies in science).

Table I.5.2 lists countries and economies according to whether their performance distributions in mathematics, reading and science narrowed, widened or did not change significantly (as measured by the inter-decile range). When this can be ascertained with confidence,[2] the table also shows whether the change or lack thereof is primarily due to changes among low-achieving students, high-achieving students or both. For example, in Chile, performance differences widened in science because low-achieving students performed worse while high-achieving students performed better (Table I.B1.5.9 and Table I.B1.5.12).

The performance distribution widened between 2018 and 2022 in all three subjects in Finland and the Netherlands* as well as on average across OECD countries. The performance distribution narrowed in all three subjects in North Macedonia, Moldova, Qatar and Saudi Arabia (Table I.5.2).

Figure I.5.4. Average change in science scores for high- and low-achieving students (2018-2022)



Notes: Only countries and economies that can compare PISA 2018 and 2022 results in science are shown.
For Spain, the change between 2015 and 2022 is reported in the figure (Spain is not included in the reported OECD averages). For Cambodia, Guatemala and Paraguay, the change between 2017 and 2022 is reported in the figure.
Statistically significant differences are shown in a darker tone (see Annex A3).
OECD average-35 refers to the average across OECD countries, excluding Costa Rica, Luxembourg and Spain. OECD average-26 refers to the average across OECD countries, excluding Luxembourg, Spain and any countries where the violation of exclusion- and/or response-rate standards may have introduced bias in the sample in either 2018 or 2022.
Countries and economies are ranked in descending order of the change in median performance in science.
Source: OECD, PISA 2022 Database, Table I.B1.5.9.

Table I.5.2. Change between 2018 and 2022 in the performance distribution in mathematics, reading and science

	Mathematics	Reading	Science
Widening of the distribution	**12 countries/economies**	**9 countries/economies**	**24 countries/economies**
Low-achievers performed worse; high-achievers performed better	Australia*, Macao (China)		**OECD average-35**, Chile, the United Arab Emirates
Low-achievers performed worse, while performance did not change significantly among high-achievers	Hong Kong (China)*	The United Arab Emirates	**OECD average-26**, Canada*, Costa Rica, Finland, France, the Netherlands*, Norway, Poland, the Slovak Republic, Slovenia, Sweden, the United Kingdom*
High-achievers performed better, while performance did not change significantly among low-achievers	Japan, Paraguay, Singapore, Chinese Taipei		Australia*, Hong Kong (China)*, Türkiye
Almost all students performed worse, but low-achievers declined by more than high-achievers did	**OECD average-35**, Estonia, Finland, the Netherlands*, New Zealand, Sweden	**OECD average-26**, **OECD average-35**, Baku (Azerbaijan), Canada*, Finland, the Netherlands*, Norway, Poland, Spain	Albania, Baku (Azerbaijan)
Almost all students performed better, but high-achievers improved by more than low-achievers did			
Overall widening of the dispersion (none of the above patterns)		Kazakhstan	Austria, the Czech Republic, Macao (China), Peru, Romania, the United States*
No change in the dispersion of the distribution	**35 countries/economies**	**55 countries/economies**	**44 countries/economies**
Performance dropped to a similar extent for both high- and low-achievers	**OECD average-26**, Albania, Austria, Baku (Azerbaijan), Belgium, Bulgaria, Canada*, the Czech Republic, Denmark*, France, Germany, Iceland, Ireland*, Italy, Latvia*, Montenegro, Norway, Poland, the Slovak Republic, Slovenia, Spain, the United Kingdom*, the United States*, Uruguay	Albania, Belgium, Bulgaria, Costa Rica, Denmark*, Estonia, France, Germany, Greece, Hong Kong (China)*, Iceland, Indonesia, Kosovo, Macao (China), Malaysia, Montenegro, Morocco, Portugal, Slovenia, Sweden, Thailand, Türkiye, the United Kingdom*	Greece, Iceland, Indonesia, Kosovo, Malaysia, Montenegro, Morocco, Spain, Thailand
Performance improved to a similar extent for both high- and low-achievers	Cambodia	Brunei Darussalam, the Dominican Republic, Japan, Panama*, Chinese Taipei	Brunei Darussalam, Cambodia, Croatia, the Dominican Republic, Ireland*, Japan, Kazakhstan, Korea, Malta, Panama*, Singapore, Chinese Taipei, Uruguay
Performance remained close to prior levels for both high- and low-achievers	Croatia, Georgia, Guatemala, Hungary, Israel, Korea, Lithuania, Malta, Romania, Switzerland, Türkiye	Australia*, Austria, Brazil, Chile, Colombia, Croatia, the Czech Republic, Georgia, Guatemala, Hungary, Ireland*, Israel, Italy, Korea, Latvia*, Lithuania, Malta, Mexico, New Zealand*, Paraguay, Peru, the Philippines, Romania, the Slovak Republic, Switzerland, the United States*, Uruguay	Argentina, Belgium, Brazil, Bulgaria, Colombia, Denmark*, Estonia, Georgia, Germany, Guatemala, Hungary, Israel, Italy, Latvia*, Lithuania, Mexico, New Zealand*, Paraguay, the Philippines, Portugal, Serbia, Switzerland
Narrowing of the distribution	**26 countries/economies**	**8 countries/economies**	**4 countries/economies**
Low-achievers performed better; high-achievers performed worse	Argentina, Brazil, Kosovo, Moldova, Morocco, North Macedonia, Qatar		
High-achievers performed worse, while performance did not change significantly among low-achievers	Chile, Colombia, Indonesia, Peru, Serbia, the United Arab Emirates	Singapore	Moldova
Low-achievers performed better, while performance did not change significantly among high-achievers	Brunei Darussalam, the Dominican Republic, Kazakhstan, Panama*, the Philippines, Saudi Arabia	Argentina, Cambodia	Qatar, Saudi Arabia
Almost all students performed worse, but high-achievers declined by more than low-achievers did	Costa Rica, Greece, Jordan, Malaysia, Mexico, Portugal, Thailand	Moldova, North Macedonia, Saudi Arabia	North Macedonia
Almost all students performed better, but low-achievers improved by more than high-achievers did		Qatar	
Overall narrowing of the dispersion (none of the above patterns)		Serbia	

Notes: Only countries and economies that can compare PISA 2018 and 2022 results are shown.
For Spain, the change between 2015 and 2022 is reported in the figure. For Cambodia, Guatemala and Paraguay, the change between 2017 and 2022 is reported in the figure.
Trend comparisons for Jordan are not reported in reading and science (see Annex A4).
Changes in the dispersion of the distribution – widening, narrowing or no change – are measured by the inter-decile range, i.e. the difference in score points between the 90th percentile and the 10th percentile of the student-performance distribution.
Also see Note 3 at the end of this chapter.
OECD average-35 refers to the average across OECD countries, excluding Costa Rica, Luxembourg and Spain. OECD average-26 refers to the average across OECD countries, excluding Luxembourg, Spain and any countries where the violation of exclusion- and/or response-rate standards may have introduced bias in the sample in either 2018 or 2022.
Source: OECD, PISA 2022 Database, Tables I.B1.5.7, I.B1.5.8, I.B1.5.9, I.B1.5.10, I.B1.5.11 and I.B1.5.12

Box I.5.3. Statistical significance of trend indicators

Statistical sources of uncertainty can be quantified. They refer to aspects of the PISA methodology that may produce variation in the reported results even in the absence of any real change in how students respond to the test. A difference in mean scores (or in other population-level estimates of performance in PISA) is called statistically significant if it is unlikely that such a difference could be observed when, in fact, no true difference exists in the populations from which student samples were drawn.

Statistical uncertainty in trend comparisons has three different sources: the sampling of students and schools; the design of PISA tests (measurement precision); and the use of a common scale to report the results of tests that were scaled independently. When results from multiple assessments are compared, small differences can be observed because a sample of students – rather than the full population of 15-year-old students – took each assessment; because the students sat slightly different tests, each including only a finite number of test items, thus yielding only an approximate measure of performance; and because PISA scores are based on estimates of test item properties (such as their difficulty) which are themselves subject to uncertainty and which, as a result, can vary across calibrations. The latter source of uncertainty – quantified in the *link error* – is unique to trend comparisons.

The link error represents uncertainty around scale values ("is a score of 432 in PISA 2022 the same as 432 in PISA 2018?") and is therefore independent of the size of the student sample. As a result, it is the same for estimates based on individual countries, subpopulations or the OECD average.[4] For comparisons between mathematics results in PISA 2022 and mathematics results in 2018, the link error corresponds to 2.24 score points. The link error tends to be smaller for comparisons of reading scores (1.47 points) and science scores (1.61 points).[5] It tends to be larger for comparisons between 2022 scores and scores from even earlier assessments. Link errors for indicators involving more than two scores (e.g. linear trends) and complex scale transformations such as the percentage of students above/below a threshold of proficiency are discussed in Annex A7.

These three independent sources of uncertainty are combined in the estimates of standard errors for trend indicators. Standard errors are then used to construct "confidence intervals", a range of values that excludes only 5% of the differences that would be observed in the absence of true change.

It should be kept in mind that the difference between significant and non-significant changes is, itself, often non-significant, and that in some situations it may be impossible to say with confidence that there has been a change, even if such a change actually happened: non-significance does not imply no change.

Changes in equity between 2018 and 2022

Up to this point, the chapter has examined trends in student performance; the remainder of the chapter looks at trends in measures of equity in education. As defined in the first chapter of this report, equity in education is examined in PISA 2022 in terms of fairness and inclusion. Fairness is examined in the following sections by looking at socio-economic and gender disparities in student performance. Inclusion is examined in chapter 6 by looking at changes in enrolment rates and achievement of basic proficiency among 15-year-old students.

Overall, PISA data show that the unprecedented decline in mathematics performance in PISA 2022 does not translate into significantly greater disparities in performance in terms of socio-economic status or gender in most countries and economies. Nevertheless, widespread declines in disadvantaged students' performance have meant that a greater proportion of students have failed to achieve baseline levels of proficiency. And at the top end of the spectrum, declines in advantaged students' performance has meant that a smaller proportion of students achieved the highest proficiency levels of 5 and 6 in many countries.

Changes in socio-economic disparities

Changes in socio-economic disparities between 2018 and 2022 are measured in this chapter by the difference in average performance in mathematics between socio-economically advantaged and disadvantaged students (hereafter, this will be referred to as the "socio-economic gap"). A narrower socio-economic gap means there is less disparity in performance between advantaged and disadvantaged students; by contrast, a wider gap indicates greater disparity.

It is important here to emphasise that a smaller socio-economic gap does not necessarily mean a greater fairness in the system that is desirable. A smaller socio-economic gap can result from the performance of disadvantaged students failing to improve and that of advantaged students declining. This was the case of two countries that participated in PISA 2022 (Chile and the United Arab Emirates), as shown below in Table I.5.3. In cases such as these, the benefits of more fairness in terms of socio-economic status should take into account the detriment of advantaged students performing worse.

Changes in the socio-economic gap

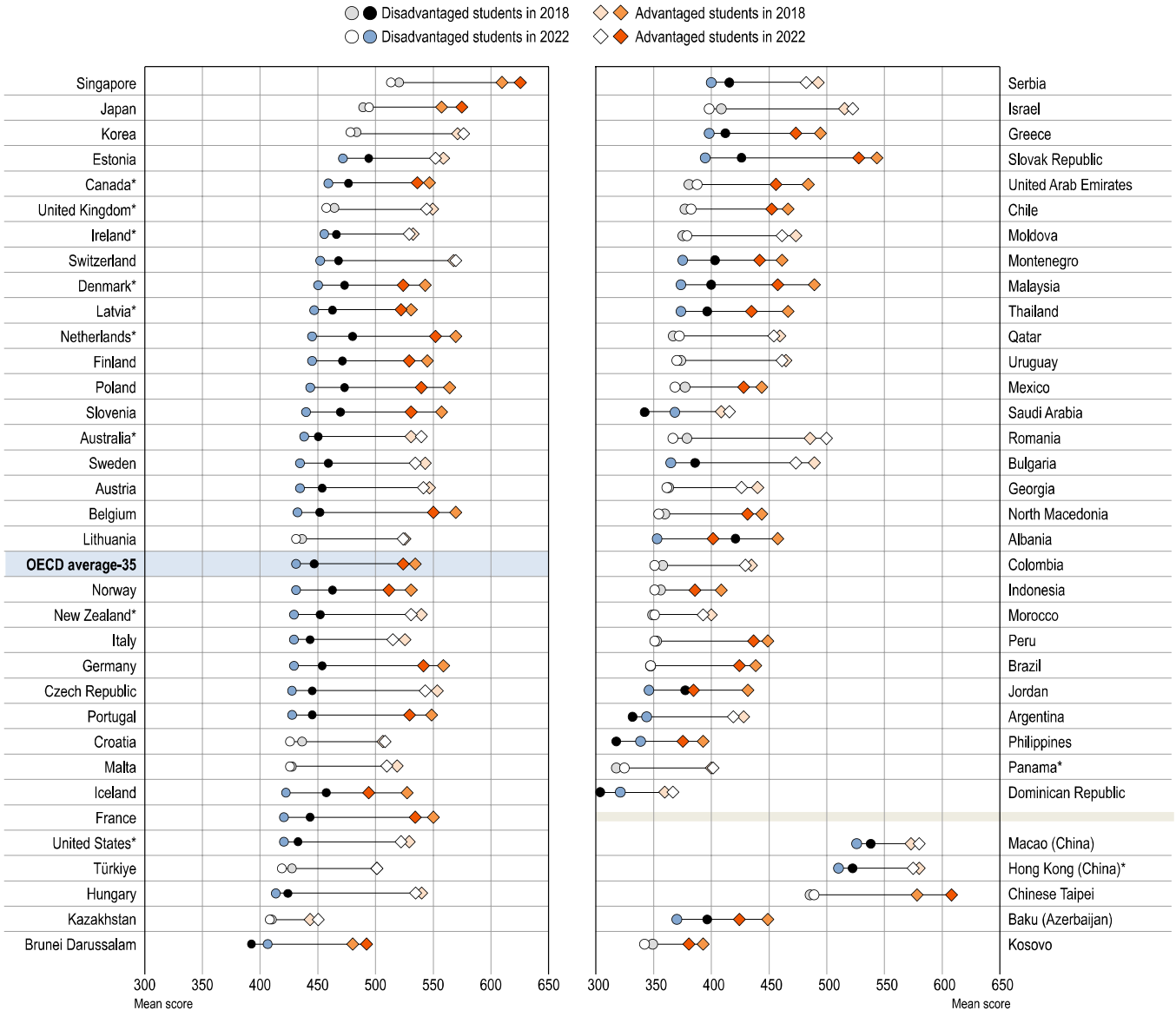
Disadvantaged students' performance in mathematics declined between 2018 and 2022 on average across OECD countries (by 17 score points) and in 34 countries/economies (Figure I.5.5). Declines that were larger than 20 score points were observed in 20 countries/economies and declines larger than 30 points were observed in seven countries (Albania, Iceland, Jordan, the Netherlands*, Norway, the Slovak Republic and Slovenia). A decline of almost 70 score points occurred in Albania.

Disadvantaged students' performance in mathematics did not change significantly in another 29 countries/economies and it improved in five countries/economies (Argentina, Brunei Darussalam, the Dominican Republic, the Philippines and Saudi Arabia). The increase in performance ranged from 12 points (in Argentina) to 27 points (in Saudi Arabia). In these five countries, the mean score of disadvantaged students in PISA 2018 was lower than 400 points; in other words, these disadvantaged students improved their scores starting from a performance level that was very low.

Advantaged students' performance in mathematics declined on average across OECD countries (by 10 score points) and in 30 countries/economies. Advantaged students' performance in mathematics declined by more than 20 points in 11 countries/economies; by more than 30 points in Iceland, Malaysia and Thailand; by almost 50 points in Jordan; and by almost 60 score points in Albania.

Advantaged students' performance in mathematics did not change significantly in 34 countries/economies and it improved in four countries (Brunei Darussalam, Japan, Singapore and Chinese Taipei). In these four countries, the increase in performance ranged from 14 points in Brunei Darussalam to 30 points in Chinese Taipei. Except for Brunei Darussalam, these are countries/economies where advantaged students' performance in PISA 2018 was already among the highest across all PISA-participating countries (ranging between 558 and 611 score points in mathematics); in other words, these advantaged students improved their scores starting from a performance level that was already very high.

Figure I.5.5. Change between 2018 and 2022 in mean performance in mathematics, by national quarter of socio-economic status



Notes: Only countries and economies that can compare PISA 2018 and 2022 results are shown.
Statistically significant differences are shown in a darker tone (see Annex A3).
Socio-economic status is measured by the PISA index of economic, social and cultural status.
OECD average-35 refers to the average across OECD countries, excluding Costa Rica, Luxembourg and Spain.
Countries and economies are ranked in descending order of the mean score in mathematics of socio-economically disadvantaged students in 2022.
Source: OECD, PISA 2022 Database, Table I.B1.5.19.

Considering that mathematics performance generally declined among disadvantaged and advantaged students, it is not surprising that in most countries the socio-economic gap in mathematics performance did not change between 2018 and 2022. Table I.5.3 shows changes in the difference in mathematics performance between socio-economically advantaged and disadvantaged students (i.e. the "socio-economic gap") over this period.

The socio-economic gap in mathematics performance did not change between 2018 and 2022 in 51 out of the 68 countries/economies with available PISA data; it widened on average across OECD countries (by seven score points) and in 12 countries/economies; and it narrowed in five countries/economies.

The socio-economic gap in performance narrowed the most (38 score points) in the Philippines where disadvantaged students' performance improved greatly (20 points) and advantaged students' performance declined by a similar margin (18 points). In Argentina and Saudi Arabia the socio-economic gap narrowed because disadvantaged students' performance improved whereas advantaged students' performance did not change. Conversely, in Chile and the United Arab Emirates the gap narrowed because advantaged students' performance declined and disadvantaged students' performance did not change.

The socio-economic gap in performance widened the most in Chinese Taipei (27 score points) where advantaged students' performance improved (30 score points) and disadvantaged students' performance did not change. Similarly, the socio-economic gap widened greatly (22 points) in Singapore because advantaged students' performance improved (16 score points) and disadvantaged students' performance did not change.

In seven other countries/economies (Australia*, Austria, Estonia, Macao [China], New Zealand*, Sweden and Switzerland), the socio-economic gap widened because disadvantaged students' performance declined whereas advantaged students' performance did not change. Within this group of countries, disadvantaged students' performance declined by more than 20 score points in Estonia, New Zealand* and Sweden.

Table I.5.3. Change between 2018 and 2022 in the socio-economic gap in mathematics performance

	Advantaged students' performance **declined** and …	**Advantaged students'** performance **did not change** and …	**Advantaged students'** performance **improved** and …
…**disadvantaged students'** performance **declined**	The socio-economic gap ***narrowed***:		
	The socio-economic gap ***did not change*** :		
	Albania, Baku (Azerbaijan), Belgium, Canada*, Denmark*, France, German y, Greece, Iceland, Jordan, Latvia*, Malaysia, Montenegro, the Netherlands*, Norwa y, Poland, Portugal, the Slovak Republic, Slovenia, Thailand	Bulgaria, the Czech Republic, Hungar y, Ireland*, Ital y, Serbia	
	The socio-economic gap ***widened***:		
	OECD average-35, Finland	Australia*, Austria, Estonia, Macao (China), New Zealand*, Sweden, Switzerland	
…**disadvantaged students'** performance **did not change**	The socio-economic gap ***narrowed***:		
	Chile, the United Arab Emirates		
	The socio-economic gap ***did not change*** :		
	Brazil, Indonesia, Kosovo, Mexico, North Macedonia, Peru	Colombia, Croatia, Georgia, Hong Kong (China)*, Kazakhstan, Korea, Lithuania, Malta, Moldova, Morocco, Panama*, Qatar, Türkiye, the United Kingdom*, the United States*, Uruguay	Japan
	The socio-economic gap ***widened***:		
		Israel, Romania	Singapore, Chinese Taipei
…**disadvantaged students'** performance **improved**	The socio-economic gap ***narrowed***:		
	The Philippines	Argentina, Saudi Arabia	
	The socio-economic gap ***did not change*** :		
		The Dominican Republic	Brunei Darussalam
	The socio-economic gap ***widened***:		

Notes: Only countries and economies that can compare PISA 2018 and 2022 results are shown.
The socio-economic status is measured by the PISA index of economic, social and cultural status.
OECD average-35 refers to the average across OECD countries, excluding Costa Rica, Luxembourg and Spain.
Source: OECD, PISA 2022 Database, Table I.B1.5.19.

Changes in socio-economic disparities at different levels of proficiency

Differences in performance in terms of socio-economic status can also be examined by looking at the change in the proportion of advantaged and disadvantaged students that scored below baseline proficiency Level 2 ("low performers") and at proficiency Level 5 or 6 ("top performers") in mathematics.[6]

As shown in Figure I.5.6, the percentage of disadvantaged students who scored below proficiency Level 2 in mathematics increased on average across OECD countries (by nine percentage points) and in most countries/economies (47 out of 68 with available data) between 2018 and 2022. In 19 of these countries/economies, the share of disadvantaged students scoring below Level 2 in mathematics increased by more than 10 percentage points. In eight countries/economies this share increased by more than 15 percentage points.

In some countries/economies where the share of socio-economically disadvantaged low-performing students increased the most (i.e. more than 10 percentage points), at least three out of four disadvantaged students scored below proficiency Level 2 in mathematics in PISA 2022 (e.g. Albania, Bulgaria, Jordan, Malaysia and Thailand) (Table I.B1.5.25). That said, in Finland and Poland the share of low performers among disadvantaged students continued to be lower than 40% despite the large increase in this share between PISA 2018 and PISA 2022.

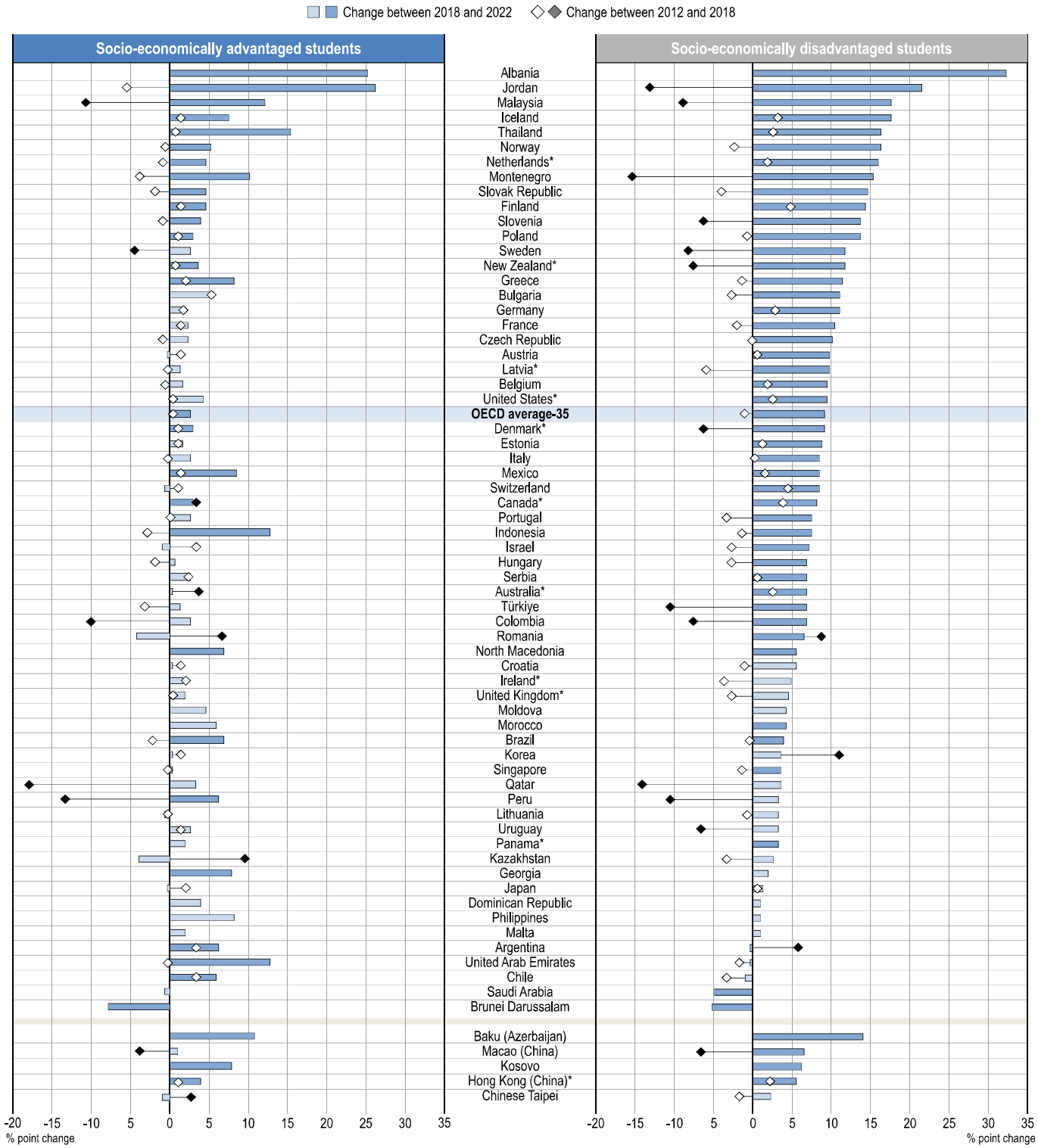
In another 19 countries/economies the percentage of disadvantaged students who scored below proficiency Level 2 in mathematics did not change whereas in Brunei Darussalam and in Saudi Arabia the share decreased (by five percentage points).

Among socio-economically advantaged students, the share of low performers typically did not change (this was observed in 39 countries/economies); it increased in 28 countries/economies and decreased in Brunei Darussalam (by eight percentage points).

Figure I.5.6 also shows that trends between 2018 and 2022 in some countries/economies sharply contrast with countries' trajectories before 2018. Most noticeably, all countries/economies in which the share of disadvantaged low performers increased between 2018 and 2022 had experienced a decrease or stability in their share of disadvantaged low performers between 2012 and 2018 (except Romania). In Montenegro, for example, the share of disadvantaged low performers decreased by 16 percentage points between 2012 and 2018 but has increased by 15 percentage points since 2018. On average across OECD countries, the share of disadvantaged low performers did not change between 2012 and 2018 but increased by nine percentage points between 2018 and 2022.

Similarly, in all countries/economies in which the share of advantaged low performers increased between 2018 and 2022 had seen stability or a decrease of this share in previous PISA assessments (except Canada*). In Peru, for example, the share of advantaged low performers decreased by 13 percentage points between 2012 and 2018 but increased by six percentage points between 2018 and 2022. On average across OECD countries, the share of advantaged low performers did not change between 2012 and 2018 but increased by three percentage points between 2018 and 2022.

Figure I.5.6. Change between 2018 and 2022 in percentage of low performers in mathematics in the context of pre-2018 trends, by national quarter of socio-economic status



Notes: Only countries and economies that can compare PISA 2018 and 2022 results are shown. Statistically significant differences are shown in a darker tone (see Annex A3). Socio-economic status is measured by the PISA index of economic, social and cultural status. Low performers in mathematics are students who scored below proficiency Level 2 in mathematics. OECD average-35 refers to the average across OECD countries, excluding Costa Rica, Luxembourg and Spain.

Countries and economies are ranked in descending order of the percentage-point difference in socio-economically disadvantaged low-performing students in mathematics between 2018 and 2022.

Source: OECD, PISA 2022 Database, Table I.B1.5.25.

Between 2018 and 2022, among advantaged students, the share of top performers decreased on average across OECD countries (by three percentage points) and in 18 countries/economies, and increased in five (Australia*, Japan, Macao [China], Singapore and Chinese Taipei) (Figure I.5.7). Among disadvantaged students, the share of top performers decreased on average across OECD countries (by one percentage point) and in 15 countries/economies, and increased in two countries (Japan and Chinese Taipei).

In Japan and Chinese Taipei, the share of top performers increased by between 10 and 13 percentage points among advantaged students and by about three to four percentage points among disadvantaged students. In Germany and Poland, the share of top performers fell by between 9 and 11 percentage points among advantaged students and by roughly three percentage points among disadvantaged students.

Countries/economies that had increased their share of socio-economically advantaged top performers between 2012 and 2018 did not change or had a decrease between 2018 and 2022. In Sweden, the share of top performers among advantaged students was 16% in PISA 2012 and 24% in 2018, but it did not change significantly between 2018 and 2022. In the United Arab Emirates, a reversal of the previous trend is observed: the share of advantaged top performers increased by four percentage points between PISA 2012 (8%) and PISA 2018 (12%) but decreased by three percentage points between 2018 and 2022 (9%).

Among disadvantaged students, the share of top performers remained stable in most countries between 2012 and 2018. In all countries/economies where the share of disadvantaged top performers decreased between 2018 and 2022, this share had not changed between 2012 and 2018 (except Denmark*, where it increased). By contrast, Japan and Chinese Taipei show promising trend reversals: while the share of disadvantaged top performers decreased in Chinese Taipei (by eight percentage points) and Japan (by four percentage points) between 2012 and 2018, it has increased in both countries/economies since 2018.

Figure I.5.7. Change between 2018 and 2022 in percentage of top performers in mathematics in the context of pre-2018 trends, by national quarter of socio-economic status

Notes: Only countries and economies that can compare PISA 2018 and 2022 results are shown.
Statistically significant differences are shown in a darker tone (see Annex A3).
Socio-economic status is measured by the PISA index of economic, social and cultural status.
Top performers in mathematics are students who scored at or above proficiency Level 5 in mathematics.
OECD average-35 refers to the average across OECD countries, excluding Costa Rica, Luxembourg and Spain.
Countries and economies are ranked in descending order of the percentage-point difference in socio-economically disadvantaged top-performing students in mathematics between 2018 and 2022.
Source: OECD, PISA 2022 Database, Table I.B1.5.27.

Box I.5.4. A context for interpreting trends

This chapter reports changes in performance and equity between 2018 and 2022. In order to attribute changes in performance over successive PISA assessments to changes in student learning or differences in the composition of student populations, the PISA test and how it is conducted must remain equivalent from assessment to assessment. Overall, PISA 2022 and PISA 2018 were conducted in much the same way:

- The assessment was primarily conducted on computer (as was also the case in both 2015 and 2018). Seven countries/economies (see below) switched from paper to computer in 2022. Some countries continued to administer a paper-based assessment, as in prior years (Cambodia, Guatemala, Paraguay[7] and Viet Nam). Because response patterns in 2022 in all subjects deviated significantly from those observed in Viet Nam in earlier assessments, no reliable trend could be established for Viet Nam, and comparisons of scale scores to those reported in past assessments are not reported in this volume (see Annex A4).
- In countries that used computers to assess students in 2022, students answered questions in just two subjects, devoting one hour to each. This was already the case for most students in 2018; however, a minority of students in 2018 was tested in three subjects within the same two-hour testing period. In previous rounds of PISA, the number of subjects varied even more across students.

A small number of countries experienced major changes in test-administration conditions between 2018 and 2022, and care must be taken when interpreting their trends.

- Argentina, Jordan, Moldova, North Macedonia, Romania, Saudi Arabia and Ukraine switched from paper to computer assessment in 2022. Although measures were taken to align the reporting scales at the international level in order to report trends, differences in familiarity with the test format or student motivation when taking the test may interfere with performance trends. Furthermore, in the case of Jordan, past reading and science scores were computed on a scale that was only weakly linked to the international scale; for this reason, this volume does not report trends in reading and science for Jordan, and limits trend reporting to mathematics.
- Three countries changed their testing period by more than one or two months in 2022, moving it to a different period in the school year. Ireland* and the Netherlands* tested students between October and December 2022 (previously, in March and April 2018). Cambodia tested students in June 2022; their previous results were collected in December 2017 as part of the PISA for Development initiative. While the age-based definition of the target population implies that neither the average age nor the average amount of schooling of students in the PISA sample changes, test-period changes do affect the grade composition of the PISA cohort; furthermore, it is possible that students' motivation and test performance are subject to seasonal patterns, which may confound differences over time.
- Iceland and Norway were the first countries/economies in PISA to rely on a server-based administration (using Chromebooks) in some schools. They reported that students in these schools experienced difficulties moving through the cognitive assessment early in the testing period. Further investigation traced the problem back to overload on the PISA contractor's server. The problem was rapidly solved for students who were tested later and did not affect other countries that used a server-based administration. In Norway, it affected at most 9% of the final sample (584 students). In Iceland, it affected at most 13% of the final sample (438 students). During data adjudication, these data were thoroughly reviewed, and considered to be fit for reporting. Furthermore, analyses conducted by the PISA National Centre for Iceland (where, due to the census nature of the survey, schools' results in PISA could be tracked over time), confirmed that the issue affected only students' ability to complete the test but not the way in which these students responded to the parts that they completed: performance changes were very similar in affected and non-affected school (OECD, Forthcoming[4]).

Finally, 21 countries and economies did not meet PISA technical standards for overall exclusion rates, student response rates, and/or school participation rates in 2022. For 12 of these, it is probable that more than minimal bias resulted from these deviations from standards (see Reader's Guide). In Portugal and two of the 12 countries mentioned above (the Netherlands* and the United States*), a response-rate issue affected PISA 2018 results. The results of these 13 countries and economies are not included in the OECD average-26. There is more detailed information about the potential bias, its most likely direction, and how it might affect trend comparisons in the Reader's Guide at the beginning of this volume and in Annex A2 and A4; and, for the Netherlands*, Portugal and the United States*, in the corresponding Annexes for 2018 (OECD, 2019[5]).

Changes in gender disparities

Table I.5.4 shows changes between 2018 and 2022 in the difference between boys and girls in average mathematics performance (hereafter, this difference will be referred to as the "gender gap").

In this analysis, the gender gap is measured by the score difference between boys and girls (boys – girls). Thus, when describing trends in the gender gap between PISA 2018 and PISA 2022, it will be said below that the gap "narrowed" if the gap became more favourable to girls; similarly, it is said that the gender gap "widened" if it became more favourable to boys.

As shown in Table I.5.4, the gender gap in mathematics performance did not change between 2018 and 2022 in most countries/economies (57 out of the 72 with comparable data). The gender gap widened on average across OECD countries (by four score points) and in 11 countries/economies, and it narrowed in four (Albania, Baku [Azerbaijan], Colombia and Montenegro).

In three out of the four countries/economies where the gender gap in performance narrowed, performance declined among boys and girls but boys' performance declined more than girls'. The gender gap narrowed the most (roughly 15 score points) in Albania and Baku (Azerbaijan). In Albania boys' and girls' performance in mathematics was not significantly different in PISA 2018 but a gap of 19 points in favour of girls was observed in PISA 2022. In Baku (Azerbaijan) a gender gap in favour of boys was observed in PISA 2018 but reversed in PISA 2022 when girls outperformed boys by seven points.

The gender gap in performance widened the most (20 score points) in Israel where girls' performance declined (by 15 score points) and boys' performance did not change. Similarly, the gender gap widened in Chile, Hong Kong (China)*, Macao (China) and Malta because girls' performance declined and boys' performance did not change.

Most typically, in 26 countries/economies, the gender gap did not change between PISA 2018 and 2022 in the context of a performance decline for both boys and girls. In 10 of these countries/economies (Costa Rica, Estonia, France, Germany, Italy, Latvia*, Mexico, New Zealand*, Portugal and the United Kingdom*) boys outperformed girls in PISA 2018 and 2022. In seven (Bulgaria, Greece, Kosovo, Poland, the Slovak Republic, Slovenia and Sweden), boys' and girls' performance in mathematics was not significantly different in either assessment. In three other countries/economies (Finland, Indonesia and Malaysia), girls outperformed boys in both assessments.

Another typical case is that neither girls' nor boys' performance changed significantly between PISA 2018 and 2022, resulting in a gender gap that did not change between the assessments. This was observed in 16 countries and economies.

Girls' performance in mathematics declined between 2018 and 2022 in 47 countries/economies; it did not change significantly in another 20 countries/economies and improved in five countries/economies (by roughly 15 score points in all of them). Girls' performance in mathematics declined by more than 60 score points in Albania and 43 points in Iceland; in Jordan, the Netherlands* and Norway girls' performance declined by more than 30 points.

Performance trends among boys were also predominantly negative, though less so than for girls. Boys' performance in mathematics declined in 33 countries/economies; it did not change significantly in another 31 countries/economies and improved in eight (Brunei Darussalam, the Dominican Republic, Guatemala, Paraguay, Qatar, Saudi Arabia, Singapore and Chinese Taipei). Boys' performance in mathematics declined by 76 score points in Albania, more than 40 points in Jordan, and more than 30 points in Malaysia.

Table I.5.4. Change between 2018 and 2022 in mean performance in mathematics, by gender

	Boys' performance **declined** and …	**Boys'** performance **did not change** and …	**Boys'** performance **improved** and …
…Girls' performance **declined**	*The gender gap **narrowed**:*		
	Albania (g), Baku (Azerbaijan) (g), Montenegro		
	*The gender gap **did not change**:*		
	Belgium, Bulgaria, Costa Rica (b), the Czech Republic (b), Denmark* (b), Estonia (b), Finland (g), France (b), Germany (b), Greece, Indonesia (g), Italy (b), Jordan (g), Kosovo, Latvia* (b), Malaysia (g), Mexico (b), New Zealand* (b), Norway, Poland, Portugal (b), the Slovak Republic, Slovenia, Sweden, Thailand, the United Kingdom* (b)	Austria (b), Hungary (b), Ireland* (b), Lithuania (b), Moldova, North Macedonia (g), Serbia (b), the United States* (b), Uruguay (b)	
	*The gender gap **widened**:*		
	OECD average-26 (b), **OECD average-35 (b)**, Canada* (b), Iceland, the Netherlands* (b)	Chile (b), Hong Kong (China)* (b), Israel (b), Macao (China) (b), Malta	Qatar (g)
…Girls' performance **did not change**	*The gender gap **narrowed**:*		
	Colombia (b)		
	*The gender gap **did not change**:*		
		Argentina (b), Australia* (b), Brazil (b), Croatia, Georgia, Japan (b), Kazakhstan, Korea, Morocco (g), Panama*, Peru (b), the Philippines (g), Romania, Switzerland (b), Türkiye, the United Arab Emirates (g)	Guatemala (b)
	*The gender gap **widened**:*		
			Saudi Arabia, Singapore (b)
…Girls' performance **improved**	*The gender gap **narrowed**:*		
	*The gender gap **did not change**:*		
		Cambodia	Brunei Darussalam (g), the Dominican Republic (g), Paraguay (b), Chinese Taipei
	*The gender gap **widened**:*		

Notes: Only countries and economies that can compare PISA 2018 and 2022 results are shown.
For Cambodia, Guatemala and Paraguay, the change between 2017 and 2022 is reported in the table.
OECD average-35 refers to the average across OECD countries, excluding Costa Rica, Luxembourg and Spain. OECD average-26 refers to the average across OECD countries, excluding Luxembourg, Spain and any countries where the violation of exclusion- and/or response-rate standards may have introduced bias in the sample in either 2018 or 2022.
The gender gap is measured in this table by the score difference in mathematics between boys and girls (boys – girls). This means that, in any particular PISA cycle, positive values for this difference indicate a gap in favour of boys and negative values indicate a gap in favour of girls. Thus, when interpreting trends in the gender gap between PISA cycles, notice that when the gender gap narrows it means that the gap becomes more favourable to girls, and when it widens it means that the gap becomes more favourable to boys. Regardless of the trend in the gap, the gender gap can favour girls or boys or not be significant in PISA 2022. The letter "g" in parenthesis next to the country name means that girls' performance in mathematics is higher than boys' performance in PISA 2022. The letter "b" means that boys performed better than girls. No letter next to the country name means that the difference in mathematics performance between boys and girls in PISA 2022 is not statistically significant (see Annex A3).
Source: OECD, PISA 2022 Database, Tables I.B1.5.38, I.B1.5.39 and I.B1.5.40.

Changes in gender disparities at different levels of proficiency

As shown in Figure I.5.8, the percentage of girls who scored below proficiency Level 2 in mathematics increased on average across OECD countries (by six percentage points) and in most countries/economies (52 out of 72 with available data) between 2018 and 2022. In 12 of these countries/economies, the share of girls scoring below Level

2 in mathematics increased by more than 10 percentage points, and in five countries/economies this share increased by more than 15 percentage points (Albania, Iceland, Jordan, Malaysia and Thailand). Iceland, the Netherlands* and Norway are examples of countries/economies that had relatively small shares of low-performing girls in PISA 2018 but saw large increases in PISA 2022.

In another 18 countries/economies, the percentage of girls who scored below proficiency Level 2 in mathematics did not change whereas in Brunei Darussalam and in Paraguay the share decreased (by roughly seven percentage points).

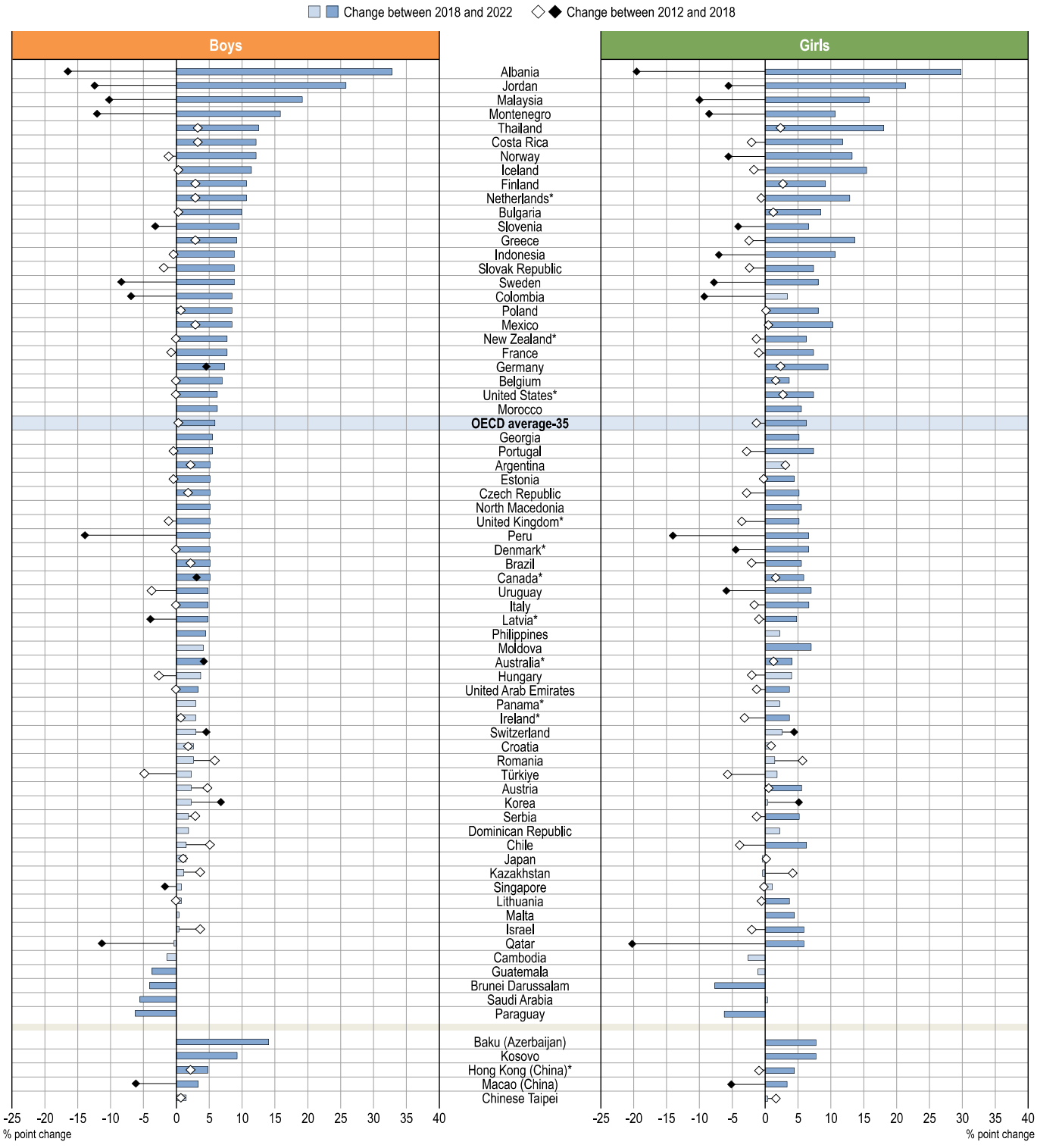
There was a marked drop in boys' performance as well, though less pronounced than for girls. As shown in Figure I.5.8, between 2018 and 2022, the share of low-performing boys increased on average across OECD countries (by six percentage points) and in most countries/economies (46); it did not change in 22 countries/economies and decreased in four (Brunei Darussalam, Guatemala, Paraguay and Saudi Arabia).

The share of low performers in mathematics increased among boys and girls between PISA 2018 and 2022 in 43 out of 72 countries with comparable data. In 13 countries/economies, the share of low performers in mathematics did not change among boy or girls.

The percentage of low-performing girls in mathematics had been decreasing or holding steady between PISA 2012 and PISA 2018 in all countries/economies where it increased between PISA 2018 and 2022. In Iceland, for example, the share of low performers among girls was 20% in PISA 2012 and 18% in PISA 2018 but 34% in PISA 2022 (increase of 16 percentage points between 2018 and 2022). Similarly, the share of girls who scored below proficiency Level 2 in mathematics in Costa Rica was 67% in PISA 2012, 65% in PISA 2018 but 76% in PISA 2022 (increase of 12 percentage points between 2018 and 2022).

Among boys, the increases in the share of low performers between 2018 and 2022 also occurred in the context of stability or decreases in previous years for several countries/economies. The percentage of low-performing boys in mathematics had been decreasing or holding steady in most countries/economies where it increased between PISA 2018 and 2022. In Sweden, for example, the share of low performers among boys decreased by nine percentage points between 2012 and 2018 (from 28% to 19%) but increased by the same amount between 2018 and 2022.

Figure I.5.8. Change between 2018 and 2022 in percentage of low performers in mathematics in the context of pre-2018 trends, by gender



Notes: Only countries and economies that can compare PISA 2018 and 2022 results are shown.
For Cambodia, Guatemala and Paraguay, the change between 2017 and 2022 is reported in the figure.
Statistically significant differences are shown in a darker tone (see Annex A3). Low performers in mathematics are students who scored below proficiency Level 2 in mathematics.
OECD average-35 refers to the average across OECD countries, excluding Costa Rica, Luxembourg and Spain.
Countries and economies are ranked in descending order of the percentage-point difference in low-performing boys between 2018 and 2022.
Source: OECD, PISA 2022 Database, Table I.B1.5.47

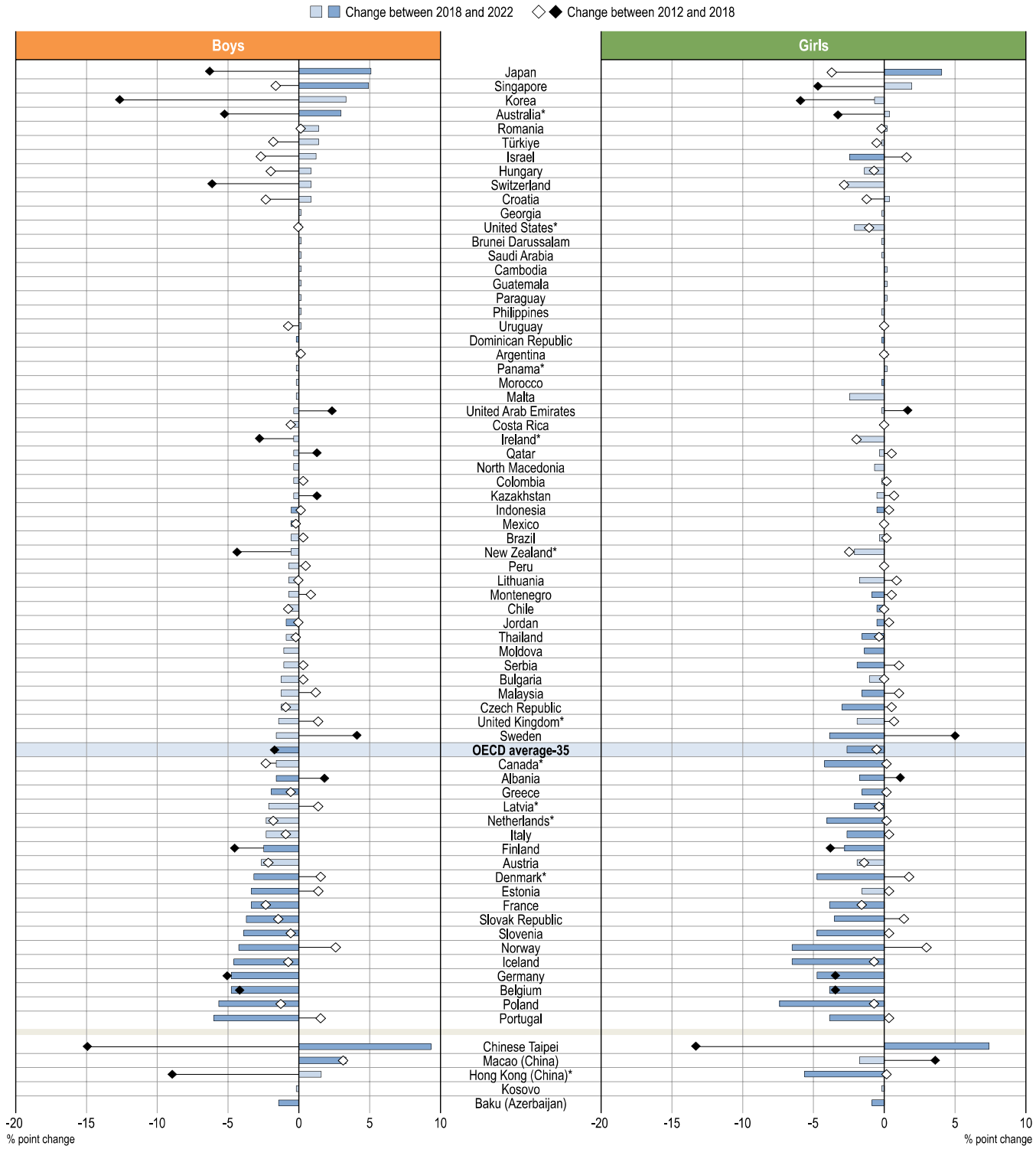
When it comes to trends in the share of top performers in mathematics, declines were somewhat more pronounced among girls than boys (Figure I.5.9). Among girls, the share of top performers decreased between PISA 2018 and 2022 on average across OECD countries (by three percentage points) and in 30 countries/economies, and increased in only two (Japan and Chinese Taipei). The decrease was the largest (between five and eight percentage points) in Hong Kong (China)*, Iceland, Norway and Poland.

Among boys, the share of top performers decreased on average across OECD countries (by two percentage points) and in 18 countries/economies; it increased in Australia*, Japan, Macao (China), Singapore and Chinese Taipei.

The share of top performers in mathematics increased between PISA 2018 and 2022 among boys and girls in Japan and Chinese Taipei whereas it decreased among boys and girls in 16 out 72 countries with comparable data. In 33 countries/economies, the share of top performers in mathematics did not change among boy nor girls.

The decrease in the share of top performers in mathematics among girls and boys was generally greater between PISA 2018 and 2022 than in the six-year period that preceded it. The percentage of top-performing girls in mathematics was increasing moderately or holding steady in most countries/economies where this share decreased between PISA 2018 and 2022 (e.g. Albania, Norway, Portugal, Sweden). Among boys, the percentage of top performers in mathematics had also been increasing moderately or holding steady in most countries/economies where this share decreased between PISA 2018 and 2022; in others a decrease in the share of top performers is observed as well between PISA 2012 and 2018 (e.g. Belgium, Finland, Germany).

Figure I.5.9. Change between 2018 and 2022 in percentage of top performers in mathematics in the context of pre-2018 trends, by gender



Notes: Only countries and economies that can compare PISA 2018 and 2022 results are shown.
For Cambodia, Guatemala and Paraguay, the change between 2017 and 2022 is reported in the figure.
Statistically significant differences are shown in a darker tone (see Annex A3).
Top performers in mathematics are students who scored at or above proficiency Level 5 in mathematics.
OECD average-35 refers to the average across OECD countries, excluding Costa Rica, Luxembourg and Spain.
Countries and economies are ranked in descending order of the percentage-point difference in top-performing boys between 2018 and 2022.
Source: OECD, PISA 2022 Database, Table I.B1.5.49.

Table I.5.5. Changes in performance and equity in education between 2018 and 2022 figures and tables

Figure I.5.1	Change between 2018 and 2022 in mean mathematics, reading and science performance
Table I.5.1	Change between 2018 and 2022 in mean performance in mathematics, reading and science
Figure I.5.2	Trends in mathematics, reading and science performance up to 2018
Figure I.5.3	Changes in performance between 2018 and 2022 in the context of pre-2018 performance trends
Figure I.5.4	Average change in science scores for high- and low-achieving students (2018-2022)
Table I.5.2	Change between 2018 and 2022 in the performance distribution in mathematics, reading and science
Figure I.5.5	Change between 2018 and 2022 in mean performance in mathematics, by national quarter of socio-economic status
Table I.5.3	Change between 2018 and 2022 in the socio-economic gap in mathematics performance
Figure I.5.6	Change between 2018 and 2022 in percentage of low performers in mathematics in the context of pre-2018 trends, by national quarter of socio-economic status
Figure I.5.7	Change between 2018 and 2022 in percentage of top performers in mathematics in the context of pre-2018 trends, by national quarter of socio-economic status
Table I.5.4	Change between 2018 and 2022 in mean performance in mathematics, by gender
Figure I.5.8	Change between 2018 and 2022 in percentage of low performers in mathematics in the context of pre-2018 trends, by gender
Figure I.5.9	Change between 2018 and 2022 in percentage of top performers in mathematics in the context of pre-2018 trends, by gender

StatLink https://stat.link/muorhc

Notes

[1] In mathematics, no increase was observed on average among the smaller set of OECD countries that reached response-rate standards in both years or where biases due to non-response could be excluded. Even among the larger set of OECD countries, the standard deviation – an alternative measure of the dispersion – did not increase significantly.

[2] This discussion only considers changes that were statistically significant. In most cases, estimates of percentiles are subject to greater uncertainty than estimates of means. Just like changes in mean performance, changes in percentiles over time are also subject to link errors; in contrast, link errors can be ignored in the estimation of changes in the inter-decile range (i.e. when determining whether the distribution narrowed or widened). For this reason, it is sometimes possible to conclude that the performance distribution widened even if neither the 10th nor the 90th percentile exhibit significant changes.

[3] Changes in the location of individual percentiles between 2018 and 2022 are estimated with less precision than changes in the mean. For some countries/economies, a significant change in mean performance was observed during the period even though changes in points along the distribution could not be deemed significant. Changes amongst low-achievers refer to situations in which student performance at either the 10th or 25th percentile improved or declined and the other percentile moved in the same direction or did not change significantly. Likewise, changes among high-achievers refer to situations in which student performance at either the 75th or 90th percentile improved or declined and the other percentile moved in the same direction or did not change significantly. In order to classify a country/economy as one where almost all students performed worse or better, when the distribution either widened or narrowed, at least four of the percentiles examined (the 10th, 25th, 50th, 75th and 90th percentiles) must have declined or improved. In order to classify a country/economy as one where most students performed worse or better, when there was no change in the dispersion of the distribution, at least three of the percentiles examined (the 10th, 25th, 50th, 75th and 90th percentiles) must have declined or improved.

[4] In PISA the link error is assumed to be constant across the scale. For PISA 2022 (as was the case for PISA 2018 and PISA 2015), link errors are estimated based on the variation in country means across distinct scale calibrations (see Annex A7).

[5] Link errors between 2022 and previous assessments were computed only based on countries that administered the PISA 2022 test on computer, as was already the case for link errors between 2018 and previous assessments. In the analysis, the same link errors are used for all countries, including those that administered PISA 2022 using paper-based instruments.

[6] For trends in the percentage of low performers among all students, see Box I.3.2 (in Chapter 3), and Figure I.6.5 and Table I.6.5 (in Chapter 6). For trends in the percentage of top performers among all students, see Figure I.6.5 and Table I.6.5 in Chapter 6.

[7]Cambodia, Guatemala and Paraguay participated in the PISA for Development project in 2017.

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6 Long-term trends in performance and equity in education

This chapter reviews trends between PISA assessment 2022 and those prior to 2018 in mean performance, performance at the various levels of proficiency measured by PISA, and equity.

For Australia, Canada, Denmark, Hong Kong (China), Ireland, Jamaica, Latvia, the Netherlands, New Zealand, Panama, the United Kingdom and the United States, caution is required when interpreting estimates as not all PISA sampling standards were met (see Reader's Guide, Annexes A2 and A4).

Changes in performance throughout countries' participation in PISA

In education, the most significant changes can often only be seen and understood over the long term. Some of the most important education-policy reforms affect how schools operate and what students learn only very gradually. For example, changes in initial teacher education can take decades before their effects are visible in most classrooms. In addition, investments in pre-school and early-grades education to strengthen the foundations for learning may have significant effects on young people's skills – but only a decade or so later.

This chapter takes a long-term perspective on PISA results and describes the trajectories of countries and economies that have participated in at least three PISA assessments, including PISA 2022.[1]

What the data tell us

- Performance in mathematics dropped sharply in 2022 on average across OECD countries after remaining stable in 2003-2018. In reading and science, however, average trajectories across OECD countries had already turned negative before 2018 after reaching their highest level between PISA 2009 and 2012, well before the COVID-19 disruptions. This decade-long decline, therefore, must have deeper reasons. Over the 2012-2022 period, performance in 29 out of 63 countries/economies deteriorated in at least two (out of three) subjects with only six countries and economies improving in at least two subjects.
- When considering results from all PISA assessments through to 2022, four countries and economies improved in all three subjects: Colombia, Macao (China), Peru and Qatar. Four other countries (Israel, Republic of Moldova, Singapore and Türkiye) improved in two out of three subjects.
- PISA scores declined similarly for both high- and low-achieving students between 2012 and 2022 on average across OECD countries.
- In mathematics, Macao (China) simultaneously boosted its percentage of high-performing students (Level 5 and above) and reduced its share of low-performing students (below Level 2) between 2012 and 2022; the Republic of North Macedonia, Peru and Qatar reduced their percentage of low-performing students, and Sweden and the United Arab Emirates increased their share of high-performing students over the same period.
- Many countries/economies have made significant progress towards the goal of universal secondary education over the past decade, including Cambodia, Colombia, Costa Rica, Indonesia, Morocco, Paraguay and Romania. While in four of these seven countries, average PISA scores appear to decline, they have, in fact, improved or remained consistent once the expansion of secondary education to previously marginalised populations was also considered.
- The socio-economic gap in mathematics performance has remained stable over the last decade in most countries/economies (42 out of 62 with available data). It widened on average across OECD countries (by three score points) and in eight countries/economies, and narrowed in 12 countries/economies.
- The gender gap in mathematics performance has not changed over the last decade in most PISA-participating countries/economies (53 out of the 64 with comparable data). The gender gap has changed over the last decade in another eleven countries/economies. In eight of them the gap has narrowed (Albania, Brazil, Chile, Colombia, Costa Rica, Indonesia, Kosovo, and Spain) and it has widened in three (Latvia*, Macao [China] and Singapore).

PISA 2022 is the eighth round of the international assessment since the programme was launched in 2000. Every PISA test assesses students' knowledge and skills in mathematics, reading and science. The first full assessment of each subject sets the scale and starting point for future comparisons. For reading, trend comparisons are possible starting from 2000. Mathematics was the focal subject for the first time in 2003 and science in 2006. This means that it is possible to measure the change in mathematics performance between PISA 2003 and 2022 but not between

PISA 2000 and 2022. In all subjects, the most reliable way to establish a trend in students' performance over a certain period is to compare results from all the assessments conducted throughout this period.[2]

Every third assessment is an opportunity to revisit what it means to be proficient in the focal subject and the way in which this proficiency is measured. With the 2015 assessment, for example, PISA made it possible for students to take the test on computers; by 2022, all PISA tests were digitalised, allowing, for instance, simulations in the science portion of the assessment and online texts in reading. Because of the changing nature of the test, PISA long-term trends reflect not only whether students have become better at mastering the reading tasks that proficient readers could successfully complete in 2000 or solving the kinds of mathematics and science problems that were assessed in 2003 or 2006, they also show if students' skills are keeping pace with the changing nature of mathematics, reading and science in contemporary societies.[3] For countries that participated in PISA over many years, trends in student performance show if students' skills in mathematics, reading and science have improved, and if so, by how much. But because countries joined PISA in different years, not all can compare their students' performance across every PISA assessment. To better understand a country's/economy's trajectory and include the largest number of countries in the comparisons, this chapter focuses on estimates of the overall direction of trends in student performance and how that direction changed over time.[4]

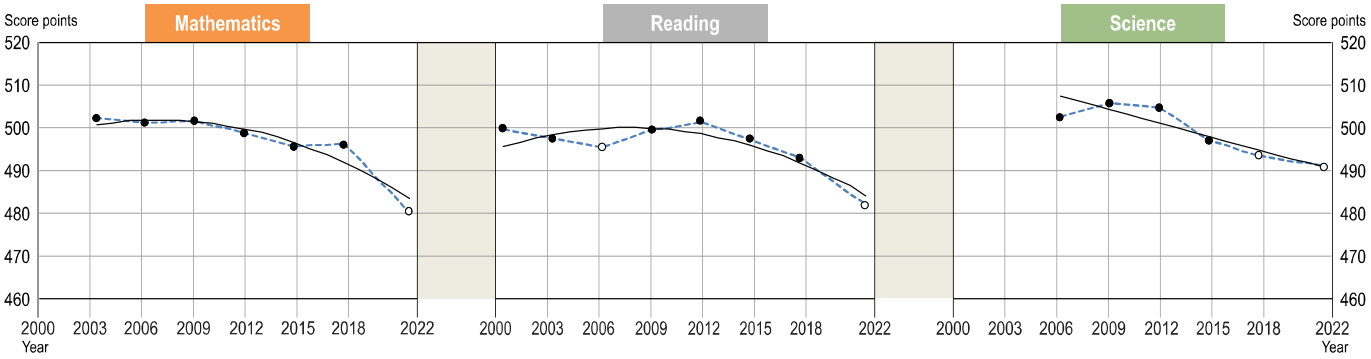
Trends in mean performance

Performance trajectories since the early PISA assessments

The average trend across OECD countries is negative, and, in mathematics and reading, increasingly so over the most recent period (Figure I.5.2; figures similar to Figure I.5.2 are presented in Annex D for each country/economy). Performance in PISA 2022 was the lowest in all subjects, significantly below the mean performance observed in any earlier assessment (except PISA 2018, in science). In mathematics, performance remained close to the 2003 level through all assessments up to 2018, then dropped sharply between 2018 and 2022. In reading and science, the strongest performance was observed in 2012 and 2009, respectively, then the trajectory turned negative: the causes of this decade-long decline have deeper origins that go beyond the COVID-19 shock.

Figure I.6.1. Trends in performance in mathematics, reading and science since the first PISA assessment

OECD average-23



Note: White dots indicate mean-performance estimates that are not statistically significantly above/below PISA 2022 estimates. Black lines indicate the best-fitting trend line.
Source: OECD, PISA 2022 Database, Tables I.B1.5.4, I.B1.5.5 and I.B1.5.6

Figure I.6.2 categorises countries and economies that can compare their PISA results over at least five assessments, i.e. since PISA 2009 or earlier, into nine groups, based on the shape of the trajectory of their mathematics performance (Table I.6.1 and Table I.6.2 provide corresponding information for reading and science).[5] Countries with an average improvement across at least five PISA assessments are in the top row; countries with no significant

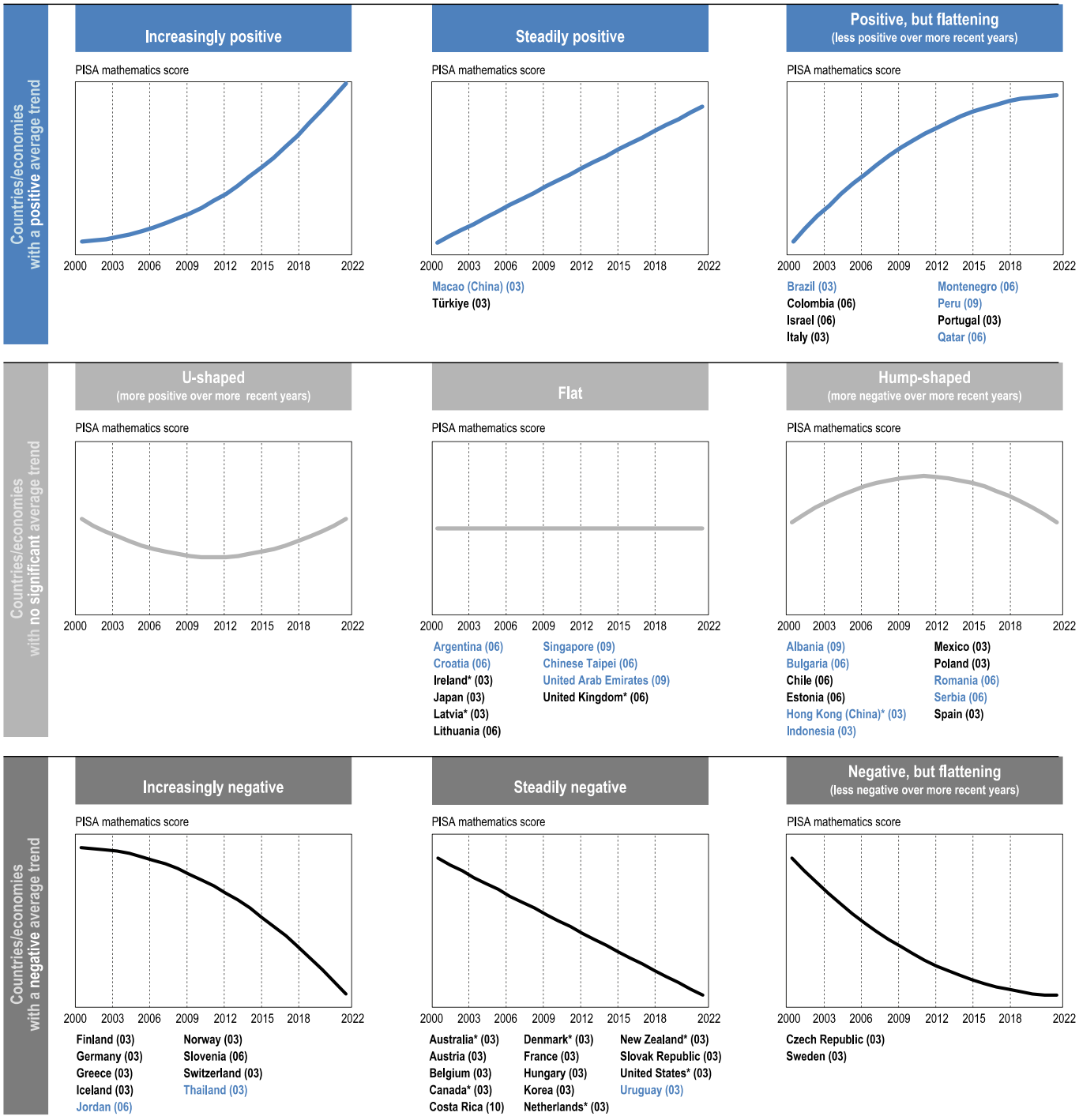
positive or negative trend are in the middle row; and countries with a negative trend are in the bottom row. The column indicates whether the trend observed is a steady trend (middle column) or an accelerating, flattening or reversing trend.

When considering the full period throughout which they participated in PISA, four countries and economies had a positive trend through to 2022 in all three subjects: Colombia, Macao (China), Peru and Qatar (Table I.B1.5.4, Table I.B1.5.5 and Table I. B1.5.6). Four other countries (Israel, Republic of Moldova,[6] Singapore and Türkiye) improved in two out of three subjects.

No single country/economy showed an increasingly positive trend in any subject. In contrast, many countries showed increasingly poor performance in at least one subject (similar to the OECD average trend in mathematics and reading depicted in Figure I.5.2). In addition, several countries (e.g. Germany in reading and Mexico in mathematics and science) reversed gains made in earlier assessments over the most recent period: their trends can be described as "hump-shaped" – improving at first but turning negative in more recent years).

Figure I.6.2. Trajectories of average performance in mathematics across PISA assessments

Direction and trajectory of trends in mean mathematics performance



Notes: Figures are for illustrative purposes only. Countries and economies are grouped according to the overall direction of their trend (the sign and significance of the average decennial trend) and to the rate of change in the direction of their trend (the sign and significance of the curvature in the estimate of quadratic trends) (see Annex A7).
Only countries and economies with data from at least five PISA mathematics assessments are included. Not all countries and economies can compare their students' performance over the same period. For each country/economy, the base year, starting from which mathematics results can be compared, is indicated in parentheses next to the country's/economy's name ("03" = 2003, "06" = 2006, etc.). Both the overall direction and the change in the direction may be affected by the period considered.
Georgia, Malta and Moldova conducted the PISA 2009 assessment in 2010, then participated in PISA 2015, 2018 and 2022. The average trend in mathematics over the full period is not significant in Georgia and Malta, and positive in Moldova. Malaysia conducted the PISA 2009 assessment in 2010, then participated in all subsequent assessments; however, PISA 2015 results were not deemed comparable due to low response rates. The average trend in mathematics over the full period, excluding results from PISA 2015, is not significant. Panama* participated in PISA 2009, 2018 and 2022. The average trend in mathematics over the full period is not significant.
Source: OECD, PISA 2022 Database, Table I.B1.5.4.

Table I.6.1. Trajectories of average performance in reading across PISA assessments

Direction and trajectory of trends in mean reading performance

Countries/economies with a positive average trend	**Increasingly positive**	**Steadily positive**	**Positive, but flattening** (less positive over more recent years)
		Israel (02), Macao (China) (03)	Albania (01), Chile (01), Colombia (06), Estonia (06), Peru (01), Qatar (06), Romania (06), Serbia (06), Singapore (09)
Countries/economies with no significant average trend	**U-shaped** (more positive over more recent years)	**Flat**	**Hump-shaped** (more negative over more recent years)
	Argentina (01)	Austria (00), Brazil (00), Bulgaria (01), the Czech Republic (00), Denmark* (00), Hungary (00), Ireland* (00), Italy (00), Japan (00), Lithuania (06), Mexico (00), Spain (00), Chinese Taipei (06), Türkiye (03), the United Kingdom* (06), the United States* (00), Uruguay (03)	Croatia (06), France (00), Germany (00), Hong Kong (China)* (02), Indonesia (01), Latvia* (00), Montenegro (06), Norway (00), Poland (00), Portugal (00), Slovenia (06), Switzerland (00)
Countries/economies with a negative average trend	**Increasingly negative**	**Steadily negative**	**Negative, but flattening** (less negative over more recent years)
	Belgium (00), Finland (00), Greece (00), Iceland (00), Korea (00), the Netherlands* (03), Thailand (01), the United Arab Emirates (09)	Australia* (00), Canada* (00), Costa Rica (10), New Zealand* (00), the Slovak Republic (03), Sweden (00)	

Notes: Countries and economies are grouped according to the overall direction of their trend (the sign and significance of the average decennial trend) and the rate of change in the direction of their trend (the sign and significance of the curvature in the estimate of quadratic trends) (see Annex A7).
Only countries and economies with data from at least five PISA reading assessments are included. Not all countries and economies can compare their students' performance over the same period. For each country/economy, the base year, starting from which reading results can be compared, is indicated in parentheses next to the country's/economy's name ("00" = 2000, "03" = 2003, etc.). Both the overall direction and the change in the direction may be affected by the period considered.
Trend comparisons for Jordan are not reported in reading (see Annex A4). Georgia, Malta and Moldova conducted the PISA 2009 assessment in 2010, then participated in PISA 2015, 2018 and 2022. The average trend in reading over the full period is not significant in Georgia and Malta, and positive in Moldova. Malaysia conducted the PISA 2009 assessment in 2010, then participated in all subsequent assessments; however, PISA 2015 results were not deemed comparable due to low response rates. The average trend in reading over the full period, excluding results from PISA 2015, is not significant. North Macedonia participated in PISA 2000, 2015, 2018 and 2022. The average trend in reading over the full period is not significant. Panama* participated in PISA 2009, 2018 and 2022. The average trend in reading over the full period is not significant.
Source: OECD, PISA 2022 Database, Table I.B1.5.5.

Table I.6.2. Trajectories of average performance in science across PISA assessments

Direction and trajectory of trends in mean science performance

Countries/economies with a positive average trend	**Increasingly positive**	**Steadily positive**	**Positive, but flattening** (less positive over more recent years)
		Macao (China) (06), Peru (09), Singapore (09), Türkiye (06)	Colombia (06), Qatar (06)
Countries/economies with no significant average trend	**U-shaped** (more positive over more recent years)	**Flat**	**Hump-shaped** (more negative over more recent years)
	Sweden (06), Chinese Taipei (06)	Argentina (06), Chile (06), the Czech Republic (06), Denmark* (06), France (06), Indonesia (06), Ireland* (06), Israel (06), Japan (06), Korea (06), Latvia* (06), Lithuania (06), Montenegro (06), Serbia (06), the United Arab Emirates (09), the United States* (06), Uruguay (06)	Albania (09), Brazil (06), Bulgaria (06), Estonia (06), Italy (06), Mexico (06), Norway (06), Poland (06), Portugal (06), Romania (06), Spain (06), Thailand (06)
Countries/economies with a negative average trend	**Increasingly negative**	**Steadily negative**	**Negative, but flattening** (less negative over more recent years)
	Germany (06), Iceland (06), the Netherlands* (06)	Australia* (06), Austria (06), Belgium (06), Canada* (06), Costa Rica (10), Finland (06), Greece (06), Hong Kong (China)* (06), New Zealand* (06), Slovenia (06), Switzerland (06), the United Kingdom* (06)	Croatia (06), Hungary (06), the Slovak Republic (06)

Notes: Countries and economies are grouped according to the overall direction of their trend (the sign and significance of the average decennial trend) and the rate of change in the direction of their trend (the sign and significance of the curvature in the estimate of quadratic trends) (see Annex A7).
Only countries and economies with data from at least five PISA science assessments are included. Not all countries and economies can compare their students' performance over the same period. For each country/economy, the base year, starting from which science results can be compared, is indicated in parentheses next to the country's/economy's name ("06" = 2006, "09" = 2009). Both the overall direction and the change in the direction may be affected by the period considered.
Trend comparisons for Jordan are not reported in reading and science (see Annex A4). Georgia, Malta and Moldova conducted the PISA 2009 assessment in 2010, then participated in PISA 2015, 2018 and 2022. The average trend in science over the full period is not significant in Georgia, Malta and Moldova. Malaysia conducted the PISA 2009 assessment in 2010, then participated in all subsequent assessments; however, PISA 2015 results were not deemed comparable due to low response rates. The average trend in science over the full period, excluding results from PISA 2015, is not significant. Panama* participated in PISA 2009, 2018 and 2022. The average trend in science over the full period is not significant.
Source: OECD, PISA 2022 Database, Table I.B1.5.6.

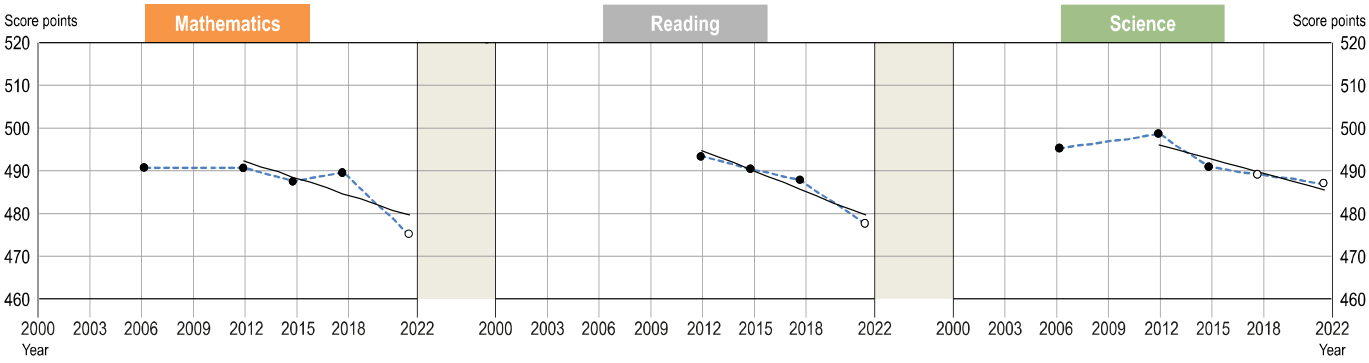
Trends over the 2012-2022 period

Over the most recent decade (2012-2022), the trend has been negative in all three subjects (Figure I.6.3) on average across OECD countries. Between 2012 and 2022, just under half of the countries/economies whose trends are reported (29 out of 63, including those whose trends can only be reported going back to 2015) performed increasingly poorly in at least two subjects (Table I.6.3) (Jordan, whose trends are only reported in mathematics, also has a negative trend). In contrast, only six countries and economies improved performances in at least two out of three subjects.

While OECD member countries have performed increasingly poorly on average, students in Peru and Qatar have improved their mean performance in mathematics, reading and science since 2012 (Table I.6.3).

Figure I.6.3. Trends in performance in mathematics, reading and science since 2012

OECD average-35



Note: White dots indicate mean-performance estimates that are not statistically significantly above/below PISA 2022 estimates. Black lines indicate the best-fitting trend lines.
Source: OECD, PISA 2022 Database, Tables I.B1.5.4, I.B1.5.5 and I.B1.5.6

Table I.6.3. Trends in mean performance in mathematics, reading and science since 2012

Based on average decennial trend

		Improving trend in **mathematics**	Non-significant trend in **mathematics**	Declining trend in **mathematics**
Improving trend in **reading**	Improving trend in **science**	Peru, Qatar	Uruguay	
	Non-significant trend in **science**			
	Declining trend in **science**			
Non-significant trend in **reading**	Improving trend in **science**	The Dominican Republic (15), Macao (China), Türkiye		
	Non-significant trend in **science**		Brazil, Colombia, Croatia, the Czech Republic, Hungary, Israel, Kazakhstan, Lithuania, Malaysia, Serbia, Singapore, Sweden	Argentina, Chile, Denmark*, Malta (15), Mexico, Portugal, Romania, the Slovak Republic, Chinese Taipei, the United States*
	Declining trend in **science**	North Macedonia (15)	Moldova (15), the United Kingdom*	Australia*, Austria, Estonia, Ireland*, Italy, Kosovo (15), New Zealand*
Declining trend in **reading**	Improving trend in **science**			
	Non-significant trend in **science**		Japan, Latvia*, Montenegro	France, Indonesia, Korea
	Declining trend in **science**		The United Arab Emirates	Albania, Belgium, Bulgaria, Canada*, Costa Rica, Finland, Georgia (15), Germany, Greece, Hong Kong (China)*, Iceland, the Netherlands*, Norway, Poland, Slovenia, Spain, Switzerland, Thailand

Notes: Only countries and economies that participated PISA 2022 and in either PISA 2012 or PISA 2015 are included.
Cells with the darkest background indicate positive (blue) or negative (grey) significant changes in all three subjects; cells with lighter background indicate one or two significant changes, all in the same direction (see Annex A3).
A number 15, in parentheses, signals countries and economies for which a shorter reference period (2015-2022) was used to compute the trends.
Jordan is not included in this table because earlier PISA results are only comparable to PISA 2022 results in mathematics (see Annex A4). The trend in mathematics in Jordan is declining.
Source: OECD, PISA 2022 Database, Tables I.B1.5.4, I.B1.5.5 and I.B1.5.6

Trends among high- and low-achieving students

Changes in a country's/economy's average performance can result from improvements or declines in performance by low-, medium- and high-achieving students. In some countries/economies, performance declines are observed along the entire distribution of performance, resulting in more students who perform at the lowest levels of proficiency and fewer students who attain the highest levels of proficiency. In other contexts, average performance declines can be mostly attributed to large declines among low-achieving students and little or no change among high-achieving students. This may result in a larger proportion of low-achieving students but no change in the share of top performers.

Figure I.6.4 shows the linear trend in median performance since PISA 2012 alongside trends observed in the performance of students in the 90th and 10th percentiles (i.e. near the top and bottom of the performance distribution; the median performance corresponds to that of students in the 50th percentile, i.e. at the mid-point of the performance distribution). Trends at the 10th percentile indicate whether the lowest-achieving 10% of students in a country/economy moved up the PISA scale over time. Similarly, trends at the 90th percentile indicate improvements among a country's/economy's high-achieving students (the 90th percentile is the point on the PISA scale below which exactly 90% of students can be found).

Among countries and economies whose mean mathematics performance worsened since 2012, there have been both widening and shrinking performance gaps in about equal proportion:

- Australia*, Canada*, Estonia, Finland, Hong Kong (China)*, the Netherlands*, Norway and Romania saw more rapid declines among low-performing students. As a result, the achievement gap in mathematics (measured by distance between the 10th and 90th percentiles) widened between 2012 and 2022.
- In contrast, Albania, Belgium, France, Georgia, Greece, Indonesia, Ireland*, Jordan, Kosovo, Malta, Mexico and Portugal saw more rapid declines among high-performing students. As a result, the achievement gap in mathematics shrank between 2012 and 2022 (Table I.B1.5.10).

In many countries, performance declines were relatively uniform along the distribution of performance; there are similar declines at the 10th and 90th percentiles, for example, for the OECD average.

Among countries and economies where mathematics performance improved over the 2012-2022 period, the Dominican Republic, North Macedonia and Qatar saw a significant change in the achievement gap, with low-achieving students improving more rapidly than (and catching up to) high-achieving students.

Finally, among countries and economies with no significant change in mean mathematics performance over the 2012-2022 period, Kazakhstan, Sweden and the United Arab Emirates nevertheless widened their performance gap. In contrast, the performance gap shrank in the Republic of Moldova (where low-achievers improved and high-achievers declined) and in Malaysia (where low-achievers' performance remained stable, and high-achievers' performance declined).

On average across the 23 OECD countries that can compare PISA results across all assessments, performance differences widened in reading and science because low-achieving students performed worse while high-achieving students remained stable; in contrast, performance differences narrowed in mathematics because almost all students performed worse but high-achieving students declined by more than low-achieving students did. Table I.6.4 considers all subjects and, for each country, the longest possible period over which comparisons are possible (excluding countries that can only compare results between PISA 2018 and 2022: their results were already reported in Chapter 5). It lists countries and economies according to whether their performance distributions in reading, mathematics and science narrowed, widened or did not change significantly (as measured by the inter-decile range) over the course of their participation in PISA. When this can be ascertained with confidence,[7] the table also shows whether the change or lack thereof is primarily due to changes among low-achieving students, high-achieving students or both.

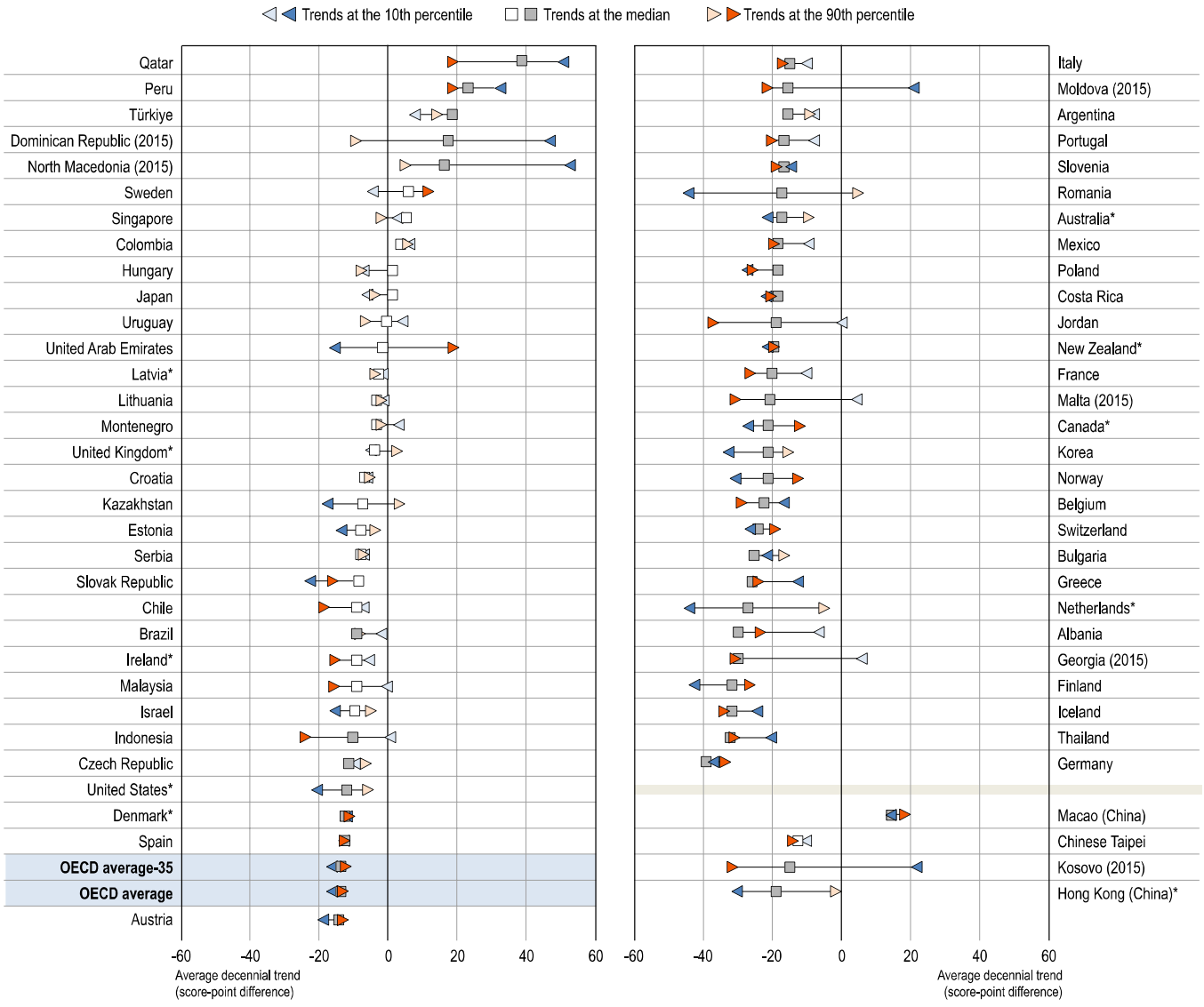
Table I.6.4. Change in performance distribution in mathematics, reading and science since the first PISA assessment

	Mathematics	Reading	Science
Widening of the distribution	**12 countries/economies**	**27 countries/economies**	**21 countries/economies**
Low-achievers performed worse; high-achievers performed better		The United Arab Emirates (09)	The United Arab Emirates (09)
Low-achievers performed worse, while performance did not change significantly among high-achievers	The United Kingdom* (06)	**OECD average-23 (00),** Canada* (00), France (00), Hong Kong (China)* (00), Hungary (00), Korea (00), Norway (00), the Slovak Republic (03), Slovenia (06), Sweden (00)	**OECD average-23 (06),** Canada* (06), Croatia (06), Hungary (06), Korea (06), Norway (06), Poland (06), Sweden (06)
High-achievers performed better while performance did not change significantly among low-achievers	Romania (06), the United Arab Emirates (09)	Brazil (00), Estonia (06), Israel (00), Macao (China) (03), Romania (06), Singapore (09), Chinese Taipei (06)	Romania (06), Serbia (06), Chinese Taipei (06)
Almost all students performed worse, but low-achievers declined by more than high-achievers did	Australia* (03), Canada* (03), Finland (03), Korea (03), the Netherlands* (03), the Slovak Republic (03)	Australia* (00), Costa Rica (09), Finland (00), Iceland (00), the Netherlands* (03)	Australia* (06), Costa Rica (09), Finland (06), Germany (06), the Netherlands* (06), the Slovak Republic (06)
Almost all students performed better but high-achievers improved by more than low-achievers did		Malaysia (09)	Macao (China) (06), Qatar (06)
Overall widening of the dispersion (none of the above patterns)	Croatia (06), Estonia (06), Chinese Taipei (06)	Austria (00), the Czech Republic (00), Japan (00), Spain (00)	Estonia (06), Montenegro (06)
No change in the dispersion of the distribution	**30 countries/economies**	**28 countries/economies**	**33 countries/economies**
Performance dropped to a similar extent for both high- and low-achievers	Austria (03), the Czech Republic (03), France (03), Hungary (03), Iceland (03), New Zealand* (03), Norway (03), Slovenia (06), Sweden (03), Switzerland (03), the United States* (03)	Belgium (00), Greece (00), New Zealand* (00), Thailand (00)	Austria (06), Belgium (06), Greece (06), Hong Kong (China)* (06), Iceland (06), New Zealand* (06), Slovenia (06), Switzerland (06), Thailand (06), the United Kingdom* (06)
Performance improved to a similar extent for both high- and low-achievers	Georgia (09), Israel (06), Italy (03), Kazakhstan (09), Macao (China) (03), Malaysia (09), Malta (09), Montenegro (06), Portugal (03), Qatar (06), Singapore (09), Türkiye (03)	Chile (00), the Dominican Republic (15), Malta (09), Moldova (09), Panama* (09), Peru (00), Qatar (06), Serbia (06)	Colombia (06), the Dominican Republic (15), Malaysia (09), Moldova (09), North Macedonia (15), Panama* (09), Peru (09), Türkiye (06)
Performance remained close to prior levels for both high- and low-achievers	Bulgaria (06), Hong Kong (China)* (03), Japan (03), Lithuania (06), Poland (03), Serbia (06), Spain (03)	Bulgaria (00), Croatia (06), Denmark* (00), Germany (00), Indonesia (00), Ireland* (00), Italy (00), Lithuania (06), Mexico (00), Montenegro (06), Poland (00), Portugal (00), Switzerland (00), Türkiye (03), the United Kingdom* (06), the United States* (00)	Brazil (06), Chile (06), the Czech Republic (06), Denmark* (06), France (06), Indonesia (06), Ireland* (06), Israel (06), Italy (06), Latvia* (06), Lithuania (06), Portugal (06), Spain (06), the United States* (06), Uruguay (06)
Narrowing of the distribution	**23 countries/economies**	**9 countries/economies**	**10 countries/economies**
Low-achievers performed better; high-achievers performed worse	Argentina (06)	Uruguay (03)	Albania (09)
High-achievers performed worse, while performance did not change significantly among low-achievers	Ireland* (03), Jordan (06), Uruguay (03)		Bulgaria (06)
Low-achievers performed better while performance did not change significantly among high-achievers	Albania (09), Brazil (03), Colombia (06), Indonesia (03), Mexico (03)	Albania (00), Argentina (00), Colombia (06)	Argentina (06), Singapore (09)
Almost all students performed worse, but high-achievers declined by more than low-achievers did	**OECD average-23 (03),** Belgium (03), Costa Rica (09), Denmark* (03), Germany (03), Greece (03), Thailand (03)		
Almost all students performed better but low-achievers improved by more than high-achievers did	The Dominican Republic (15), Kosovo (15), Moldova (09), North Macedonia (15), Panama* (09), Peru (09)	Georgia (09), Kazakhstan (09), Kosovo (15), North Macedonia (00)	Georgia (09), Kazakhstan (09), Kosovo (15), Malta (09)
Overall narrowing of the dispersion (none of the above patterns)	Chile (06), Latvia* (03)	Latvia* (00)	Japan (06), Mexico (06)

Notes: For each country/economy, the base assessment, starting from which results can be compared, is indicated in parentheses next to the country's/economy's name ("00" = 2000, "03" = 2003, etc.) Changes in the dispersion of the distribution – widening, narrowing or no change – are measured by the inter-decile range, i.e. the difference in score points between the 90th percentile and the 10th percentile of the student-performance distribution. Trends in percentiles are estimated with less precision than trends in mean performance. For some countries/economies, a significant trend in mean performance was observed during the period even though changes in points along the distribution could not be deemed significant. Trends among low-achievers refer to situations in which student performance at either the 10th or 25th percentile improved or declined and the other percentile moved in the same direction or did not change significantly. Likewise, trends among high-achievers refer to situations in which student performance at either the 75th or 90th percentile improved or declined and the other percentile moved in the same direction or did not change significantly. In order to classify a country/economy as one where almost all students became weaker or stronger, when the distribution either widened or narrowed, at least four of the percentiles examined (the 10th, 25th, 50th, 75th and 90th percentiles) must have declined or improved. In order to classify a country/economy as one where most students became weaker or stronger, when there was no change in the dispersion of the distribution, at least three of the percentiles examined (the 10th, 25th, 50th, 75th and 90th percentiles) must have declined or improved.
Trend comparisons for Jordan are not reported in reading and science (see Annex A4).
OECD average-23 refers to the average across OECD countries that can compare performance across all assessments, from PISA 2000 through to PISA 2022.
Source: Tables I.B1.5.7, I.B1.5.8, I.B1.5.9, I.B1.5.10, I.B1.5.11 and I.B1.5.12

Changes in enrolment rates (i.e. more disadvantaged 15-year-olds are now enrolled in secondary school than were in previous generations) may, in some cases, have contributed to widening disparities in performance. To determine how this may have shifted performance trends, "adjusted trends" that neutralise the contribution of enrolment trends on performance trends are computed (see section "Average 10-year trend in performance, taking into account changes in enrolment rates" and Figure I.6.7 below). Demographic shifts such as increases in the immigrant population may also have contributed to the observed trends; the magnitude of international migration trends and their effect on education systems' performance is discussed in Chapter 7.

Figure I.6.4. Average decennial trend in mathematics for high- and low-achieving students (2012-2022)



Notes: Only countries/economies that participated in the 2022 and either the 2012 or 2015 PISA assessments are shown.
When the base year is 2015, this is indicated next to the country/economy name.
Values that are statistically significantly different from 0 are marked in a darker tone (see Annex A3).
OECD average-35 refers to the average across OECD countries, excluding Costa Rica, Luxembourg and Spain.
Countries and economies are ranked in descending order of the average decennial trend in median performance in mathematics.
Source: OECD, PISA 2022 Database, Table I.B1.5.7

Changes in the proportion of 15-year-old students at different levels of proficiency

PISA scores in mathematics, reading and science skills are more than a tool to rank students and countries. Together with proficiency-level descriptions, scores give information on what level of skills students have. In each subject, these range from the basic skills required for further learning, and full participation in non-manual work and most of today's institutions to the complex skills that only a few students in most countries have mastered. These include being able to understand and communicate complex information, and model complex situations mathematically. Trends in the proportion of low- and top-performing students indicate how their mastery of specific skills (as established in the described proficiency scale) has changed over time.[8]

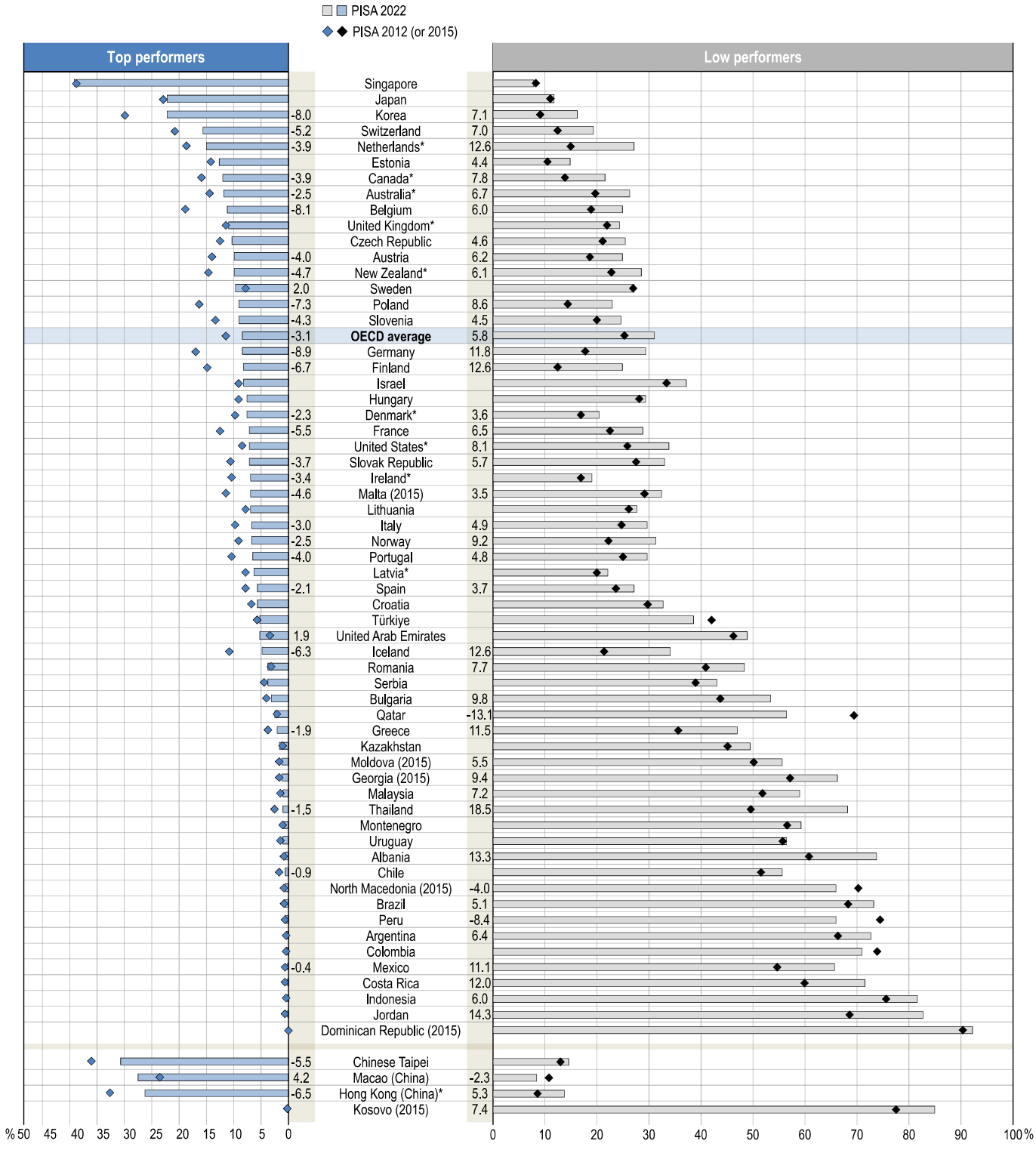
The proportion of students who do not reach Level 2 on the PISA scales (low-performing students) and the proportion of students who are able to score at Level 5 or 6 (top-performing students) indicate the quality of a country's/economy's talent pool. Trends in the share of low-performing students indicate the extent to which school systems are advancing (or not) towards providing all students with basic literacy and numeracy skills. Trends in the share of top-performing students indicate whether education systems are making progress in ensuring that young people can successfully use their mathematics, reading and science skills to navigate a volatile, uncertain, complex and ambiguous environment.

On average across OECD countries, the proportion of students scoring below Level 2 in mathematics increased by 5.8 percentage points between 2012 and 2022 whereas the proportion of students scoring at or above Level 5 decreased by 3.1 percentage points (Figure I.6.5). Over the decade prior to 2022, 25 countries and economies had a similar pattern of increasing shares of low-performing students and decreasing shares of high-performing students in mathematics.

In mathematics, only one economy, Macao (China), was able to simultaneously reduce its share of low-performing students and increase its share of high-performing students over the past decade. Three countries/economies decreased their share of low-performing students: North Macedonia, Peru and Qatar (North Macedonia can only compare PISA 2022 with 2015 results). In addition, Sweden and the United Arab Emirates increased their share of students at Level 5 and above.

Table I.6.5 summarises the information in Figure I.6.5 by grouping countries/economies according to the significance and direction of trends in the share of top-performing and low-performing students since PISA 2012. It presents similar information for reading and science.

Figure I.6.5. Percentage of low- and top performers in mathematics in 2012 and 2022



Notes: Only countries/economies that participated in the 2022 and either the 2012 or 2015 PISA assessments are shown.
When the base year is 2015, this is indicated next to the country/economy name.
The numbers at the bottom indicate statistically significant changes between the base year and 2022 in the share of students performing below Level 2 in mathematics; the numbers to the top indicate statistically significant changes in the share of students performing at or above Level 5.
Countries and economies are ranked in descending order of the percentage of students who scored at or above Level 5 in 2022.
Source: OECD, PISA 2022 Database, Table I.B1.5.1.

Table I.6.5. Change in the percentage of low- and top performers in mathematics, reading and science since PISA 2012

Countries/economies where the ...

... share of low-performing students (students scoring below Level 2) ...	...and the share of top-performing students (students scoring at Level 5 or 6)...	Mathematics	Reading	Science
... decreased ...	... increased	Macao (China)	Qatar, Uruguay	Peru, Qatar
	... did not change significantly	North Macedonia (15), Peru, Qatar	Peru	The Dominican Republic (15), Uruguay
	... decreased			
... did not change significantly ...	... increased	Sweden, the United Arab Emirates	Brazil, Chile, Colombia, the United States*	Brazil, Chile, Colombia, Kazakhstan, Macao (China), Sweden, Chinese Taipei, Türkiye, the United States*
	... did not change significantly	Colombia, Croatia, the Dominican Republic (15), Hungary, Israel, Japan, Kazakhstan, Latvia*, Lithuania, Montenegro, Serbia, Singapore, Türkiye, the United Kingdom*, Uruguay	Argentina, Croatia, the Czech Republic, the Dominican Republic (15), Ireland*, Italy, Lithuania, Macao (China), Malaysia, Malta (15), North Macedonia (15), Portugal, Romania, Serbia, Singapore, Sweden, the United Kingdom*	Argentina, Denmark*, Indonesia, Israel, Japan, Malaysia, Mexico, Montenegro, Portugal, Serbia, Singapore, the Slovak Republic
	... decreased	Chile, Ireland*, Chinese Taipei	Moldova (15)	Malta (15)
... increased ...	... increased		Kazakhstan, the United Arab Emirates	Korea, the United Arab Emirates
	... did not change significantly	Albania, Argentina, Brazil, Bulgaria, Costa Rica, the Czech Republic, Estonia, Georgia (15), Indonesia, Jordan, Kosovo (15), Malaysia, Moldova (15), Romania, the United States*	**OECD average**, Australia*, Austria, Canada*, Costa Rica, Denmark*, Estonia, Germany, Hungary, Indonesia, Israel, Korea, Kosovo (15), Latvia*, Mexico, Montenegro, New Zealand*, Norway, Poland, the Slovak Republic, Slovenia, Spain, Switzerland, Chinese Taipei	**OECD average**, Albania, Australia*, Austria, Belgium, Canada*, Costa Rica, Croatia, the Czech Republic, Estonia, France, Germany, Greece, Hungary, Kosovo (15), Latvia*, Lithuania, Moldova (15), the Netherlands*, New Zealand*, North Macedonia (15), Norway, Romania, Slovenia, Spain, Switzerland, Thailand, the United Kingdom*
	... decreased	**OECD average**, Australia*, Austria, Belgium, Canada*, Denmark*, Finland, France, Germany, Greece, Hong Kong (China)*, Iceland, Italy, Korea, Malta (15), Mexico, the Netherlands*, New Zealand*, Norway, Poland, Portugal, the Slovak Republic, Slovenia, Spain, Switzerland, Thailand	Albania, Belgium, Bulgaria, Finland, France, Georgia (15), Greece, Hong Kong (China)*, Iceland, Japan, the Netherlands*, Thailand, Türkiye	Bulgaria, Finland, Georgia (15), Hong Kong (China)*, Iceland, Ireland*, Italy, Poland

Notes: Only countries/economies that participated in the 2022 and either the 2012 or 2015 PISA assessments are shown.
Trend comparisons for Jordan are not reported in reading and science (see Annex A4).
When the base year is 2015, this is indicated next to the country/economy name.
Source: OECD, PISA 2022 Database, Tables I.B1.5.1, I.B1.5.2 and I.B1.5.3.

Average 10-year trend in performance, taking into account changes in enrolment rates

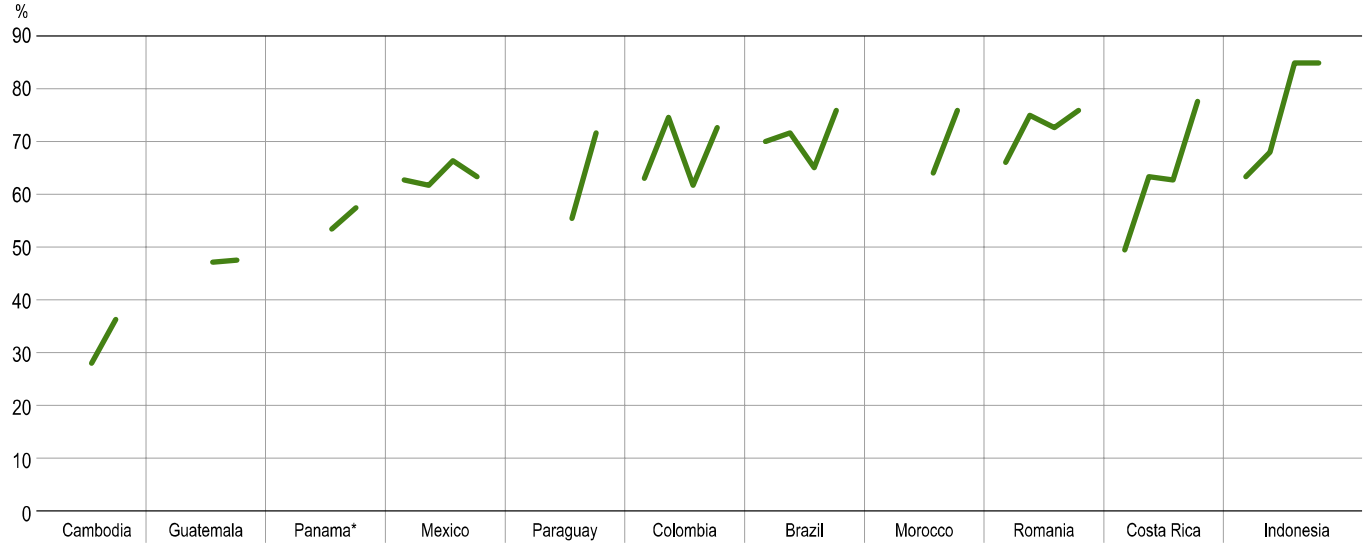
In most countries, all boys and girls who were born in 2006 were of the correct age to sit the PISA 2022 test (in countries that tested students in the second part of 2022, a 12-month period spanning the years 2006 and 2007 defined the eligible birthdates). However, age was not the only criterion for eligibility: 15-year-olds also had to be enrolled in seventh grade or higher at the time of testing.

This additional condition might seem redundant in high-income countries that had established universal, free, and, sometimes, compulsory primary and lower-secondary schooling many decades ago,[9] but because eligibility in PISA is determined by more than just a student's age, the PISA sample excludes 15-year-olds who do not go to school or are severely delayed in their school-grade progression. PISA results thus reflect a combination of 15-year-olds' access to education and the quality of the education they have received over the course of their lives.

Globally, enrolment in secondary education has continued to expand over the past decade in many countries. This expansion is also reflected in PISA data: in most of the 11 countries where fewer than two in three 15-year-olds were eligible to participate in past PISA assessments, there is now a marked increase in the number of 15-year-olds eligible for the test relative to all the 15-year-olds in the country. Between 2012 and 2022, Indonesia added more than 1.1 million students to the total population of 15-year-olds that could take the PISA test (the total population of 15-year-olds increased only by about 300 000 over the same period). Cambodia, Colombia, Costa Rica, Morocco, Paraguay and Romania also increased the number of 15-year-olds eligible to sit the PISA test despite stable or, in some cases, shrinking populations of 15-year-olds. As a result, PISA coverage – the proportion obtained by dividing the number of PISA-eligible students by the total number of 15-year-olds in a country – increased by about 10 percentage points in Cambodia, Colombia, Morocco and Romania; 16 percentage points in Paraguay; and more than 20 percentage points in Costa Rica and Indonesia.

Figure I.6.6. Change between 2012 and 2022 in the percentage of 15-year-olds covered by PISA

Selected countries; 2012, 2015 or 2018 to 2022.



Note: Only countries whose Coverage Index 3 (CI3) was below 66.6% in 2012, 2015 or 2018 are included in the figure.
Countries are ranked in ascending order of the percentage of 15-year-olds covered by the PISA sample (CI3) in 2022.
Source: OECD, PISA 2022 Database, Table I.B1.4.1.

There are many reasons why the social, economic and institutional barriers that kept many 15-year-olds out of school have come down. These include compulsory-schooling laws, income-support policies (such as conditional cash transfers), and wider changes in society and the economy, such as urbanisation. This welcome expansion in education opportunities makes it, however, more difficult to interpret how mean scores in PISA have changed over time. Increases in the share of PISA-eligible students relative to all 15-year-olds can lead to an underestimation of the real improvements education systems have achieved. Household surveys often show that children from poor households, rural areas, or ethnic minorities have a greater chance of not attending or completing lower secondary education (UNESCO, 2015[1]). Typically, as populations that had previously been excluded gain access to higher

levels of schooling, a larger proportion of low-performing students would be included in PISA samples (Avvisati, 2017[2]).

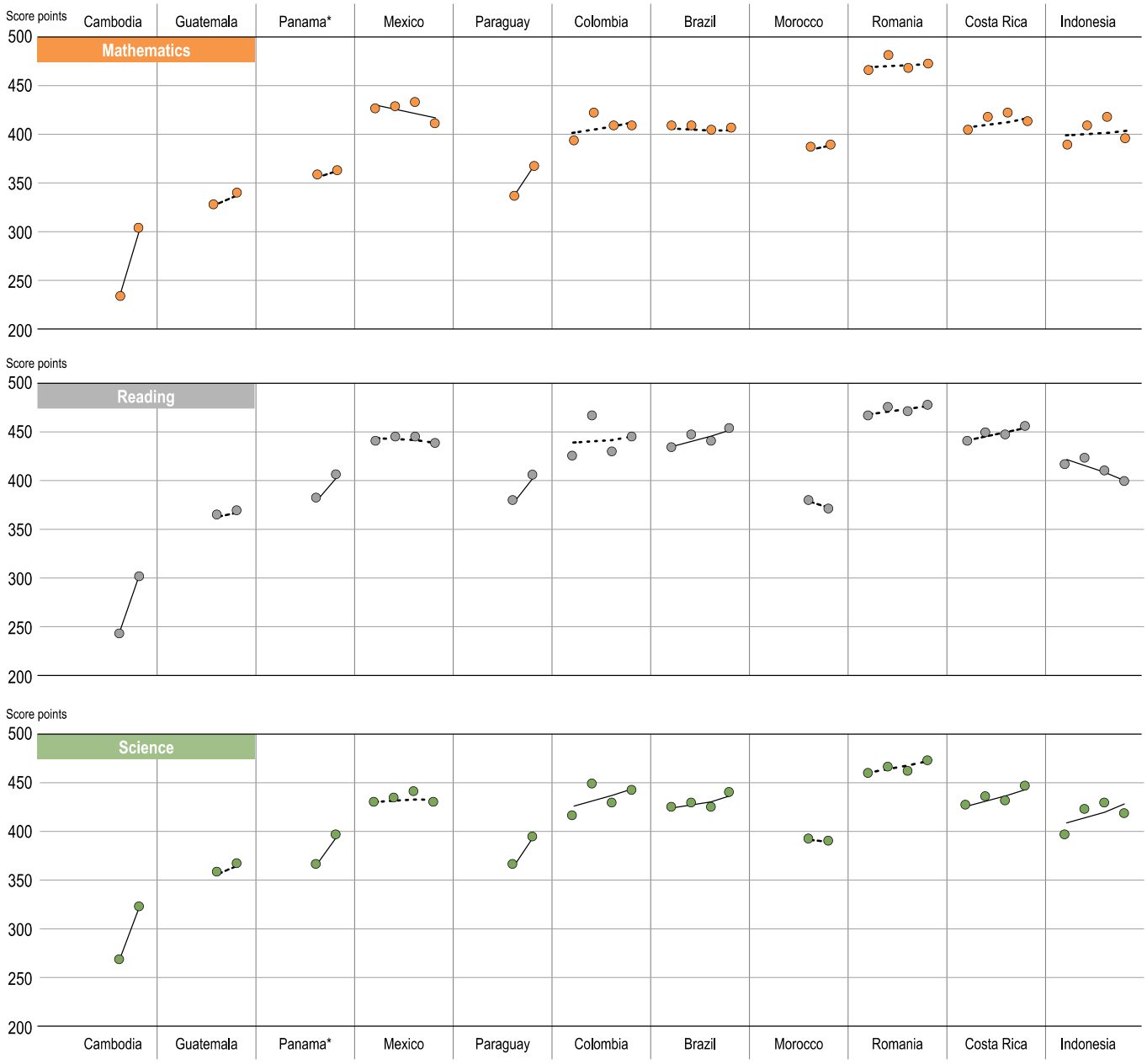
Just like the majority of countries and economies discussed in this chapter, many of these countries saw a declining trend over the past decade in two and, sometimes, all three subjects. Of the countries in which PISA coverage increased markedly, only Cambodia and Paraguay (whose first participation was as participants in the PISA for Development initiative in 2017) saw improvements in performance in at least one subject by 2022. Among those with a longer record of participation, only in Colombia did mean performance remain stable in all three subjects over the period – all other countries experienced falling mean scores in one subject at least.

Do these declines mean that the quality of education has gone down for all students in the past decade? Or, do they reflect the expansion of education to more marginalised populations? By considering a population equal in size to 25% of an age group made up of only the best-performing students in a country, it is possible to monitor the rate of change in PISA performance for a sample of 15-year-olds that was only indirectly affected by changes in coverage rates over a given period but whose composition remained unchanged. Most likely, all members of this group would have been eligible to participate in PISA even in the counterfactual situation of no educational expansion.[10] This analysis, reported in Figure I.6.7, offers a different reading of many of these countries' results. Minimum scores for 25% of top-performing 15-year-olds increased over this period in all three subjects in Cambodia and Paraguay. They improved in reading and science in Brazil and Panama*, and improved in science only in Colombia and Costa Rica. Minimum scores remained stable in all three subjects in Morocco and Romania. In Indonesia, science scores at the 75th percentile of young people improved, reading results deteriorated, and mathematics results remained stable over this period.

Summing up, among the seven countries that increased participation in secondary education over the 2012-2022 period, mean scores remained stable in Colombia; improved in one subject at least in Cambodia and Paraguay; and dropped in one subject at least in the remaining four (Costa Rica, Indonesia, Morocco and Romania). In all these cases, the decline in mean scores is linked to the integration of more 15-year-olds from marginalised populations into schooling. PISA results show that these education systems did not deteriorate and that expanding secondary education to more marginalised students did not compromise the quality of education for their more-advantaged peers.

Figure I.6.7. Linear trend in the minimum score attained by at least 25% of 15-year-olds since 2012

Selected countries; 2012, 2015 or 2018 to 2022



Note: Only countries whose Coverage Index 3 (CI3) was below 66.6% in 2012, 2015 or 2018 are included in the figure.
Dotted trend-lines indicate non-significant trends over the period considered.
Countries are ranked in ascending order of the percentage of 15-year-olds covered by the PISA sample (CI3) in 2022.
Source: OECD, PISA 2022 Database, Tables I.B1.4.1, I.B1.5.16, I.B1.5.17 and I.B1.5.18.

Changes in equity in education over the last decade

Long-term changes in socio-economic disparities

Table I.6.6 shows how the socio-economic gap in mathematics performance has evolved over time as well as how mathematics performance has evolved for advantaged and disadvantaged students. For each country/economy, a "10-year average trend" is computed based on every PISA assessment available since PISA 2012.

In most countries and economies (42 out of 62 with available data), the socio-economic gap has remained stable over the last decade. This includes, most importantly, 15 countries/economies where advantaged and disadvantaged students saw a decline in their performance; 13 countries/economies where the performance of advantaged and disadvantaged students did not change over time; and three countries/economies where advantaged and disadvantaged students improved their performance (North Macedonia, Qatar and Türkiye).

The socio-economic gap narrowed over the last decade in 12 countries/economies. In 11 of them, advantaged students saw a decline in their performance (the exception is Peru, where advantaged students' performance improved). Disadvantaged students' performance did not change in eight out of the 12 countries/economies where the socio-economic gap narrowed. It improved in one (Peru) and declined in another three (Denmark*, Greece and New Zealand*).

The socio-economic gap has widened over the last decade on average across OECD countries (by three score points) and in eight countries/economies. Except for Macao (China), all other countries where socio-economic disparities have increased on average over the last decade are European, which explains why the OECD average doesn't reflect the more widespread international trend of stable (not growing) socio-economic disparities in performance. Among countries/economies where the socio-economic gap in student performance has widened, the driving factor has been the decline in disadvantaged students' performance (six out of eight countries/economies), more than the improvement of advantaged students' performance (two out of eight countries/economies).

Table I.6.6. Change in the socio-economic gap in mathematics performance since 2012

Average decennial trend in mathematics performance across PISA assessments since 2012, by quarter of socio-economic status

	Advantaged students' performance **declined** and …	**Advantaged students'** performance **did not change** and …	**Advantaged students'** performance **improved** and …
…**disadvantaged students'** performance **declined**	The socio-economic gap ***narrowed***:		
	Denmark*, Greece, New Zealand*		
	The socio-economic gap ***did not change***:		
	Argentina, Australia*, Belgium, Bulgaria, Canada*, France, Germany, Hong Kong (China)*, Iceland, Korea, Mexico, Poland, Slovenia, Spain, Thailand	Austria, Croatia, the Czech Republic, Italy, Malaysia, Serbia, the Slovak Republic, the United States*	
	The socio-economic gap ***widened***:		
	OECD average-35, Finland, Norway	Estonia, the Netherlands*, Romania, Switzerland	
…**disadvantaged students'** performance **did not change**	The socio-economic gap ***narrowed***:		
	Chile, Georgia, Indonesia, Ireland*, Jordan, Malta, the United Arab Emirates, Uruguay		
	The socio-economic gap ***did not change***:		
	Portugal, Chinese Taipei	Brazil, Colombia, Hungary, Israel, Japan, Kazakhstan, Kosovo, Latvia*, Lithuania, Moldova, Montenegro, Singapore, the United Kingdom*	
	The socio-economic gap ***widened***:		
			Macao (China), Sweden
…**disadvantaged students'** performance **improved**	The socio-economic gap ***narrowed***:		
			Peru
	The socio-economic gap ***did not change***:		
		The Dominican Republic	North Macedonia, Qatar, Türkiye
	The socio-economic gap ***widened***:		

Notes: Only countries/economies that participated in the 2022 and either the 2012 or 2015 PISA assessments are shown.
OECD average-35 refers to the average across OECD countries, excluding Costa Rica, Luxembourg and Spain.
Source: OECD, PISA 2022 Database, Table I.B1.5.19.

Long-term changes in gender disparities

Table I.6.7 shows trends in the gender gap in mathematics performance as well as trends in girls' and boys' mathematics performance since 2012. The gender gap is measured here by the score difference in mathematics between boys and girls (boys – girls); thus, positive values for this difference indicate a gap in favour of boys and negative values indicate a gap in favour of girls. In addition, notice that when the gender gap narrows it means that the gap becomes more favourable to girls, and when it widens it means that the gap becomes more favourable to boys. Regardless of the trend in the gap, the gender gap can favour girls or boys or not be significant in PISA 2022.

The gender gap in mathematics performance has not changed over the last decade in most PISA-participating countries/economies (53 out of the 64 with comparable data). This includes 26 countries/economies where girls and boys have seen a decline in their performance; 16 countries/economies where the performance of boys and girls has not changed over time; and five countries/economies where boys and girls have improved their performance (the Dominican Republic, North Macedonia, Peru, Qatar and Türkiye). In half of the 53 countries/economies where the gender gap has not changed since 2012, boys outperformed girls in PISA 2022 whereas in seven of them girls outperformed boys (Dominican Republic, Finland, Jordan, Malaysia, North Macedonia, Qatar and the United Arab Emirates).

The gender gap has changed over the last decade in another eleven countries/economies. In eight of them the gap has narrowed (Albania, Brazil, Chile, Colombia, Costa Rica, Indonesia, Kosovo and Spain) and it has widened in three (Latvia*, Macao [China] and Singapore).

On average across OECD countries, the gender gap has narrowed over the last decade by 3 score points. The gender gap has narrowed by 15 score points in Albania (the most) and 7 points (the least) in Costa Rica and Spain on average since 2012. In countries/economies where the gender gap has narrowed, this is due to declines in boys' performance more than to improvements in girls' performance. Girls' performance has not improved over the last decade in any of the eight countries/economies where the gender gap narrowed; in five of them (Brazil, Chile, Colombia, Indonesia and Kosovo) girls' performance has not changed and in three (Albania, Costa Rica and Spain) it has declined. Out of the eight countries/economies where the gender gap has narrowed over the last decade, girls outperformed boys in PISA 2022 in two (Albania and Indonesia), and boys outperformed girls in five (Brazil, Chile, Colombia, Costa Rica and Spain).

The gender gap in performance has widened in Singapore (by 15 points on average since 2012) because boys' performance has improved while girls' performance has remained stable over time. In Macao (China), the gap has widened because boys' performance has improved more than girls' performance (which has also improved). In Latvia*, the gender gap has widened because girls' performance has declined while boys' performance has remained stable. In the three countries/economies where the gender gap has widened over the last decade, boys outperformed girls in PISA 2022.

Table I.6.7. Change since 2012 in mean performance in mathematics, by gender

Average decennial trend in mathematics performance across PISA assessments since 2012, by gender

	Boys' performance **declined** and …	**Boys'** performance **did not change** and …	**Boys'** performance **improved** and …
…**Girls'** performance **declined**	The gender gap ***narrowed***:		
	OECD average (b), Albania (g), Costa Rica (b), Spain (b)		
	The gender gap ***did not change***:		
	Australia* (b), Austria (b), Belgium, Bulgaria, Canada* (b), Denmark* (b), Finland (g), France (b), Germany (b), Greece, Hong Kong (China)* (b), Iceland, Italy (b), Jordan (g), Korea, Malta, Mexico (b), the Netherlands* (b), New Zealand* (b), Norway, Poland, Portugal (b), Romania, Slovenia, Switzerland (b), Thailand	Estonia (b), Georgia, the United States* (b)	
	The gender gap ***widened***:		
		Latvia* (b)	
…**Girls'** performance **did not change**	The gender gap ***narrowed***:		
	Brazil (b), Chile (b), Indonesia (g), Kosovo	Colombia (b)	
	The gender gap ***did not change***:		
	Argentina (b), Ireland* (b), the Slovak Republic	Croatia, the Czech Republic (b), Hungary (b), Israel (b), Japan (b), Kazakhstan, Lithuania (b), Malaysia (g), Moldova, Montenegro, Serbia (b), Sweden, Chinese Taipei, the United Arab Emirates (g), the United Kingdom* (b), Uruguay (b)	
	The gender gap ***widened***:		
			Singapore (b)
…**Girls'** performance **improved**	The gender gap ***narrowed***:		
	The gender gap ***did not change***:		
			The Dominican Republic (g), North Macedonia (g), Peru (b), Qatar (g), Türkiye
	The gender gap ***widened***:		
			Macao (China) (b)

Notes: Only countries/economies that participated in the 2022 and either the 2012 or 2015 PISA assessments are shown.
The gender gap is measured in this table by the score difference in mathematics between boys and girls (boys – girls). This means that, in any particular PISA cycle, positive values for this difference indicate a gap in favour of boys and negative values indicate a gap in favour of girls. Thus, when interpreting trends in the gender gap between PISA cycles, notice that when the gender gap narrows it means that the gap becomes more favourable to girls, and when it widens it means that the gap becomes more favourable to boys. Regardless of the trend in the gap, the gender gap can favour girls or boys or not be significant in PISA 2022.
The letter "g" in parenthesis next to the country name means that girls' performance in mathematics is higher than boys' performance in PISA 2022. The letter "b" means that boys perform higher than girls. No letter next to the country name means that the difference in mathematics performance between boys and girls in PISA 2022 is not statistically significant (see Annex A3).
Source: OECD, PISA 2022 Database, Tables I.B1.5.38, I.B1.5.39 and I.B1.5.40.

Table I.6.8. Long-term trends in performance and equity in education Chapter 6 figures and tables

Figure I.6.1	Trends in performance in mathematics, reading and science since the first PISA assessment
Figure I.6.2	Trajectories of average performance in mathematics across PISA assessments
Table I.6.1	Trajectories of average performance in reading across PISA assessments
Table I.6.2	Trajectories of average performance in science across PISA assessments
Figure I.6.3	Trends in performance in mathematics, reading and science since 2012
Table I.6.3	Trends in mean performance in mathematics, reading and science since 2012
Table I.6.4	Change in performance distribution in mathematics, reading and science since the first PISA assessment
Figure I.6.4	Average decennial trend in mathematics for high- and low-achieving students (2012-2022)
Figure I.6.5	Percentage of low- and top performers in mathematics in 2012 and 2022
Table I.6.5	Change in the percentage of low- and top performers in mathematics, reading and science since PISA 2012
Figure I.6.6	Change between 2012 and 2022 in the percentage of 15-year-olds covered by PISA
Figure I.6.7	Linear trend in the minimum score attained by at least 25% of 15-year-olds since 2012
Table I.6.6	Change in the socio-economic gap in mathematics performance since 2012
Table I.6.7	Change since 2012 in mean performance in mathematics, by gender

StatLink https://stat.link/lsncy9

Notes

[1] Out of all countries and economies that participated in PISA 2022, 64 can compare their results in mathematics, reading and science performance to at least one assessment *prior to* PISA 2018 (i.e. with PISA 2015 or earlier assessments and over a period of seven years or more). Jordan can compare its results only in mathematics; results in reading and science from prior assessments were not deemed fully comparable to those in 2022 (see Annex A4). The methodology underpinning the analysis of trends in performance in this chapter is detailed in Annex A7.

[2] In order to allow for fair comparisons across subjects and countries, this chapter emphasises, next to the "longest possible trends", trends between 2012 and 2022 (i.e. over a decade including up to four PISA assessments). When the emphasis is on comparisons across countries and subjects, such trends allow to control for differences in the reference period. In some cases, even this shorter reference period had to be adjusted for some countries/economies and subjects due to the unavailability of data; this is explicitly signalled in figures throughout this chapter.

[3] In 2022, four countries continued to assess students using pen-and-pencil tests. Three of these (Cambodia, Guatemala and Paraguay) participated for the first time in PISA in 2017 as part of the PISA for Development initiative; trends between their first participation in PISA and 2022 are discussed in the previous chapter. Changes in enrolment and PISA coverage, and their effects on PISA performance are discussed in this chapter for all countries to provide a wider comparative perspective. Viet Nam participated in all PISA assessments since 2012, using the same paper-based test in each cycle; however, because response patterns in 2022 in all subjects deviated significantly from those observed in Viet Nam in earlier assessments, no reliable trend could be established for Viet Nam and comparisons of scale scores to those reported in past assessments are not discussed in this chapter.

[4] The overall direction of a trend is estimated by the linear trend. This represents the average change in student performance per unit of time (a 10-year interval is chosen in this chapter) observed over the entire period for which data are available. The exact period may vary depending on the country and the subject assessed. Because the rate of change is reported over intervals of 10 years, the linear trend is referred to as the "decennial or 10-year trend" in this chapter. For countries and economies that have participated in all PISA assessments, the average decennial trend computed over the longest period takes into account up to eight points in time (for reading); for those countries

that have data that were deemed comparable for fewer assessments, the average decennial trend takes into account only the comparable and available information.

[5] Non-linear trend trajectories are estimated using a regression model by fitting a quadratic function to the five, six or seven mean estimates available and taking into account the statistical uncertainty associated with each estimate as well as with comparisons over time (see Annex A7). Trajectories are classified as steadily positive (negative) or flat if the curvature (the quadratic coefficient) is not significant. This regression-based measure is a more robust measure of a country's/economy's trajectory in performance than the successive comparison of mean scores across consecutive assessments because it is less sensitive to one-time statistical fluctuations that may alter a country's/economy's mean performance estimate.

[6] Moldova only participated in four assessments up to 2022 (in 2010, 2015, 2018 and 2022), and is therefore not included in the figures and tables which examine curvilinear trajectories.

[7] This discussion only considers changes that were statistically significant. In most cases, estimates of percentiles are subject to greater uncertainty than estimates of means. Just like changes in mean performance, changes in percentiles over time are also subject to link errors; in contrast, link errors can be ignored in the estimation of changes in the inter-decile range (i.e. when determining whether the distribution narrowed or widened). For this reason, it is sometimes possible to conclude that the performance distribution widened even if neither the 10th nor the 90th percentile exhibit significant changes.

[8] In this section, the proportions of students at Level 5 and above, and below Level 2, are compared across countries over the same period (2012 to 2022). Due to updates to the assessment framework, the specific abilities that define top-performing and low-achieving students differ slightly between the reference year and 2022 but the same cut-off scores on the equated scales were used to define and compare proficiency levels.

[9] The *International Covenant on Economic, Social and Cultural Rights* adopted by the United Nations General Assembly on 16 December 1966 recognises the right of everyone to free primary education and commits its parties to work towards introducing free education at secondary and higher levels (UN General Assembly, 16 December 1966[3])

[10] The interpretation of these trends requires the additional hypothesis that all 15-year-olds who were excluded from participation in PISA in past cycles (mostly because they were not in secondary school at age 15) would not have scored above the "adjusted 75th percentile" if they had sat the test. In other words, this analysis relies on the hypothesis that, while the skills and ability of the 15-year-olds who were not eligible to participate in PISA may vary, this variation is bounded below the 75th percentile of the distribution of 15-year-olds' performance in the subjects assessed by PISA. In particular, 15-year-olds who were not in school or were below Grade 7 at the time of the PISA test would not have scored among the country's top quarter had they sat the PISA test. No assumption is made about how well these 15-year-olds would have scored if they had received the additional schooling that would have made them eligible to sit the PISA test. If some non-eligible 15-year-olds had had greater skills than assumed in this analysis, the 75th percentile estimates on which this analysis is based are, in reality, lower bounds on the *true* 75th percentiles. As the selectivity of PISA samples is attenuated (i.e. Coverage Index 3 increases), the lower bounds can be expected to move closer to the true value. In that context, the reported changes and trends may overestimate the *true* changes and trends. For a discussion of non-parametric methods for partial identification of trends in the presence of selection, see Blundell et al. (2007[4]).

It is impossible to know for certain what the PISA score of 15-year-olds who were not enrolled in school or who were still in Grades 1 through 6 would have been, had they been tested. Without attributing an exact score to these students, it is nevertheless possible to assume with some confidence that they would have scored in the bottom part

of a country's performance distribution (Hanushek and Woessmann, 2008[7]; Spaull and Taylor, 2015[5]; Taylor and Spaull, 2015[6])

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7 Immigrant background and student performance

This chapter examines the mathematics and reading performance of students with an immigrant background in PISA-participating countries and economies. It investigates who these students are and how their circumstances (i.e. socio-economic status and linguistic background) relate to their performance in mathematics and reading. The chapter also explores performance gap trends in terms of immigrant background.

For Australia, Canada, Denmark, Hong Kong (China), Ireland, Jamaica, Latvia, the Netherlands, New Zealand, Panama, the United Kingdom and the United States, caution is required when interpreting estimates as one or more PISA sampling standards were not met (see Reader's Guide, Annexes A2 and A4).

What the data tell us

- Immigrant students scored higher in mathematics than non-immigrant students in eight countries/economies before accounting for students' backgrounds; in 17 countries/economies once students' socio-economic status had been accounted for; and in 16 countries/economies once students' socio-economic status and the language they speak at home had been accounted for. Non-immigrant students scored higher in mathematics than immigrant students in 22 countries/economies but only in eight once students' socio-economic status and the language they speak at home had been accounted for. Similar relationships are observed between students' immigrant backgrounds and performance in reading.
- Disparities in mathematics performance by immigrant background did not change between 2018 and 2022 in most countries/economies with comparable PISA data. The mathematics performance gap shifted in favour of immigrant students in Canada*, Kazakhstan and the United Kingdom*. In Canada*, the gap was not significant in 2018 but immigrant students outperformed their non-immigrant peers in mathematics in 2022. In Kazakhstan and the United Kingdom*, a gap in favour of non-immigrants in PISA 2018 narrowed into a statistically insignificant gap in 2022. By contrast, in Saudi Arabia the performance gap in favour of non-immigrant students narrowed by 15 percentage points because non-immigrant students' performance improved and immigrant students did not change between 2018 and 2022.
- The share of socio-economically disadvantaged students is greater among immigrant than non-immigrant students on average across OECD countries and in 28 countries and economies (not counting countries/economies with less than 5% of immigrant students). In eight countries and economies, however, it is greater among non-immigrant students (Brunei Darussalam, Malta, Montenegro, Qatar, Saudi Arabia, Serbia, Singapore and the United Arab Emirates). In another four countries and economies, the share of disadvantaged students is not statistically significantly different by immigration background.
- The share of immigrant students has remained predominantly stable in most PISA-participating countries since 2012 but increased in 20 countries/economies and declined in five. On average across OECD countries, the share of 15-year-old students with an immigrant background is 13%. In 21 of the 81 countries and economies in PISA 2022, the share of immigrant students is higher than 15% and in 11 of them it is higher than 25%. In 40 countries and economies, students with an immigrant background comprise less than 5% of the 15-year-old student population.

A fair education system gives students with an immigrant background an equal opportunity to thrive at school and realise their full learning potential. This chapter examines the extent to which the countries and economies that participated in PISA 2022 ensure that all students are on a level playing field regardless of their immigrant backgrounds.

Overall, results in this chapter show that non-immigrant students tend to outperform immigrant students in all PISA subjects in most (but not all) countries. However, this gap in performance in favour of non-immigrant students can be explained to a large extent by the socio-economic and linguistic barriers that immigrant students face. Once socio-economic status and language spoken at home are taken into account in the analysis, it turns out that immigrant students outperform non-immigrant students in more countries/economies than where the opposite is true. What's more, there are countries/economies that combine large shares of students with an immigrant background and high average levels of performance (Canada*, Hong Kong [China]*, Macao [China] and Switzerland). This finding goes against the common misconception that the more immigrant students there are, the lower performance is. PISA results show that it remains a challenge for education systems to create school environments that are accepting of diversity, multiculturalism and immigrant students[1].

Students with an immigrant background in PISA

PISA defines immigrant students as students whose mother and father were both born in a country/economy other than that where the student took the PISA test. Non-immigrant students are students who have at least one parent born in the country of assessment.

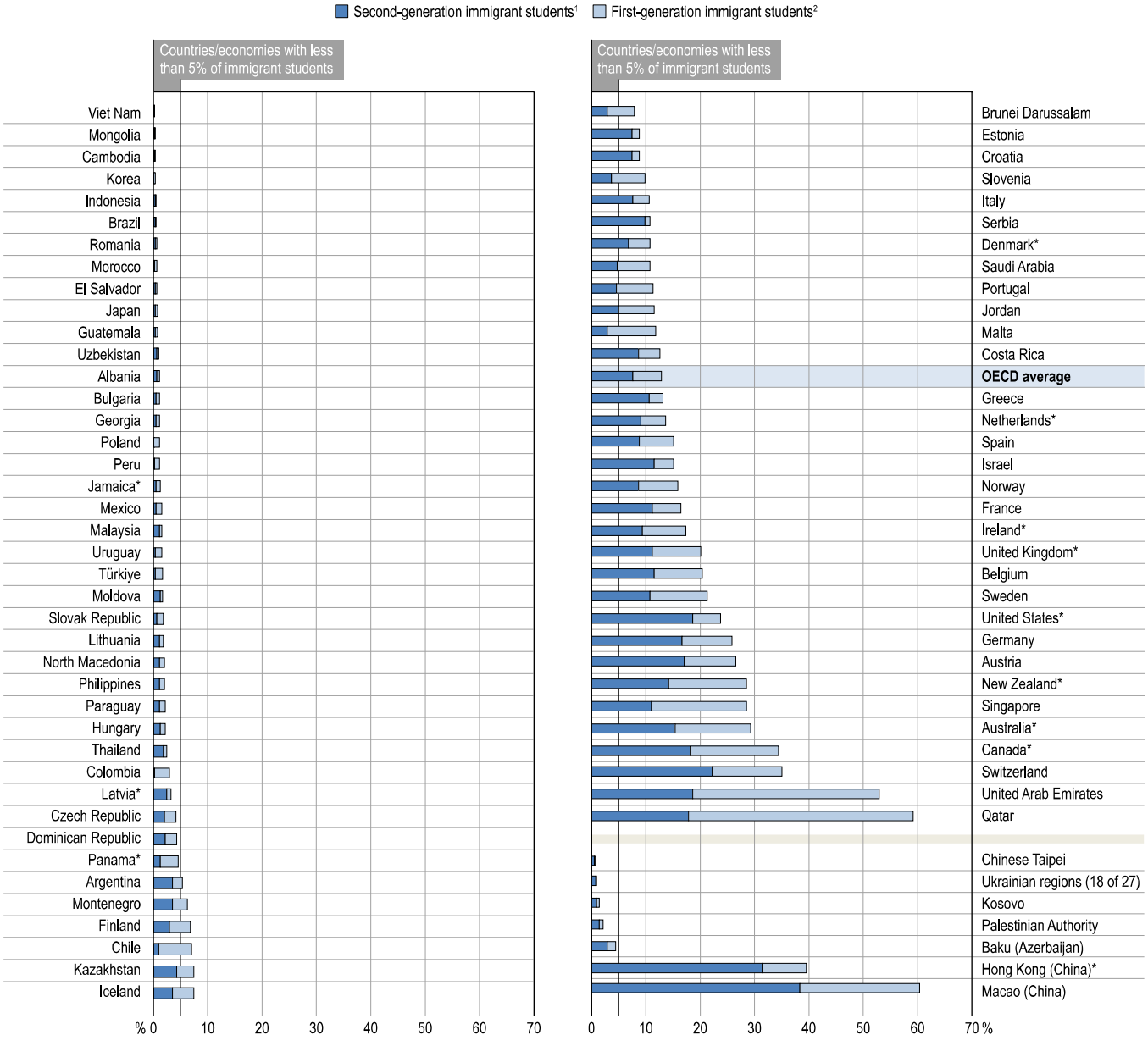
Education systems around the world vary greatly in terms of how large their immigrant student population is (Figure I.7.1). In about half of the countries and economies in PISA 2022 (40 out of 80), the share of 15-year-old students with an immigrant background is small (less than 5%). But in 20 countries and economies, the share of immigrant students is higher than 15%; in 11 countries and economies it is higher than 25%; and in Macao (China), Qatar and the United Arab Emirates more than half of students have an immigrant background. On average across OECD countries, 13% of students have an immigrant background.

Students with an immigrant background can be distinguished between first- and second-generation immigrants. First-generation immigrants are students born outside the country of assessment and whose parents were also born outside the country of assessment. Second-generation students are students born *in* the country of assessment but whose parent(s) were born outside the country of assessment.

The share of second-generation immigrants is 8% and the share of first-generation immigrants 5% on average across OECD countries in PISA 2022 (Figure I.7.1). In 36 countries and economies there are more second-generation than first-generation immigrant students although in most cases the difference in the share of second- and first-generation immigrant students is small (i.e. five percentage points or fewer)[2]. The share of second-generation immigrant students is more than 10 percentage points more than the share of first-generation immigrant students only in the United States*, Macao (China) and Hong Kong (China)* (in ascending order).

By contrast, there are more first- than second-generation immigrant students in 20 countries and economies but only in Chile, Malta, Qatar, Singapore and the United Arab Emirates is the share of first-generation immigrant students larger by more than 5%.

Figure I.7.1. Students with an immigrant background



1. Second-generation immigrant students are those born in the country of assessment but whose parent(s) were born in another country.
2. First-generation immigrant students are those born outside the country of assessment and whose parents were also born in another country.
Countries and economies are ranked in ascending order of the share of students with an immigrant background.
Source: OECD, PISA 2022 Database, Table I.B1.7.1

Figure I.7.2 shows that the percentage of immigrant students has remained stable in most PISA-participating countries since 2012. Only countries where more than 5% of students have an immigrant background in 2022 are represented in the figure.

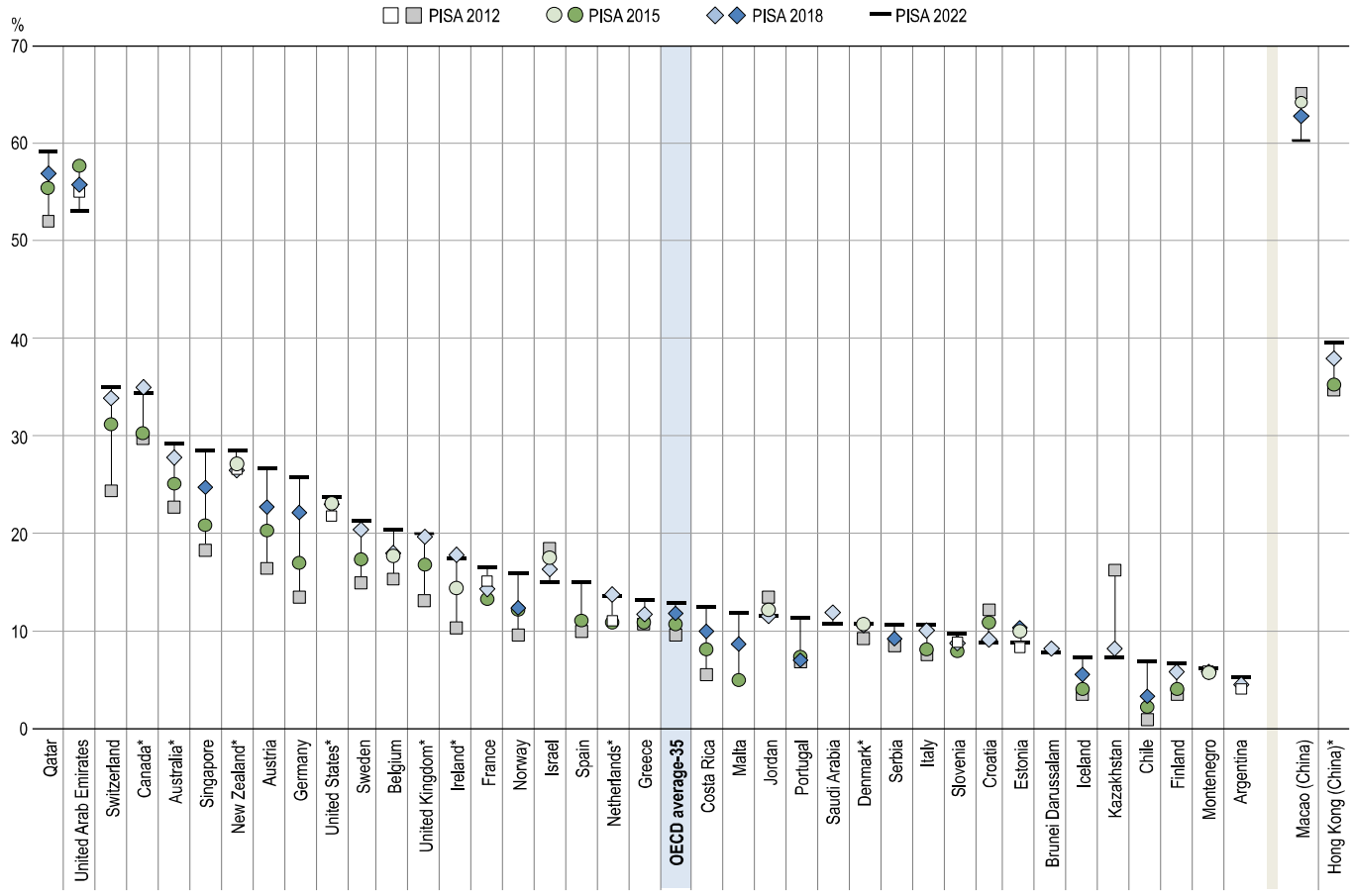
Between PISA 2018 and 2022, the percentage of immigrant students increased on average across OECD countries and in 11 out of 40 countries/economies included in Figure I.7.2. However, in most of these countries/economies the margin of increase was small – between one and four percentage points.

In Portugal, where the share of immigrant students saw the largest increase, the share of immigrant students was 7% in PISA 2018 and 11% in PISA 2022 (a four percentage-point increase).

When considering changes over the last decade (i.e. between 2012 and 2022), 23 out of 40 countries with more than 5% of students participating in PISA 2022 show increases in their share of students with an immigrant background. The share of immigrant students increased in this period by between 10 and 12 percentage points in Austria, Germany, Singapore and Switzerland. In these four countries, the increase in immigrant students is due to an increase in the share of both first- and second-generation immigrant students.

The share of immigrant students has rarely declined among PISA-participating countries. Between 2018 and 2022, it declined in only three countries/economies (Estonia, Macao [China], the United Arab Emirates) and never by more than three percentage points. Between 2012 and 2022, the share of immigrant students declined in five countries (Croatia, Israel, Jordan, Kazakhstan and Macao [China]) and never by more than nine percentage points.

Figure I.7.2. Change between 2012, 2015, 2018 and 2022 in the percentage of students with an immigrant background



Notes: Statistically significant differences in the share of immigrant students between PISA 2022 and previous cycles are shown in a darker tone (see Annex A3).
Countries/Economies where less than 5% of students have an immigrant background in 2022 are not represented in the figure.
Countries and economies are ranked in descending order of the share of immigrant students in 2022.
Source: OECD, PISA 2022 Database, Tables I.B1.7.1, I.B1.7.2, I.B1.7.3 and I.B1.7.4

Immigrant students and socio-economic status[3]

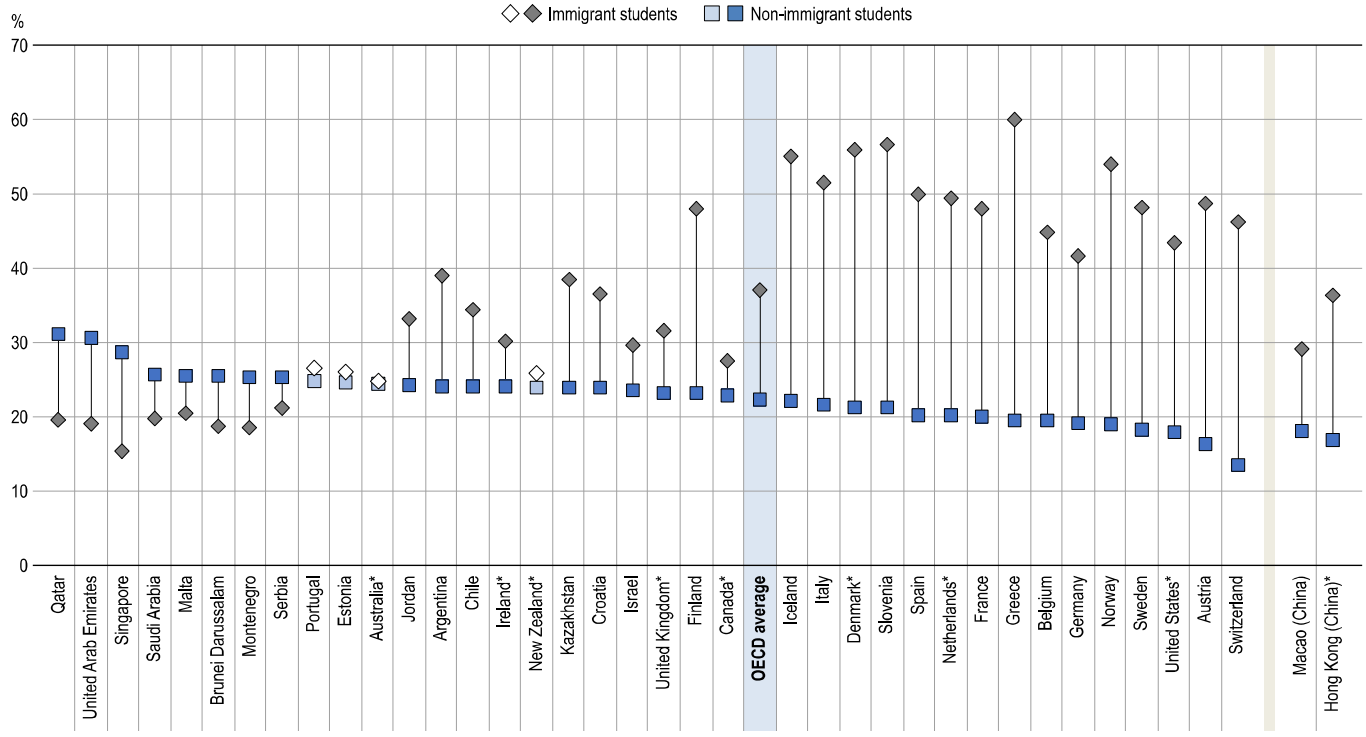
Students with an immigrant background typically have a more disadvantaged socio-economic profile than non-immigrant students[4].

As shown in Figure I.7.3, the share of disadvantaged students is almost 37% among immigrant students and 22% among non-immigrant students on average across OECD countries. In Greece, Norway and Slovenia the difference in the share of disadvantaged students by immigration background is the largest among countries and economies in PISA 2022 (more than 35 percentage points more among immigrant students).

There are, however, eight countries and economies where the opposite is observed. The largest differences are found in Qatar, Singapore and the United Arab Emirates, where the share of disadvantaged students is greater among non-immigrant than immigrant students by more than 10 percentage points.

In another four countries, the share of disadvantaged students is not statistically significantly different by immigration background.

Figure I.7.3. Percentage of disadvantaged students, by immigrant background



Notes: Statistically significant differences in share of disadvantaged students are shown in a darker tone (see Annex A3).
Countries/Economies where less than 5% of students have an immigrant background are not represented in the figure.
Socio-economic status is measured by the PISA index of economic, social and cultural status.
Countries and economies are ranked in descending order of the share of disadvantaged students among non-immigrant students.
Source: OECD, PISA 2022 Database, Table I.B1.7.5.

Immigrant students and language spoken at home

This section[5] shows that most students with an immigrant background speak a language at home that is different from the language in which they took the PISA assessment. This is truer for first-generation than second-generation immigrants. There are also many countries where the share of students with an immigrant background who speak a different language at home has increased over the last decade and in recent years. This is important for policy and educators because lower proficiency in the language spoken at school can hinder immigrant students from fully integrating. This language barrier can be particularly hard to overcome for first-generation immigrant students who were born (and in some cases completed part of their education) in countries where the language is different from that of the host country.

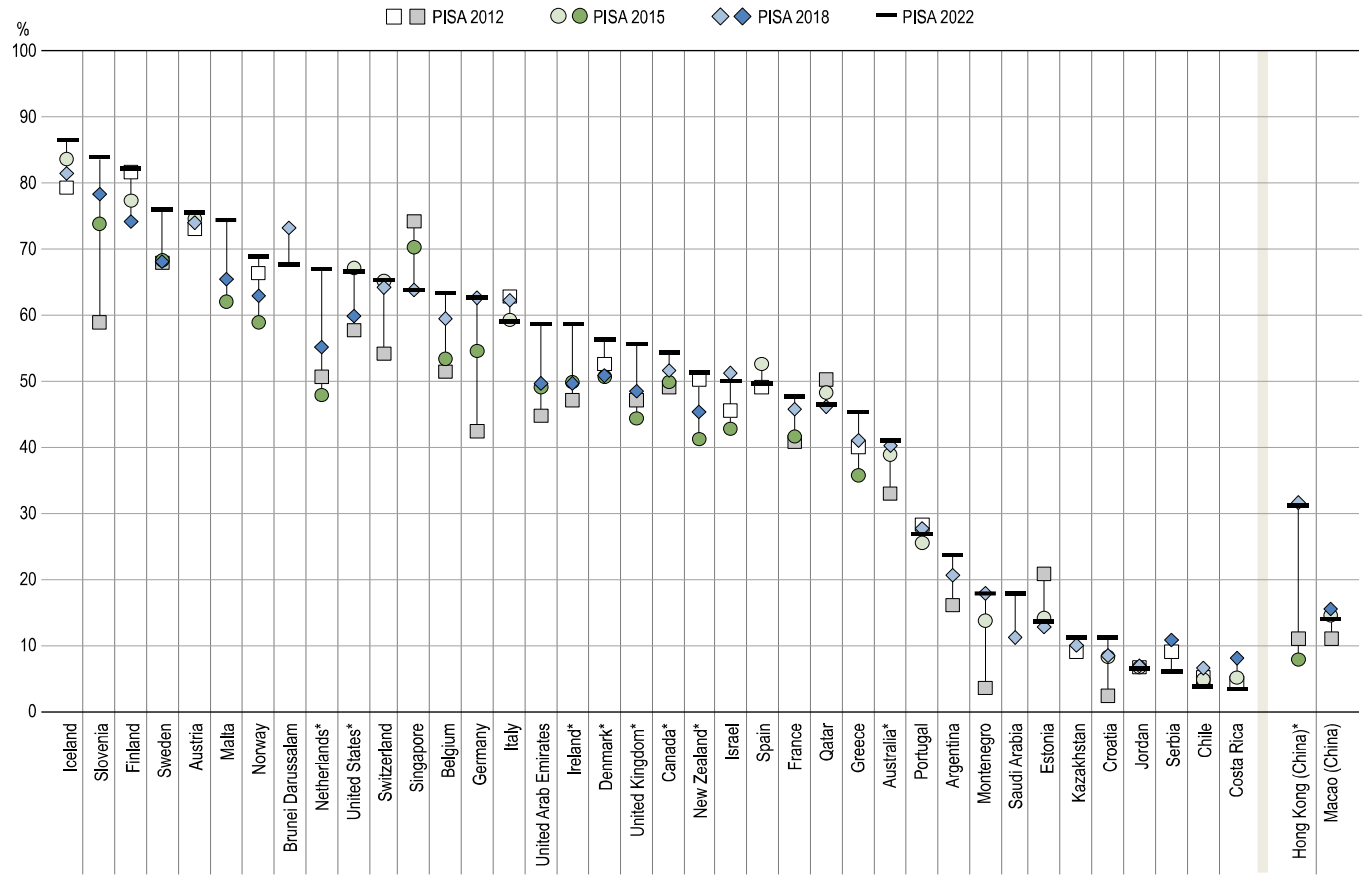
In 2022 and earlier assessments, PISA asked students what language they spoke at home most of the time. On average across OECD countries in PISA 2022, 11% of all students (regardless of their immigrant background) speak a language at home that is different from the language in which they took the PISA assessment (Table I.B1.7.9). This proportion is greater among immigrant students than non-immigrant students on average across OECD countries (47 percentage points difference) and in 62 out of 77 countries/economies with available data (i.e. this latter count includes countries/economies with less than 5% of immigrant students). This difference ranged from two percentage points in Jordan to 84 percentage points in Iceland.

Among first-generation immigrant students, the percentage of students who mainly speak another language at home is 62% on average across OECD countries whereas it is 44% among second-generation immigrant students (Table I.B1.7.9). In the Czech Republic, Iceland, Morocco, and Slovenia, more than 90% of first-generation immigrant students reported that they mainly speak another language at home. In Brunei Darussalam, Austria, Finland and Iceland, more than 70% of second-generation immigrant students mainly speak another language at home.

In terms of changes over time, the share of immigrant students who mainly speak another language at home has not changed between PISA 2018 and 2022 in 24 out of 39 countries/economies included in Figure I.7.4 (i.e. only countries/economies with at least 5% of students with an immigrant background in 2022). It has increased in 12 countries/economies and decreased in three (Costa Rica, Macao [China] and Serbia).

When considering long-term trends between 2012 and 2022, the share of immigrant students who mainly spoke another language at home did not change in 16 out of 37 countries/economies with available data. It increased in 18 countries/economies and decreased in three (Estonia, Qatar and Singapore).

Figure I.7.4. Change between 2012, 2015, 2018 and 2022 in the percentage of students who do not speak the language of assessment at home



Notes: Statistically significant differences in the share of immigrant students who do not speak the language of assessment at home between PISA 2022 and previous cycles are shown in a darker tone (see Annex A3).

Countries/Economies where less than 5% of students have an immigrant background in 2022 are not represented in the figure.

Countries and economies are ranked in descending order of the share of immigrant students who do not speak the language of assessment at home in 2022.

Source: OECD, PISA 2022 Database, Tables I.B1.7.9, I.B1.7.10, I.B1.7.11 and I.B1.7.12.

First-generation immigrant students and age at arrival

First-generation immigrants who take the PISA test arrive in the host country at different ages. Some arrive in their early childhood, that is, by age 5 or before ("early arrivers" as they will be referred to in this chapter). Others arrive as late as age 12 or later (these will be referred to as "late arrivers"). Early arrivers are immigrant students who started primary school and completed most of their compulsory education in their host country. Late arrivers completed several years of schooling before moving to their host country. Late arrivers are more likely to face language barriers and experience disruption because they must adapt to a different education system (Cerna, Brussino and Mezzanotte, 2021[1]).

On average across OECD countries in PISA 2022, the percentage of first-generation immigrant students who arrived at their host country/economy at or before age 5 (early arrivers) is 34%; 29% arrived after age 12 (late arrivers) (Table I.B1.7.13). There is, however, wide variation in these percentages, as shown in Figure I.7.5. For example, in Greece and Kazakhstan, the share of early arrivers is as high 60% and the share of late arrivers as low as roughly 15%. By contrast, in Chile and Portugal the share of early arrivers is as low as roughly 15% and the share of late arrivers as high as more than half of all first-generation immigrant students.

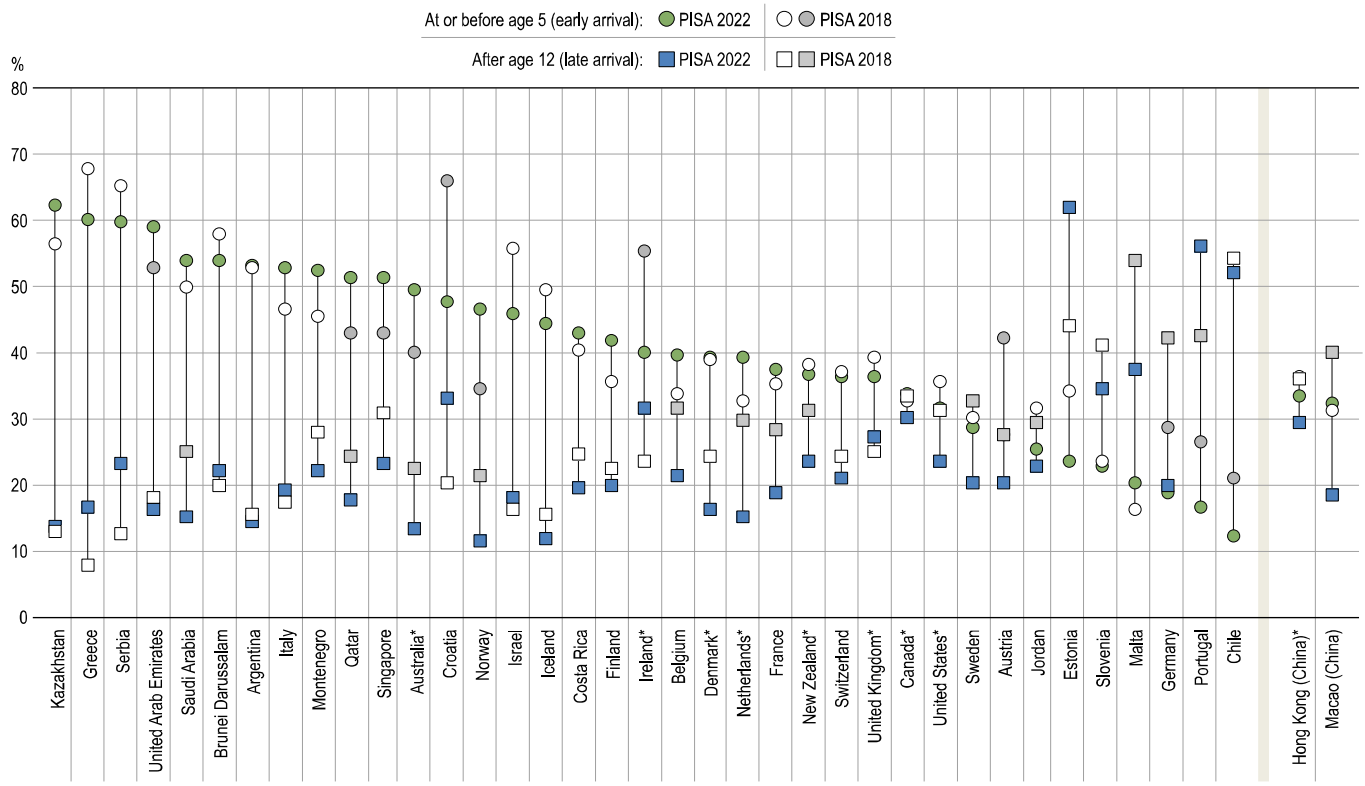
In Chile, only 1% of students had an immigrant background in PISA 2012; this percentage has increased slowly but persistently across PISA assessments, reaching 7% in PISA 2022. Most immigrant students in Chile are, therefore, first-generation immigrants. Back in PISA 2012, a little less than half of first-generation immigrant students arrived in Chile between the ages of 6 and 11 ("mid-arrivers"). But a gradual increase in the share of late arrivers along with a decrease in the share of early arrivers has been happening in Chile since 2012. In PISA 2022, 52% of first-generation immigrants are later arrivers, 36% are mid-arrivers and 12% are early arrivers in Chile. These trends in the composition of immigrant students occur in the larger context of recent immigration trends in Chile, which has seen large influxes of newcomers, including asylum seekers, from Latin American countries (especially Colombia, Haiti and Venezuela)[6].

Between PISA 2018 and PISA 2022, the composition of first-generation immigrants remained stable in most of the 39 countries/economies with available data included in Figure I.7.5. In 28 countries/economies, the share of early arrivers did not change in this period; similarly, in 24 countries/economies the share of late arrivers did not change. However, in countries where this composition has changed over time, the predominant trend is a decline in early and late arrivers, and an increase in mid-arrivers, i.e. those who arrived at ages 6-11 (Table I.B1.7.15).

Between PISA 2012 and 2022, the share of early arrivers decreased in 12 out of 41 countries/economies with available data and increased in eight (Table I.B1.7.16). In the same period, the share of late arrivers increased in 13 countries/economies and decreased in seven.

Figure I.7.5. Change between 2018 and 2022 in age of arrival of immigrant students

Percentage of first-generation immigrant students who arrived in the country at or before age 5 or at age 12 or later



Notes: Statistically significant differences in the share of immigrant students who arrived at or before the age of 5 or after age 12 between PISA 2018 and PISA 2022 are shown in a darker tone (see Annex A3).

Countries/Economies where less than 5% of students have an immigrant background in 2022 are not represented in the figure.

Countries and economies are ranked in descending order of the share of immigrant students who arrived at or before the age of 5 in 2022.

Source: OECD, PISA 2022 Database, Tables I.B1.7.13, I.B1.7.14 and I.B1.7.15.

Disparities in student performance by immigrant background

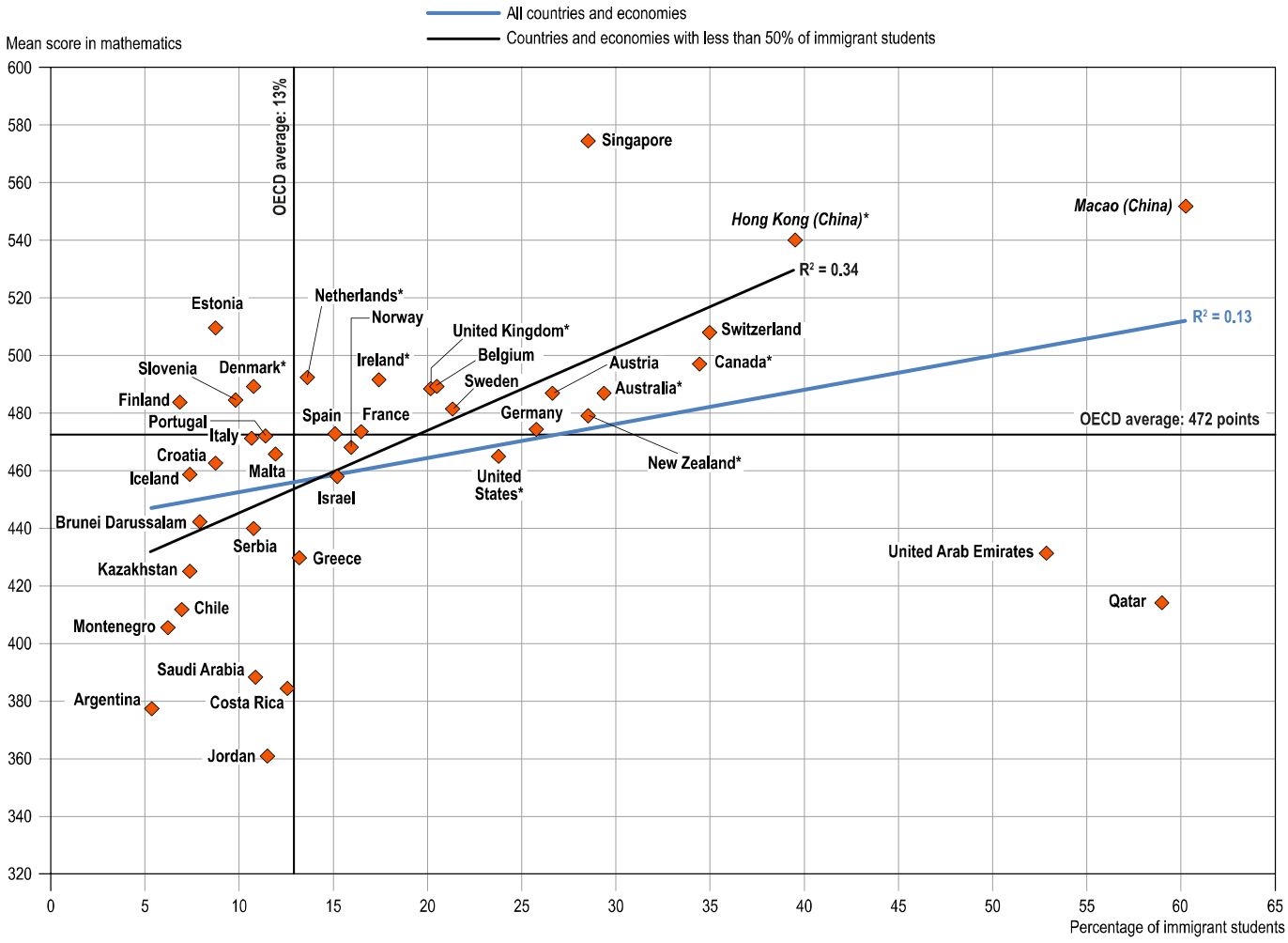
PISA 2022 provides no bases for the claim that larger proportions of students with an immigrant background are related to poor education outcomes in host countries.

Figure I.7.6 shows a positive relationship between the share of immigrant students and mean performance in mathematics in PISA 2022, meaning that the greater the share of immigrant students the higher the country's mean performance in mathematics in PISA 2022. Among countries that have between five and 15 percent of immigrant students there is wide variation in mean performance; for example, Croatia and Estonia have similar shares of immigrant students (about nine percent) but very different mean performances in mathematics (463 points in Croatia and 510 in Estonia). However, among countries/economies where the share of immigrant students is between 15% and 40% the correlation is much stronger: Canada*, Hong Kong (China)* and Switzerland are examples of countries/economies that receive many immigrant students and have strong performances.

Macao (China), Qatar and the United Arab Emirates are outliers in the sense that their share of immigrant students is much higher (i.e. more than 50% of the student population) than that of all other PISA-participating countries/economies. Each should be examined in its own context (i.e. social demographic profile of immigrant population, immigration policies, educational policies towards immigrant, etc). Macao (China) has one of the highest levels of mathematics performance; by contrast, Qatar and the United Arab Emirates performed below the OECD average in mathematics.

These results should be interpreted carefully because they do not consider national income, which is correlated with both mean performance[7] and the share of immigrant students[8]. After accounting for national income, the correlation between the share of immigrant students and mean performance in mathematics in PISA 2022 becomes very weak or close to zero[9].

Figure I.7.6. Percentage of students with an immigrant background and mean performance in mathematics



Note: Countries/Economies where less than 5% of students had an immigrant background are not represented in the figure.
Source: OECD, PISA 2022 Database, Tables I.B1.2.1 and I.B1.7.1.

The relationship between immigrant background and student performance must also be examined by looking at differences between immigrant and non-immigrant students within countries. Figure I.7.7 and Figure I.7.8 show disparities by immigrant background in student performance in mathematics and reading, respectively.

Because differences in student performance by immigrant background are related to differences in the socio-economic status and linguistic background of immigrant and non-immigrant students, accounting for these students' backgrounds is important. As shown in the analyses below, net differences (i.e. after accounting) in mathematics performance by immigrant background are typically smaller than raw differences (i.e. before accounting), meaning there is less of a performance gap between immigrant and non-immigrant students when comparing these two groups of students with similar socio-economic status and home language. This shows that policies that tackle the socio-economic and linguistic barriers immigrant students face can boost immigrant student performance. This, and improving attitudes towards immigrants in their host countries, and making schools more welcoming of diversity and multiculturalism can boost outcomes for immigrant students even more (Buchmann and Parrado, 2006[2]; Marks, 2005[3]; Portes and Zhou, 1993[4]; Feliciano, 2020[5]).

Figure I.7.7 shows disparities in student performance in mathematics related to immigrant background (hereafter, this will be referred to as the "immigration gap" in student performance). On average across OECD countries, non-

immigrant students scored 29 score points more than immigrant students in mathematics before accounting for students' backgrounds. Once student socio-economic status was taken into account, however, the immigration gap in mathematics performance in favour of non-immigrant students narrows to 15 points. Furthermore, after student socio-economic status and language spoken at home were accounted for, the score-point difference in favour of non-immigrant students narrows even further to a mere five points on average across OECD countries (Figure I.7.7).

Before accounting for students' backgrounds, non-immigrant students outperformed immigrant students in mathematics in 22 out of the 39 countries/economies included in Figure I.7.7; immigrant students outperformed non-immigrant students in nine countries/economies (Australia*, Brunei Darussalam, Canada*, New Zealand*, Qatar, Saudi Arabia, Singapore and the United Arab Emirates); and the difference between immigrant and non-immigrant students in mathematics performance is not significant in nine countries/economies (Argentina, Jordan, Kazakhstan, Macao [China], Malta, Montenegro, Serbia, the United Kingdom* and the United States*).

After accounting for students' socio-economic status, however, non-immigrant students scored higher in mathematics than immigrant students in 17 countries/economies but immigrant students scored higher than non-immigrant did in 14 countries/economies.

Socio-economic status alone accounts for more than half of the gap in mathematics performance in favour of non-immigrant students in several countries/economies; in France, Greece, Norway, Spain and Switzerland, student socio-economic status accounts for more than 60% of the immigration gap in mathematics. In Spain, where 15% of students have an immigrant background in PISA 2022, non-immigrant students scored 32 score points more than immigrant students in mathematics before accounting for student socio-economic status but only seven points more once it was accounted for. In four countries and economies (Croatia, Ireland*, Israel and Italy), non-immigrant students outperformed immigrant students in mathematics before accounting for other variables but after accounting for student socio-economic status the net score-point difference turned out to be not statistically significant.

After accounting for students' socio-economic status and language spoken at home, immigrant students scored higher in mathematics than non-immigrant students in 16 countries/economies while non-immigrant students scored higher in mathematics than immigrant students in only eight countries/economies. The difference between immigrant and non-immigrant students is not significant in 15 countries/economies after accounting for students' socio-economic status and language spoken at home.

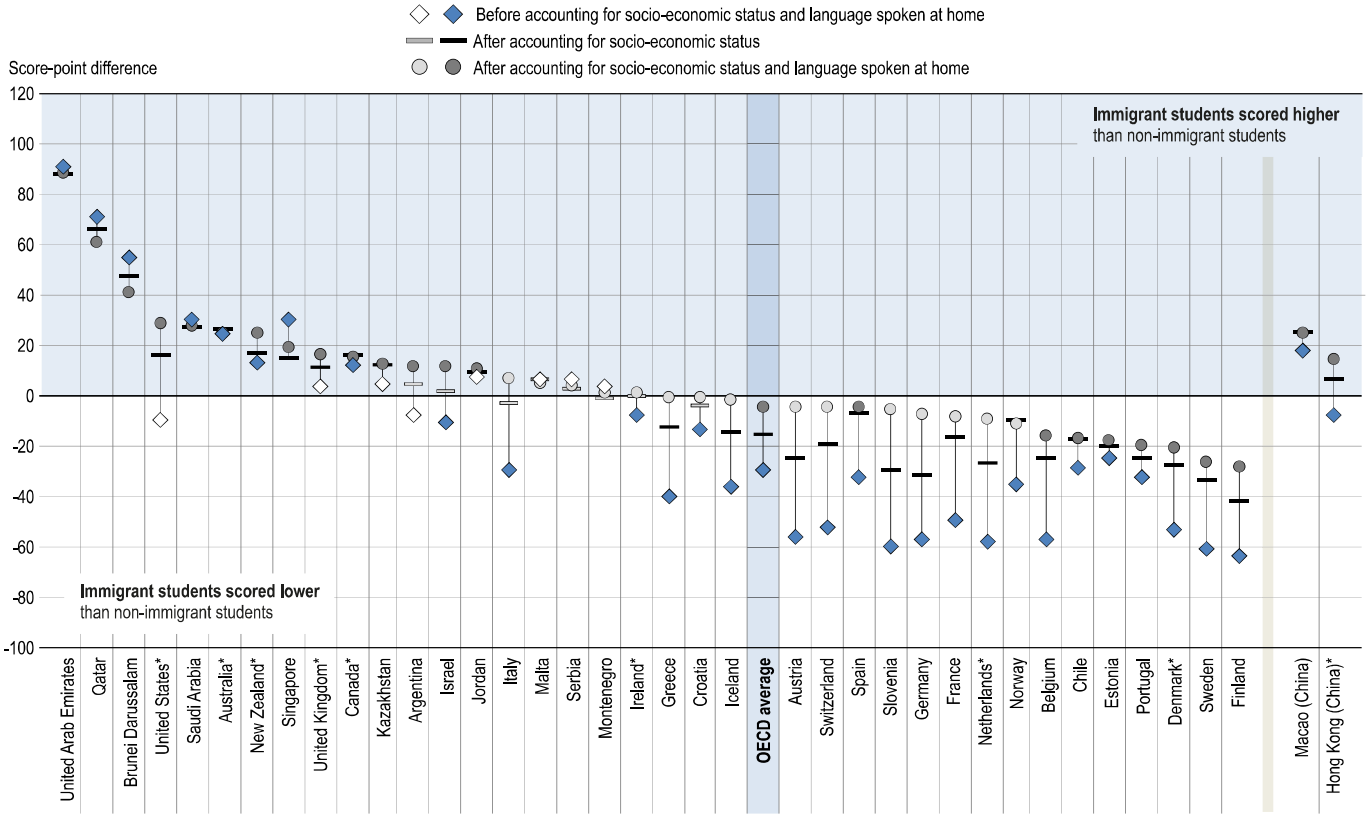
In seven European countries (Austria, Belgium, Finland, Germany, the Netherlands*, Slovenia and Sweden), the gap in mathematics performance by immigration background before accounting for other variables is the largest: non-immigrant students scored, on average, over 55 score points more than immigrant students. This large gap can be explained in part by socio-economic differences: in these countries, the share of disadvantaged students is at least 20 percentage points more among immigrant than non-immigrant students (see Figure I.7.3). Accounting for socio-economic status, however, reduces the immigration gap by more than half in Austria, Belgium, the Netherlands* and Slovenia; and by more than a third in Finland, Germany and Sweden. For example, in the Netherlands*, the immigration gap is 58 points before and 27 after accounting for student socio-economic status; in Slovenia non-immigrant students scored 60 points more than immigrant students before accounting for other variables but only 29 points more after accounting for student socio-economic status. In Finland, non-immigrant students scored 64 points more than immigrant students before accounting for other variables and 42 points more *after* accounting for student socio-economic status. The remaining gap in performance can be explained to a large extent by language barriers. In these seven countries, between 60% and 85% of immigrant students do not speak the language of assessment at home (see Figure I.7.4). After accounting for socio-economic status *and* language spoken at home, the immigration gap in mathematics performance becomes not significant in Austria, Germany, the Netherlands* and Slovenia but remains stubbornly large in Finland (29 score-point difference), Sweden (27 points) and Belgium (17 points).

In the United States*, where one in four students have an immigrant background in PISA 2022, immigrant and non-immigrant students did not perform significantly different in mathematics before accounting for other variables. However, after student socio-economic status was accounted for immigrant students outperformed non-immigrant students by 16 score points. Furthermore, after accounting socio-economic status and language spoken at home,

immigrant students in the United States* outperformed non-immigrant students by 28 score points. This finding suggests that dismantling the social and linguistic barriers immigrant students face could lead to significant performance gains among these students.

Figure I.7.7. Differences in mathematics performance, by immigrant background

Difference in mathematics score between non-immigrant students and immigrant students (immigrant students - non-immigrant) before and after accounting for socio-economic status and language spoken at home



Notes: Statistically significant differences in mathematics performance are shown in a darker tone (see Annex A3).
Countries/Economies where less than 5% of students have an immigrant background are not represented in the figure.
Socio-economic status is measured by the PISA index of economic, social and cultural status.
Countries and economies are ranked in descending order of the gap in mathematics performance related to immigrant background, after accounting for students' socio-economic status and language spoken at home.
Source: OECD, PISA 2022 Database, Table I.B1.7.52.

In reading, similar patterns were found as those observed in mathematics. On average across OECD countries, non-immigrant students outperformed immigrant students in reading by 39 score points before accounting for other factors, by 25 after accounting for student socio-economic status, and by nine points after accounting for student socio-economic status and language spoken at home (Figure I.7.8).

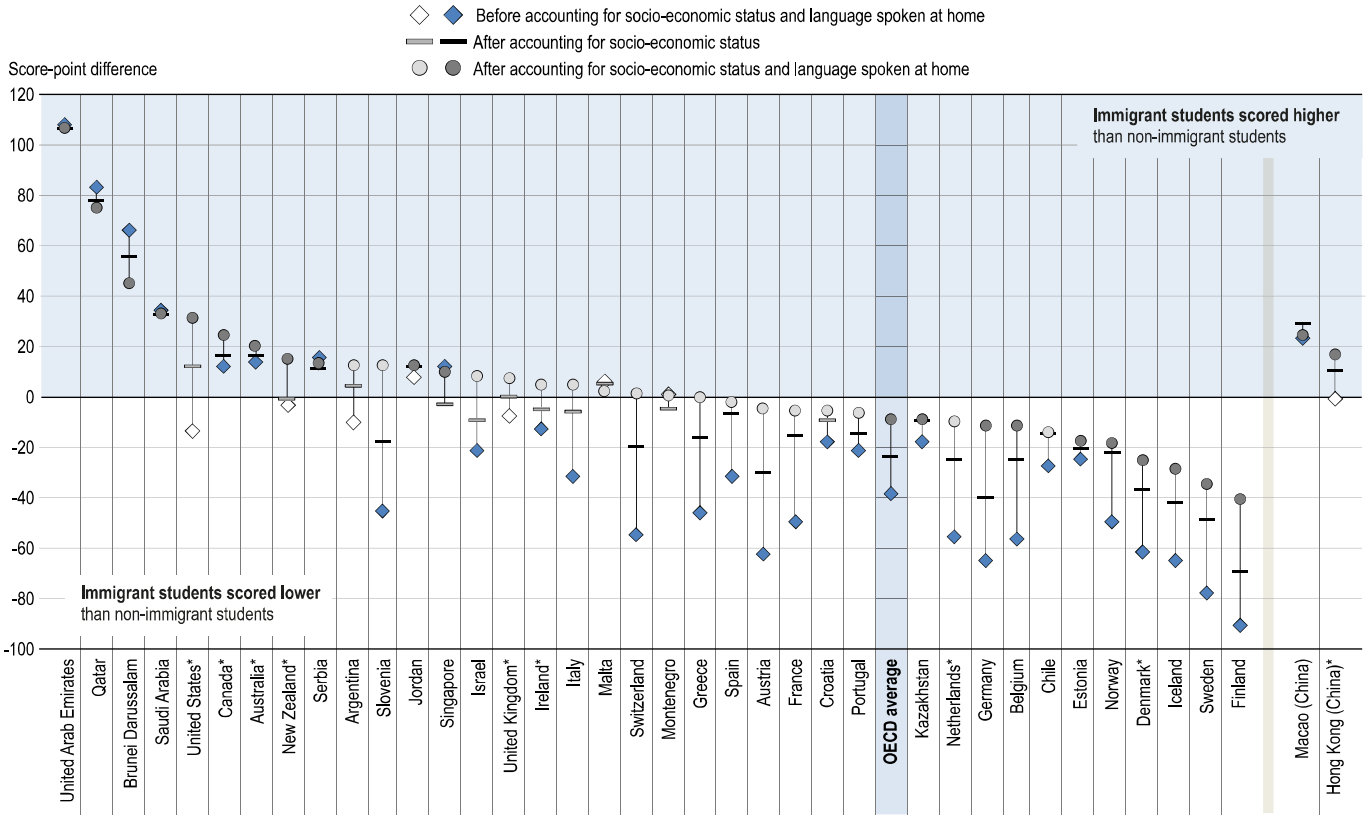
Before accounting for students' backgrounds, immigrant students scored higher in reading than non-immigrant students in eight countries and economies, and non-immigrant students scored higher than immigrant students in 22 countries and economies and on average across OECD countries. The difference between immigrant and non-immigrant students in reading performance is not significant in nine countries/economies before accounting for other factors.

After accounting for student socio-economic status, immigrant students scored higher than non-immigrant students in reading in 10 countries and economies while non-immigrant students scored higher than immigrant students in 18 countries and economies and on average across OECD countries. The difference between immigrant and non-immigrant students in reading performance is not significant in 11 countries/economies after accounting for student socio-economic status.

After accounting for student socio-economic status and language spoken at home, immigrant students scored higher than non-immigrant students in reading in 13 countries and economies while non-immigrant students scored higher than immigrant students in only nine countries and economies, and on average across OECD countries. The difference between immigrant and non-immigrant students in reading performance is not significant in 17 countries/economies after accounting for student socio-economic status and language spoken at home.

Figure I.7.8. Differences in reading performance, by immigrant background

Difference in reading score between immigrant students and non-immigrant students before and after accounting for socio-economic status and language spoken at home



Notes: Statistically significant differences in reading performance are shown in a darker tone (see Annex A3).
Countries/Economies where less than 5% of students have an immigrant background are not represented in the figure.
Countries and economies are ranked in descending order of the gap in reading performance related to immigrant background, after accounting for students' socio-economic status and language spoken at home.
Source: OECD, PISA 2022 Database, Table I.B1.7.57.

Trends in disparities in performance by immigrant background

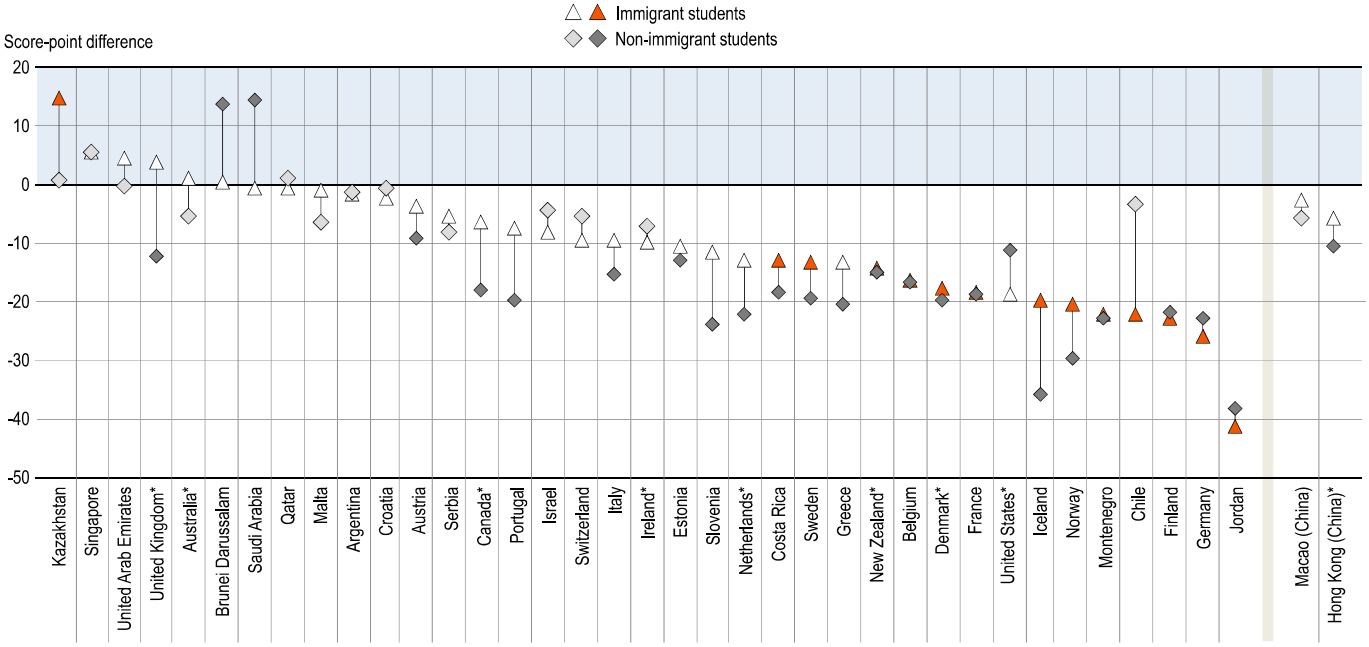
Between PISA 2018 and PISA 2022, disparities in mathematics performance shifted in favour of immigrant students in three countries (among countries with more than 5% of immigrant students in PISA 2022): Canada*, Kazakhstan and the United Kingdom* (Figure I.7.9).

In Kazakhstan, a gap in mathematics performance of nine points in favour of non-immigrants in PISA 2018 became non-significant in PISA 2022 due to the improved performance of immigrant students (no change among non-immigrants). In Canada* and the United Kingdom*, a significant decline in non-immigrant students' performance coincided with no change in immigrant student performance between PISA 2018 and 2022. As a result, in the United Kingdom*, a gap of 14 points in favour of non-immigrant students in PISA 2018 narrowed into a statistically insignificant gap in 2022. In Canada*, the gap in mathematics performance in terms of immigrant background was not significant in PISA 2018 but immigrant students outperformed their non-immigrant peers in mathematics by 12 score points in PISA 2022.

In the same period, disparities in mathematics performance shifted in favour of non-immigrants only in Saudi Arabia. There, non-immigrant students' performance improved and immigrant students did not change, and, as a result, the performance gap in favour of immigrant students narrowed by 15 score points. In all other countries/economies with comparable PISA data, the gap in mathematics performance by immigration background did not change between 2018 and 2022.

Figure I.7.9. Change in mathematics performance among immigrant and non-immigrant students between 2018 and 2022

Score-point difference between PISA 2018 and PISA 2022 (PISA 2022 - PISA 2018)



Notes: Statistically significant differences between PISA 2018 and PISA 2022 are shown in a darker tone (see Annex A3).
Countries/Economies where less than 5% of students have an immigrant background in 2022 are not represented in the figure.
Countries and economies are ranked in descending order of the difference in mathematics performance of immigrant students between 2018 and 2022.
Source: OECD, PISA 2022 Database, Table I.B1.7.19.

Figure I.7.10 displays trends in the immigration gap in mathematics performance since 2012 after accounting for socio-economic status and language spoken at home (i.e. "net" performance gap). These trends need to be

interpreted in the context of changes in the amount and profile of the immigrant population of different countries/economies, as described above in sections about changes in the socio-economic status, language background and age of arrival of immigrant students.

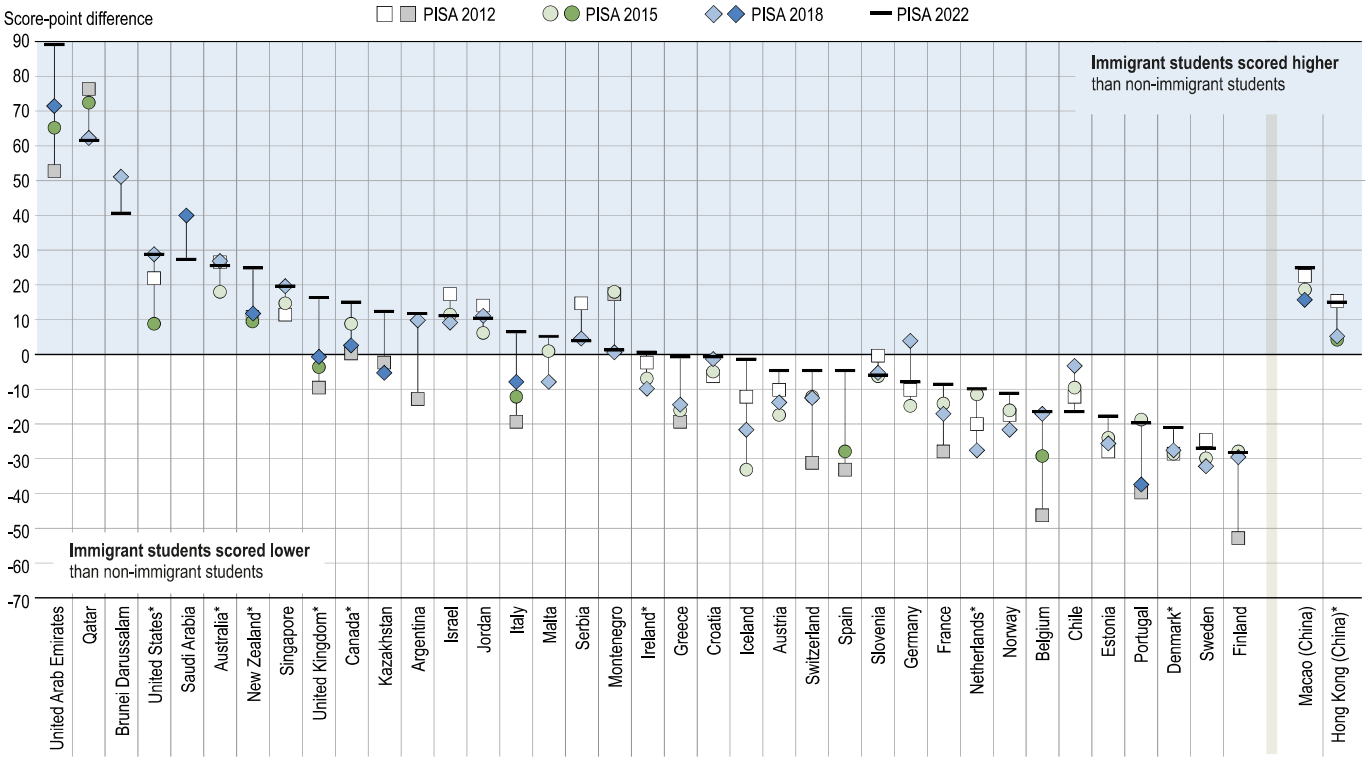
Between PISA 2012 and 2022, the net performance gap in mathematics changed in ways that favoured immigrant students in the following countries/economies:

- In four countries/economies (Belgium, Finland, Portugal and Spain), a very large net performance gap in favour of non-immigrant students in PISA 2012 narrowed. For example, in Belgium the net performance gap in mathematics in favour of non-immigrant students was 46 score points in PISA 2012 but 17 points in PISA 2022.
- In four countries/economies (France, Greece, Italy and Switzerland), a very large net performance gap in favour of non-immigrant students in PISA 2012 narrowed so much that differences between immigrant and non-immigrant students became statistically insignificant in PISA 2022.
- In Argentina, a net performance gap in favour of non-immigrant students in PISA 2012 shifted in favour of immigrant students in PISA 2022.
- In Canada*, Kazakhstan and the United Kingdom*, a net performance gap that was not significant in PISA 2012 became a net performance gap in favour of immigrant students in PISA 2022.
- In the United Arab Emirates, a very large net performance gap in favour of non-immigrant students in PISA 2012 became even larger in PISA 2022.

In Montenegro and Qatar, the net performance gap in mathematics changed between 2012 and 2022 in ways that favoured non-immigrant students. In the remaining 21 countries/economies shown in Figure I.7.10, the net performance gap in mathematics did not change between 2012 and 2022.

Figure I.7.10. Difference in mathematics performance between non-immigrant and immigrant students in 2012, 2015, 2018 and 2022

Difference after accounting for student socio-economic background and language spoken at home



Notes: Statistically significant changes between PISA 2022 and previous cycles in the difference in mathematics performance between non-immigrant and immigrant students are shown in a darker tone (see Annex A3).

Countries/Economies where less than 5% of students have an immigrant background in 2022 are not represented in the figure.

Socio-economic status is measured by the PISA index of economic, social and cultural status.

Countries and economies are ranked in descending order of the score-point difference between immigrant and non-immigrant students in 2022.

Source: OECD, PISA 2022 Database, Table I.B1.7.53.

Table I.7.1. Immigrant background and student performance figures and tables

Figure I.7.1	Students with an immigrant background
Figure I.7.2	Change between 2012, 2015, 2018 and 2022 in the percentage of students with an immigrant background
Figure I.7.3	Percentage of disadvantaged students, by immigrant background
Figure I.7.4	Change between 2012, 2015, 2018 and 2022 in the percentage of immigrant students who do not speak the language of assessment at home
Figure I.7.5	Change between 2018 and 2022 in age of arrival of immigrant students
Figure I.7.6	Percentage of students with an immigrant background and mean performance in mathematics
Figure I.7.7	Differences in mathematics performance, by immigrant background
Figure I.7.8	Differences in reading performance, by immigrant background
Figure I.7.9	Change in mathematics performance among immigrant and non-immigrant students between 2018 and 2022
Figure I.7.10	Difference in mathematics performance between non-immigrant and immigrant students in 2012, 2015, 2018 and 2022

StatLink https://stat.link/dsfn6h

Notes

[1] In sections examining student performance by immigration background, the focus on the chapter is mathematics and reading. Results for science are not discussed to avoid repetition but data tables with results for science are available in Annex B1.

[2] Table I.B1.7.1 includes information about the statistical significance of the difference between first-generation and second-generation immigrant students.

[3] In the following sections, the figures show results only for the 42 countries/economies (out of 81 with available data) where more than 5% of students have an immigrant background. This restriction ensures sample sizes robust enough to disaggregate the data not only by immigration background but also by socio-economic status, language spoken a home and age of arrival at the country of assessment. Also, this restriction serves to focus the analysis on educational systems where learning disparities by immigration background affect a larger share of the population. Estimates are available for all countries in online tables included in Annex B1.

[4] Student socio-economic status in PISA is measured through the PISA index of Economic, Social and Cultural Status (ESCS). Lower values in the index signal lower socio-economic standing and higher values signal higher socio-economic standing. Socio-economically disadvantaged students are defined as students in the bottom quarter of the distribution of ESCS in their countries/economies. Socio-economically advantaged students are defined as students in the top quarter of ESCS in their countries/economies.

5 Insufficient experience in the language of assessment is one of the criteria allowed by PISA for exclusion of students within sampled schools. More specifically, exclusion is allowed for the following group: “Students with insufficient experience in the language of assessment: these are students who need to meet all of the following criteria: i) are not native speakers of the assessment language(s), ii) have limited proficiency in the assessment language(s), and iii) have received less than one year of instruction in the assessment language(s)” (OECD, Forthcoming[9]). Efforts were made to ensure that exclusions, if they were necessary, were minimised according to the PISA Technical Standards. Thus, when interpreting results in this section, consider that countries/economies can exclude from the PISA sample students who do not speak language of assessment at home if they meet the criteria described above.

[6] For more information about immigration trends and policies in Chile, see Alarcón-Leiva and Gotelli-Alvial (2021[6]), Mera-Lemp, Bilbao and Basabe (2020[7]) and OECD (2022[8]).

[7] The relationship between national income (as measured by per capita GDP) and student performance is examined in chapter 4. Countries with higher national incomes tend to score higher in PISA; the relationship is not linear and it flattens at higher levels of per capita GDP (see Figure I.4.13).

[8] Across 81 countries/economies that took part in PISA 2022, the correlation between share of immigrant students and per capita GDP is positive and strong (r = 0.72). To ensure that outliers were not driving the findings, the correlation was conducted again without countries where the share of immigrant students is much higher than that of all other PISA-participating countries/economies (Macao [China], Qatar and the United Arab Emirates). Across the 78 countries/economies where the share of immigrant students is lower than 40%, the correlation coefficient between the share of immigrant students and per capita GDP is similar (correlation coefficient = 0.69). Source: OECD, PISA 2022 Database, Tables I.B1.7.1 and I.B3.2.1.

[9] The partial correlation coefficient between the share of immigrant students and mean performance in mathematics after accounting for per capita GDP is negative and weak (r = -0.15) across the 81 countries/economies that took part in PISA 2022. However, correlation is driven by the three countries where the share of immigrant students is much higher than that of all other PISA-participating countries/economies (Macao [China], Qatar and the United Arab Emirates). Across the 78 countries/economies where the share of immigrant students is lower than 40%, the partial

correlation coefficient between the share of immigrant students and mean performance in mathematics after accounting for per capita GDP is close to zero (r = -0.02). Source: OECD, PISA 2022 Database, Tables I.B1.2.1, I.B1.7.1. and I.B3.2.1.

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8 From data to insights

Results from PISA offer a wealth of data points that can highlight aspects of education policy that merit further investigation and development. This chapter suggests a plan for digging deeper into PISA 2022 data to better understand how policies can be improved to meet the needs of every student.

For Australia, Canada, Denmark, Hong Kong (China), Ireland, Jamaica, Latvia, the Netherlands, New Zealand, Panama, the United Kingdom and the United States, caution is required when interpreting estimates as one or more PISA sampling standards were not met (see Reader's Guide, Annexes A2 and A4).

The eighth assessment of PISA was delayed by one year due to the COVID-19 pandemic. Results from that assessment, PISA 2022, show that Singapore scored significantly higher than all other participating countries/economies in mathematics (575 points), reading (543 points) and science (561 points). In mathematics, six East Asian education systems, namely Singapore, Macao (China), Chinese Taipei, Hong Kong (China)*, Japan and Korea (in descending order of average scores) outperformed all other countries/economies. In reading, behind top-performing education system Singapore, Ireland* performed as well as Japan, Korea, Chinese Taipei and Estonia (in descending order of average scores) and better than 75 other countries/economies. In science, the highest-performing countries were the same six East Asian countries/economies, and Estonia and Canada* (Tables I.2.1, I.2.2 and I.2.3).

But PISA 2022 results also show significant deterioration in mathematics and reading performance between 2018 and 2022. During that period mean scores dropped by almost 15 points in mathematics and 10 points in reading, on average across OECD countries. Over half of the countries/economies that can compare PISA 2022 data with PISA 2018 data deteriorated in average mathematics and reading performance (Figure I.5.1).

Beyond score rankings, results from PISA offer policy makers a wealth of data points that can highlight aspects of education that merit further investigation – and that imply that changes to existing policies and practices, or the design and implementation of new ones, may be necessary.

Results from PISA 2022 suggest a plan for digging deeper into the data with the aim of better understanding how education policies can be improved to meet the needs of every student:

Examine why student performance declined so sharply

The steep declines in performance observed between 2018 and 2022 are unprecedented, given that changes in the OECD average over consecutive PISA assessments up to 2018 had never exceeded four score points in mathematics and five score points in reading. These more recent declines are equivalent to around half a year to three-quarters of a year of learning, as 20 score points represents the average annual pace of learning among 15-year-olds in countries/economies that participated in PISA (see Volume I Box I.5.1 for details).

The sharp declines may not be due solely to the pandemic because performance trends vary across subjects...

Between 2018 and 2022, average performance in mathematics and reading deteriorated precipitously while average performance in science did not change significantly, on average across OECD countries. Indeed, in 33 out of 71 countries/economies, science performance remained broadly stable between 2018 and 2022 (Figure I.5.1).

...and across education systems...

During the period, mathematics performance improved in Chinese Taipei, Saudi Arabia, the Dominican Republic, Brunei Darussalam, Cambodia, Paraguay and Guatemala (in descending order) by around 10 to 16 score points. However, in Albania, Jordan, Iceland, Norway and Malaysia (in descending order), mathematics scores dropped by more than 30 points (Figure I.5.1).

Reading performance improved in Brunei Darussalam, Panama*, Chinese Taipei, Qatar, Japan, the Dominican Republic, and Cambodia (in descending order) by around 8 to 21 score points between 2018 and 2022; but in Albania, Iceland and North Macedonia, reading scores declined by more than 30 points during that period.

Science performance improved in 18 countries/economies between 2018 and 2022, including in Kazakhstan, the Dominican Republic, Panama*, Chinese Taipei, Japan, Cambodia and Brunei Darussalam (in descending order), where scores improved by around 15 to 26 points. However, in Albania, North Macedonia, Iceland and Malaysia (in descending order), science scores deteriorated by more than 20 points during the period.

... and performance was already deteriorating before the pandemic...

The deterioration in mathematics performance between 2018 and 2022 followed a decade-and-a-half of stable performance. Trajectories in reading and science performance, however, had already turned negative before 2018, after reaching their highest levels between PISA 2009 and 2012, well before the COVID-19 disruptions (Figure I.6.1).

The following countries/economies were already showing a decline in mean performance prior to 2018. These negative trends were often confirmed and reinforced between 2018 and 2022 (Figure I.5.3):

- Belgium, Canada*, the Czech Republic, Finland, France, Hungary, Iceland, the Netherlands*, New Zealand* and the Slovak Republic in mathematics performance
- Costa Rica, Finland, Iceland, the Netherlands*, the Slovak Republic, Sweden and Thailand in reading performance
- Belgium, Finland, Germany, Greece, Iceland, Kosovo, the Netherlands* and Slovenia in science performance.

...which suggests that there are other structural reasons for the decline.

Provide all students with opportunities to fulfil their potential regardless of their backgrounds, and tailor policies to education systems' particular contexts

In 70% of PISA-participating education systems the gap in mathematics performance related to socio-economic status did not change between 2018 and 2022 – mainly because both advantaged and disadvantaged students' performance deteriorated during the period.

The gap in mathematics performance related to socio-economic status did not change between 2018 and 2022 in 48 out of the 68 countries/economies with available PISA data. This gap widened on average across OECD countries and in 13 countries/economies; it narrowed in 7 countries/economies (Argentina, Brazil, Chile, Moldova, the Philippines, Saudi Arabia and the United Arab Emirates). Of these latter countries, only in Argentina, the Philippines and Saudi Arabia did the gap narrow because of improvements in disadvantaged students' performance. In three other countries, advantaged students' performance deteriorated (Table I.5.3).

Many education systems became more inclusive of marginalised populations over the past decade.

Many countries/economies, including Cambodia, Colombia, Costa Rica, Indonesia, Morocco, Paraguay and Romania, made significant progress towards the goal of universal secondary education over the past decade. While in four of these countries average PISA scores appeared to decline, in fact they improved or remained stable after accounting for the expansion of secondary education to previously marginalised populations (Figure I.6.7).

PISA results show that education systems can both attain higher overall performance and minimise the impact of students' socio-economic status on their performance.

Education systems in Canada*, Denmark*, Finland, Hong Kong (China)*, Ireland*, Japan, Korea, Latvia*, Macao (China) and the United Kingdom* are highly equitable. They have achieved high levels of socio-economic fairness at the same time as a large share of their 15-year-old students have attained at least basic proficiency in mathematics, reading and science (Figure I.4.20).

Results from PISA can indicate which type of policy, universal or targeted, is more likely to have a strong impact on a particular education system.

PISA results can indicate whether policies should be targeted to low-performing or socio-economically disadvantaged students or both. They can also help policy makers determine whether students or schools should be targeted (Box I.4.3).

In Japan, Lithuania, the Netherlands*, Poland, Slovenia and Chinese Taipei, performance-targeted policies aimed at improving the scores of the lowest performers, regardless of their socio-economic status, could be implemented initially at the school level. Conversely, Australia*, Canada*, Korea, New Zealand* and Sweden could implement such policies by focusing first on individual students.

If the aim is to reduce inequalities in education by providing additional resources, support or assistance to disadvantaged students and schools, targeting disadvantaged schools is likely to have a greater impact in Bulgaria, Colombia, Malaysia, Mongolia, Panama*, Peru and Uruguay. The only exception is Portugal, where disadvantaged students, rather than schools, could be targeted first.

In Austria, Belgium, the Czech Republic, France, Hungary, Israel, Romania and the Slovak Republic a mix of targeted policies that provides adapted resources and support to address both low achievement and disadvantage may be more effective when targeting schools. Only in Singapore and Switzerland are students from disadvantaged backgrounds more evenly distributed across schools than the OECD average.

Study resilient systems where learning, equity and well-being were maintained and promoted despite pandemic-related disruptions

Four education systems, namely Japan, Korea, Lithuania and Chinese Taipei, are identified as resilient education systems...

Of the 81 countries/economies that participated in PISA 2022, only Japan, Korea, Lithuania and Chinese Taipei showed overall resilience: they performed well, were equitable, their students reported a sense of belonging at school that was as strong as or stronger than the OECD average in 2022, and they showed no deterioration in any of these aspects between 2018 and 2022 (Figure II.1.1).

...while 21 education systems were resilient in one or two of the three aspects considered: performance, equity and students' well-being.

Singapore was resilient in both mathematics performance and equity, but not in well-being (with a focus here on students' sense of belonging at school). Switzerland was resilient in both mathematics performance and students' well-being, but not in equity. Australia* was resilient in mathematics performance, but not in equity or in well-being. Hong Kong (China), the United Kingdom* and the United States* were considered resilient in equity, but not in mathematics performance or in well-being. Austria, Croatia, Finland, France, Georgia, Germany, Hungary, Iceland, Montenegro, Portugal, Romania, Saudi Arabia, Serbia, Slovenia and Sweden were resilient in well-being but not in mathematics performance or in equity.

Ten actions related to resilience:

1. Keeping schools open longer for more students

> *PISA 2022 data show that systems that spared more students from longer school closures scored higher while their students enjoyed a greater sense of belonging at school.*

PISA 2022 student-reported data show that systems that spared more students from longer closures (longer than three months) tended to score higher in mathematics (Figure II.2.2). These systems also showed stable or improving trends between 2018 and 2022 in their students' sense of belonging at school (Figure II.2.3).

PISA 2022 asked students whether their school building was closed to students for more than a month in total (some schools closed and reopened multiple times during the period) in the previous three years due to COVID-19. In most countries/economies, schools were closed for several months because of the pandemic (Table II.B1.2.1). On average across OECD countries, fewer than one in two students reported that their school was closed for less than three months. In fact, only one in three countries/economies with available data avoided longer school closures for a

majority of their students. In Iceland, Japan, Korea, Sweden, Switzerland and Chinese Taipei more than three out of four students indicated that their school was closed for less than three months, while in Brazil, Ireland*, Jamaica* and Latvia* only one out of four students or fewer who responded to the question reported so.

Keeping schools open longer, for more students, seems to be important – but insufficient – for maintaining students' learning during disruptions; how learning is organised during school closures also matters. In situations where schools have to be closed, education systems and schools have to ensure that instruction can continue in remote mode in order to avoid severe learning losses. Remote education forces students to learn more autonomously which, in turn, requires them to draw on their self-directed learning skills. Promoting the acquisition of these skills in school is not only beneficial to individual students, it is also an investment in the resilience of education systems.

2. Preparing students for autonomous learning

When remote learning runs smoothly, students and education systems benefit.

Education systems in which students encountered fewer problems during remote learning tended to score higher in mathematics than other systems, on average (Table II.B1.2.45). In addition, these systems saw improvements in their students' sense of belonging at school between 2018 and 2022, pre- to post-COVID (Table II.B1.2.46).

However, remote learning left many students struggling to motivate themselves. PISA 2022 results show that, on average across OECD countries, almost one in two students indicated that they had problems at least once a week motivating themselves to do schoolwork. In Australia* and the United Kingdom*, six out of ten students reported that they frequently had difficulty motivating themselves to do schoolwork while learning remotely – more than double the share of students in Guatemala, Iceland, Indonesia, Kazakhstan, Korea, Moldova and Chinese Taipei who so reported. Once motivated, however, students seemed to be well-equipped for learning: at least three out of four students reported that they never or only a few times had problems with access to a digital device when they needed one, with Internet access, with finding a quiet place to study, with time to study because of household responsibilities or with finding someone who could help them with schoolwork (Figure II.2.13 and Table II.B1.2.30).

Students were more confident about using digital technology for remote learning than about taking responsibility for their own learning.

PISA 2022 also explored whether education systems prepared students for autonomous learning by asking students to report on their confidence in their capacity for self-directed learning. Overall, students reported feeling more confident about using digital technology for learning remotely during school closures than they felt about taking responsibility for their own learning (Table II.B1.2.5). For instance, on average across OECD countries, about three out of four students reported that they feel confident or very confident about using a learning-management system, a school learning platform or a video communication program, and about finding learning resources on line on their own (Figure II.2.5). Only six out of ten students reported feeling equally confident about motivating themselves to do schoolwork and focusing on it without reminders.

These results suggest that providing students with the skills to use technological tools for learning is not enough; students also need to learn how to assume responsibility for their learning. Some education systems implemented a new programme to enhance students' skills in and attitudes towards self-directed learning. See Box I.8.1 for an example in Singapore.

Teachers could play a key role in enhancing students' confidence in their capacity for self-directed learning.

In education systems where students reported that their teachers were available when they needed help, students tended to be more confident that they could learn independently and remotely if their school has to close again in the future. On average across OECD countries, students who had a more positive experience with remote learning – for example, students who agreed or strongly agreed that their teachers were available when they needed help – scored

higher in mathematics and reported feeling more confident about learning independently if their school has to close again in the future (Figure II.2.11 and Table II.B1.2.47).

Box I.8.1. Blended Learning in secondary and pre-university schools in Singapore

As part of Blended Learning, regular Home-Based Learning (HBL) Days have been implemented in all secondary schools and pre-university institutions since the end of 2022. This programme aims to help students become self-directed, independent and passionate learners. Regular HBL Days provide students with more opportunities to learn curricular content in a self-directed manner, using both digital and non-digital methods of learning. HBL Days also include time set aside for student-initiated learning, where students can pursue their own interests and learn outside the curriculum – such as learning a foreign language, or studying financial literacy or programming.

Schools schedule about two HBL days a month as part of the school schedule. This accounts for about 10% of curriculum time in an academic year. HBL Days are less structured than a typical day in a classroom, allowing students to learn curricular content in a self-paced manner. Around four to five hours are allocated to the curriculum and at least one hour is dedicated to student-initiated learning. Schools determine the subjects and topics covered on HBL Days and customise the support for student-initiated learning based on their students' interests and needs. For example, for students who need more guidance on their student-initiated learning, schools can suggest activities or provide resources at the start, before reducing this scaffold over time.

Educational technology platforms and resources, such as those in the Singapore Student Learning Space, the national online learning platform, and personal learning devices that have been rolled out for all secondary school students under the National Digital Literacy Programme, support the implementation of Blended Learning. Students who require additional learning support or who do not have a home environment that is conducive to learning can return to school on HBL Days where they will be supervised by school personnel but will still have the opportunity to learn and organise their schedule independently.

Source: (Ministry of Education, Singapore, 2020[1]; Ministry of Education, Singapore, 2022[2])

3. Building strong foundations for learning and well-being for all students

No system provided all of its students with the solid foundations needed for learning and well-being, such as food security…

On average across OECD countries, 8.2% of students reported that they had not eaten at least once a week in the previous 30 days because there was not enough money to buy food. Some OECD countries have some of the smallest proportions (less than 3%) of these students, notably Portugal (2.6%), Finland (2.7%) and the Netherlands* (2.8%). However, in some OECD countries the proportion of students who suffer from food insecurity exceeds 10%, including Türkiye (19.3%), New Zealand* (14.1%), Colombia (13.3%), Chile (13.1%), the United States* (13%), Lithuania (11%) and the United Kingdom* (10.5%) (Figure I.4.6).

...and feelings of safety.

Overall, students feel safe at school, particularly in their classrooms. However, PISA 2022 results suggest that education systems could consider improving safety on the routes students travel to or from school, or in places outside of the classroom, such as hallways, cafeterias or restrooms (Figure I.3.9 and Table II.B1.3.17). Around 10% of students disagreed or strongly disagreed that they feel safe in these places, on average across OECD countries. In Jamaica*, Moldova and Morocco, 25% of students reported feeling unsafe outside the classroom, and in Baku (Azerbaijan), Jamaica* and Moldova, more than 15% of students reported feeling unsafe even in their classroom. However, in many systems, including Belgium, Croatia, Ireland*, Korea, the Netherlands*, Portugal, Serbia, Singapore, Switzerland and Chinese Taipei, less than 5% of students reported feeling unsafe in their classroom or in other places in the school.

Education systems can address food security and safety through various policies. In Finland, school meals are an integral part of the national core curriculum. National legislation guarantees students, from pre-primary through upper secondary education, the right to free meals on school days (Finnish National Agency for Education, 2023[3]). In Ireland, the School Meals Programme provides funding for the provision of needs-based meals for students and children in schools and organisations (Ireland Department of Social Protection, 2022[4]). In Portugal, the School without Bullying, School without Violence plan (2019) emphasises a whole-community approach to combatting bullying and school violence, with actions aimed at teachers, parents, students and other stakeholders. Schools define an action plan involving strategies and activities that raise awareness about harmful behaviours and promote early identification (OECD, 2021[5]). In the Flemish Community of Belgium, the *Paraat voor de schoolstraat (Ready for the school street)* policy initiative, aimed at reducing air pollution in school neighbourhoods, prohibits vehicles from driving on streets near schools for set periods of time in the morning or afternoon (Burns and Gottschalk (eds.), 2020[6]).

4. Limiting the distractions caused by using digital devices in class

One in three students becomes distracted while using digital devices at school.

PISA 2022 data show that, on average across OECD countries and in around a third of all education systems, the disciplinary climate improved between 2012 and 2022 (Table II.B1.3.12). However, apart from "traditional" disciplinary problems, around 30% of students, on average across OECD countries, reported that, in most or every mathematics lesson, they get distracted using digital devices (Figure II.3.4 and Table II.B1.3.9). Equally important, around 25% of students indicated that, in most or every lesson, they become distracted by other students who are using digital devices, that the teacher has to wait a long time for students to quiet down, that students cannot work well and that students do not start working for a long time after the lesson begins.

Limiting distractions is important for student performance and well-being.

On average across OECD countries, students who reported that they become distracted in every or most mathematics lessons scored 15 points lower in mathematics than students who reported that this never or almost never happens, after accounting for students' and schools' socio-economic profile (Table II.B1.3.13). A similar pattern was observed in over 80% of education systems with available data. In all countries/economies students who perceive the climate in their mathematics lessons to be less disruptive reported feeling less anxious towards mathematics (Table II.B1.3.16).

Students who frequently use smartphones at school reported that they are likely to become distracted while using digital devices in mathematics lessons.

Relying on students' cell phones at school increases the risk that students use their phones in class for non-educational activities or get distracted by notifications. Students appear to be less distracted when they switch off notifications from social networks and apps on their digital devices during class, when they do not have their digital

devices open in class to take notes or search for information, and when they do not feel pressured to be on line and answer messages while in class (Table II.B1.5.44).

Policies that target students' skills and behaviours when using digital devices are critical for limiting distractions.

Many schools have introduced guidelines addressing the problem of distraction when students use digital devices in school. The content and design of such rules, as well as the capacity to enforce them, determine their effectiveness. When a school's written statements or rules are too general, imprecise or lenient, they are unlikely to benefit teaching and learning with digital devices. Schools and teachers also need the time and capacity to enforce such rules. Teachers are probably unable to monitor what their students are doing with their digital devices in class, even when the devices are used as part of the lesson. Indeed, teachers' preparedness in integrating digital devices in instruction bears little relationship with the possibility of students becoming distracted while using digital devices during mathematics class (Figure II.5.9).

Students are less likely to report being distracted by using digital devices in mathematics lessons when the use of cell phones on school premises is banned. At first glance, cell phone bans would appear to be a useful policy. However, further research is needed to fully understand the effectiveness and impact of such bans. On average across OECD countries, 30% of students in schools where the use of cell phones is banned reported using a smartphone several times a day, and 21% reported using one every day or almost every day at school (Table II.B1.5.39). These data show that cell phone bans are not always effectively enforced. PISA 2022 results also show that, in some countries/economies, when cell phones are banned at their school, students are less likely to turn off their notifications from social networks and apps on their digital devices when going to sleep at night (Table II.B1.5.45). This finding suggests that students in schools with cell phone bans might not have adequate opportunities to develop self-directed strategies for using cell phones.

Moderate use of digital devices in school is related to higher performance; but the relationship differs greatly according to the purpose of use.

Students who spend up to one hour per day on digital devices for learning activities in school scored 24 points higher in mathematics than students who spend no time on such devices, on average across OECD countries. Even after accounting for students' and schools' socio-economic profile, the former group of students scored 14 points higher. This positive relationship is observed in over half of the education systems with available data. However, the relationship becomes negative when students spend more than one hour per day on digital devices for learning in school (Table II.B1.5.66).

Students who spend up to one hour per day on digital devices for leisure activities scored 20 points higher in mathematics than students who spend no time on such devices. The difference in performance amounts to 10 points even after accounting for students' and schools' socio-economic profile. This positive relationship is observed in around half of the education systems with available data (Table II.B1.5.67). However, students who spend more than an hour per day on digital devices for leisure activities scored lower in mathematics.

These findings suggest that moderate use of digital devices is not intrinsically harmful and can even be positively associated with performance. It is the overuse and/or misuse of digital devices that is negatively associated with performance. Results from PISA 2022 confirm the need for better guidelines on how to use digital devices at school.

5. Strengthening school-family partnerships and keeping parents involved in students' learning

In many education systems parental involvement in students' learning decreased.

PISA trend data collected from school principals show that the percentage of parents who were involved in school activities decreased substantially between 2018 and 2022 in many countries/economies, especially the share of parents involved in learning-related activities (Figure II.3.15 and Table II.B1.3.67). On average across OECD

countries, the share of students in schools where most parents discussed their child's progress with a teacher on their own initiative or on the initiative of one of their child's teachers shrank by ten and eight percentage points, respectively. Only in a few countries/economies did parents become more involved during the period: in Macao (China), Mexico and Romania, parents were more involved in parent-initiated discussions with teachers in 2022 than in 2018; in Brunei Darussalam, the Dominican Republic, Georgia, Qatar, Saudi Arabia and the United Arab Emirates, more parents in 2022 than in 2018 were involved in teacher-initiated discussions.

Education systems with more positive trends in parental involvement showed stable or improved performance, especially among disadvantaged students.

The education systems in which the share of parents who discussed their child's progress with a teacher on their own initiative shrank less between 2018 and 2022 showed more stable or improved mathematics performance (Figure II.3.16), especially among disadvantaged students (Table II.B1.3.77).

Students who were supported at home had more positive attitudes towards school and learning.

In all countries/economies, students who enjoy more support from their families reported a greater sense of belonging at school and life satisfaction, and more confidence in their capacity for self-directed learning (Table II.B1.3.75). In most countries/economies, these students also reported feeling less anxious towards mathematics.

Students thrive when their families take an active interest in them and their learning.

Higher-performing students reported that their family regularly ("about once or twice a week" or "every day or almost every day") eats the main meal together, spends time just talking with them, or asks them what they did in school that day. These students scored 16 to 28 points higher in mathematics than students who reported that their family does not do those things regularly, on average across OECD countries and after accounting for students' and schools' socio-economic profile (Table II.B1.3.72).

Students' responses to the question about whether their parents or someone from the family asks what they did in school that day show one of the greatest variations across education systems. In Australia*, Colombia, Croatia, Denmark, Germany, Hungary, Italy, Ireland*, the Netherlands*, New Zealand*, Portugal, Sweden and the United Kingdom*, at least 80% of students reported that their parents or someone in their family asks what they did in school that day about once or twice a week. In Hong Kong (China)*, Macao (China) and Thailand, only around 50% of students reported that this occurs regularly (Figure II.3.18).

While there is no doubt as to the importance of parental and family engagement in education, there is an on-going debate on the appropriate balance and nature of their involvement, especially beyond children's early years. PISA results show that, for adolescents, even seemingly innocuous activities, like sharing a family meal or just talking together, are strongly associated with student performance and well-being.

6. Delaying the age at selection into different education programmes

Early tracking is negatively associated with socio-economic fairness, and is related to the concentration of advantaged/disadvantaged students in schools

PISA 2022 results consistently show that in systems where students are selected into different curricular programmes at an earlier age, there is a stronger association between students' socio-economic profile and their performance (Table II.B1.4.31).

The earlier students are selected into different academic programmes, the greater the isolation of advantaged and disadvantaged students in the education system (Figures II.4.16 and II.4.17). The measures of concentration of advantaged and disadvantaged students in schools gauge the opportunities for social interaction between different groups of students in a school. This is important because classmates and schoolmates can have a strong influence on one another (i.e. peer effects) – for better and for worse. They can motivate each other and help each other

overcome learning difficulties; but they can also disrupt instruction, require disproportionate attention from teachers, and be a source of anxiety.

PISA results show that early tracking, the concentration of advantaged and disadvantaged students in schools, and socio-economic fairness in mathematics are related. Although PISA data cannot determine how they are related, they provide insights into some aspects that countries may wish to consider as they aim to provide learning opportunities for all students. It may be worth exploring whether the undesirable consequences of early tracking can be mitigated by: keeping the concentration of advantaged and disadvantaged students in schools at reasonable levels and minimising its impact on student learning; removing the social stigma associated with certain tracks; implementing challenging and rich curricula in all programmes and ensuring they are adequately supported and resourced; introducing flexibility into the system so that students can transfer easily between programmes; and offering pathways to higher education to all students.

7. Providing additional support to struggling students instead of requiring them to repeat a grade

Education systems with more grade repetition tend to show lower average performance in mathematics.

In the group of high-performing and equitable systems, comparatively few students had repeated a grade (Table II.4.2). Across OECD countries, the greater the proportion of grade repeaters in an education system, the lower the average mathematics performance and the stronger the relationship between students' socio-economic profile and their performance in mathematics (Table II.B1.4.31).

Teachers in education systems with automatic grade promotion provide greater support to students.

Students in education systems with automatic grade promotion were more likely than students in education systems without automatic grade promotion to report that their mathematics teachers are supportive, and that they have good relationships with their teachers (when considering the latter, the difference is significant only when comparing OECD countries) (Figure II.4.9).

Greater efforts are needed to ensure that students receive necessary and relevant support from their teachers.

PISA 2022 results suggest that further efforts are needed to ensure that students receive necessary and relevant support from teachers. In half of all countries/economies and on average across OECD countries, teacher support deteriorated between 2012 and 2022 (Table II.B1.3.4). For instance, the share of students who reported that their teacher gives extra help when students need it in most or every lesson decreased by three percentage points over the period. In 2022, around 70% of students reported that their teacher gives extra help when students need it and, in every or most lessons, continues teaching until students understand, on average across OECD countries; 30% of students reported that their teachers do not do these things (Table II.B1.3.1).

Attendance at pre-primary school seems to reduce the likelihood of repeating a grade later on.

While the cross-sectional nature of PISA data cannot establish causality, PISA 2022 results clearly show that, on average across OECD countries and in a majority of education systems, students who had attended pre-primary school for at least one year were considerably less likely to have repeated a grade at any education level than students who had never attended pre-primary school or who had attended for less than a year, even after accounting for socio-economic factors (Figure II.4.5).

The education systems with the strongest negative association between attendance at pre-primary school and grade repetition were Denmark, Greece, Iceland, Israel, Malaysia, Chinese Taipei, Thailand, Singapore and Sweden; the only education system with a positive association was North Macedonia. In Thailand, 15-year-old students who had

not attended pre-primary school, or had done so for less than one year, were about 5 times more likely to have repeated a grade than students who had attended for one year or longer.

8. Ensuring adequate, high-quality education staff and material

Principals were more concerned about the shortage of education staff in 2022 than in 2018.

PISA results show that between 2018 and 2022, in more than half of all education systems school principals in 2022 were more likely than their counterparts in 2018 to report that instruction was hindered, to some extent or a lot, by inadequate or poorly qualified teaching staff. This was particularly evident in education systems that saw the proportion of full-time teachers shrink over the period. Yet PISA results also show that between 2018 and 2022, student-teacher ratios and class size decreased slightly, on average across OECD countries, or remained stable in most countries/economies.

It is important for education systems to examine why principals in 2022 perceived a greater shortage of teachers when the number of teachers per student had not necessarily decreased. Other notions or phenomena might be feeding this perception, such as teacher absenteeism, the idea that teachers are not sufficiently qualified, or even changes in the role of teachers, which can, in turn, affect expectations and thus alter the standards against which teacher performance is measured.

By contrast, school principals in 2022 were less likely than their counterparts in 2018 to report a shortage of educational material. However, within education systems the availability of educational material varied across schools.

Education systems need to provide adequate and high-quality educational material and digital devices, and develop guidelines for their use.

PISA 2022 results show that socio-economically disadvantaged schools were more likely than advantaged schools to suffer from shortages of material resources, on average across OECD countries and in 47 education systems (Figure II.5.7). On average across OECD countries and in 41 education systems, advantaged schools were more likely than disadvantaged schools to suffer from a lack of or poor-quality digital resources (Figure II.5.6).

Within each education system, it is important to ensure that all schools, regardless of their socio-economic profile, enjoy adequate and quality educational material and digital resources.

9. Establishing schools as hubs for social interaction

PISA 2022 results show that schools can serve as hubs not only for students' learning but also for their well-being.

In high-performing education systems, schools tend to provide a room where students can do their homework, and school staff offer help with homework (Table II.B1.5.102). This relationship is observed both across OECD countries, and across all countries/economies, even after accounting for per capita GDP. A similar relationship is observed within education systems as well. Students in schools that provide a room to do homework scored 13 points higher in mathematics than students in schools that do not provide such a room, on average across OECD countries. After accounting for students' and schools' socio-economic profile the improvement is smaller (three points), but still significant (Table II.B1.5.87).

Across OECD countries, an increase in the availability of peer-to-peer tutoring is associated with an increase in students' sense of belonging at school. In education systems where more students in 2022 than in 2018 attended schools that offer peer-to-peer tutoring, students' sense of belonging at school strengthened during the period (Table II.B1.5.104).

These results highlight the importance of social interaction for student learning and well-being. Collaboration or co-operation, the key component of teamwork, can be incorporated into curricula to facilitate learning. For example, more than half of the curriculum in Estonia, Kazakhstan and Korea involves collaborative learning (OECD, 2021[7]).

10. Combining school autonomy with quality-assurance mechanisms

Understanding the conditions under which greater school autonomy works in the interests of students is critical for education policy making.

PISA data show that the greater the autonomy granted to schools in an education system, the higher the average mathematics performance; and this is most evident when education authorities and schools had certain quality-assurance mechanisms in place (Figure II.6.1). More specifically, the quality-assurance mechanisms that appear to ensure that greater school autonomy is associated with better academic performance across PISA-participating countries/economies are (in descending order of importance): teacher mentoring arrangements; monitoring teacher practice by having inspectors observe classes; schools' systematic recording of students' test results and graduation rates; internal or self-evaluations; tracking achievement data by an administrative authority; and using mandatory standardised tests at least once a year.

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Annex A1. The construction of reporting scales and of indices from the student context questionnaire

The construction of reporting scales

The results of the PISA 2022 test are reported in a numerical scale consisting of PISA score points. This section summarises the test-development and scaling procedures used to ensure that PISA score points are comparable across countries and with the results of previous PISA assessments.

Assessment framework and test development

The first step in defining a reporting scale in PISA is developing a framework for each domain assessed. This framework provides a definition of what it means to be proficient in the domain; delimits and organises the domain according to different dimensions; and suggests the kind of test items and tasks that can be used to measure what students can do in the domain within the constraints of the PISA design (OECD, 2023[1]). These frameworks were developed by a group of international experts for each domain and agreed upon by the participating countries.

The second step is the development of the test questions (i.e. items) to assess proficiency in each domain. A consortium of testing organisations under contract to the OECD on behalf of participating governments develops new items and selects items from previous PISA tests (i.e. "trend items") of the same domain. The expert group that developed the framework reviews these proposed items to confirm that they meet the requirements and specifications of the framework.

The third step is a qualitative review of the testing instruments by all participating countries and economies to ensure the items' overall quality and appropriateness in their own national context. These ratings are considered when selecting the final pool of items for the assessment. Selected items are then translated and adapted to create national versions of the testing instruments. These national versions are verified by the PISA consortium.

The verified national versions of the items are then presented to a sample of 15-year-old students in all participating countries and economies as part of a field trial. This is to ensure that they meet stringent quantitative standards of technical quality and international comparability. In particular, the field trial serves to verify the psychometric equivalence of items across countries and economies (see Annex A6).

After the field trial, material is considered for rejection, revision or retention in the pool of potential items. The international expert group for each domain then formulates recommendations as to which items should be included in the main assessments. The final set of selected items is also subject to review by all countries and economies. This selection is balanced across the various dimensions specified in the framework and spans various levels of difficulty so that the entire pool of items measures performance across all component skills and a broad range of contexts and student abilities.

Proficiency scales for mathematics, reading, and science

Proficiency scores in mathematics, reading, and science are based on student responses to items that represent the assessment framework for each domain (see section above). While different students saw different questions, the test design, which ensured a significant overlap of items across different forms, made it possible to construct proficiency scales that are common to all students for each domain. In general, the PISA frameworks assume that a single continuous scale can be used to report overall proficiency in a domain but this assumption is further verified during scaling (see section below).

PISA proficiency scales are constructed using item-response-theory models in which the likelihood that the test-taker responds correctly to any question is a function of the question's characteristics and of the test-taker's position on the scale. In other words, the test-taker's proficiency is associated with a particular point on the scale that indicates the likelihood that he or she responds correctly to any question. Higher values on the scale indicate greater proficiency, which is equivalent to a greater likelihood of responding correctly to any question. A description of the modelling technique used to construct proficiency scales can be found in the *PISA 2022 Technical Report* (OECD, Forthcoming[2])

In the item-response-theory models used in PISA, the test items characteristics are summarised by two parameters that represent task difficulty and task discrimination. The first parameter, task difficulty, is the point on the scale where there is at least a 50% probability of a correct response by students who score at or above that point; higher values correspond to more difficult items. For the purpose of describing proficiency levels that represent mastery, PISA often reports the difficulty of a task as the point on the scale where there is at least a 62% probability of a correct response by students who score at or above that point.

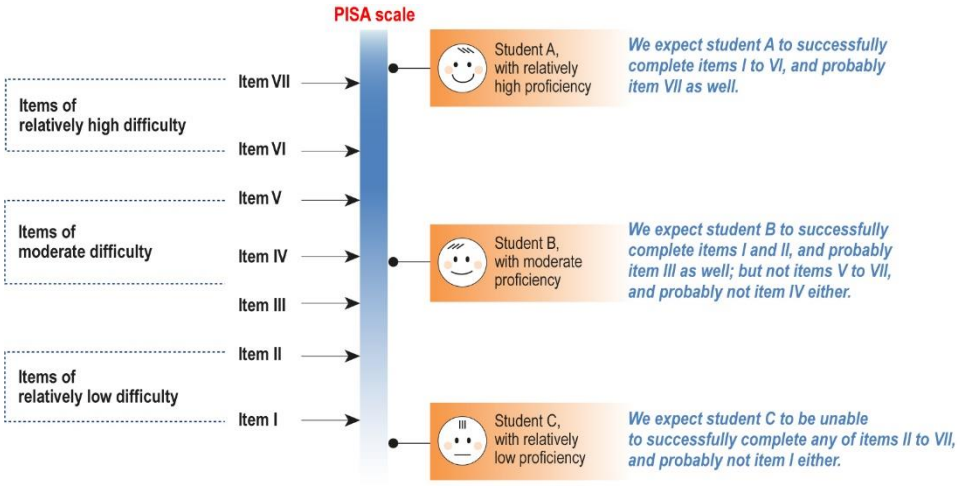
The second parameter, task discrimination, represents the rate at which the proportion of correct responses increases as a function of student proficiency. For an idealised highly discriminating item, close to 0% of students respond correctly if their proficiency is below the item difficulty and close to 100% of students respond correctly as soon as their proficiency is above the item difficulty. In contrast, for weakly discriminating items, the probability of a correct response still increases as a function of student proficiency, but only gradually.

A single continuous scale can therefore show both the difficulty of questions and the proficiency of test-takers (see Figure I.A1.1). By showing the difficulty of each question on this scale, it is possible to locate the level of proficiency in the domain that the question demands. By showing the proficiency of test-takers on the same scale, it is possible to describe each test-taker's level of skill or literacy by the type of tasks that he or she can perform correctly most of the time.

Estimates of student proficiency are based on the kinds of tasks students are expected to perform successfully. This means that students are likely to be able to successfully answer questions located at or below the level of difficulty associated with their own position on the scale. Conversely, they are unlikely to be able to successfully answer questions above the level of difficulty associated with their position on the scale.[1]

The higher a student's proficiency level is located above a given test question, the more likely he or she can answer the question successfully. The discrimination parameter for this particular test question indicates how quickly the likelihood of a correct response increases. The further the student's proficiency is located below a given question, the less likely he or she is able to answer the question successfully. In this case, the discrimination parameter indicates how fast this likelihood decreases as the distance between the student's proficiency and the question's difficulty increases.

Figure I.A1.1. Relationship between questions and student performance on a scale



How reporting scales are set and linked across multiple assessments

The reporting scale for each domain was originally established when the domain was the major focus of assessment in PISA for the first time: PISA 2000 for reading, PISA 2003 for mathematics and PISA 2006 for science.

The item-response-theory models used in PISA describe the relationship between student proficiency, item difficulty and item discrimination, but do not set a measurement unit for any of these parameters. In PISA, this measurement unit was chosen the first time a reporting scale was established. The score of "500" on the scale was defined as the average proficiency of students across OECD countries; "100 score points" was defined as the standard deviation (a measure of the variability) of proficiency across OECD countries.[2]

To enable the measurement of trends, achievement data from successive assessments are reported on the same scale. It is possible to report results from different assessments on the same scale because in each assessment PISA retains a significant number of items from previous PISA assessments. These are known as trend items. All items used to assess reading and science in 2018 and a significant number of items used to assess mathematics (74 out of 234) were developed and already used in earlier assessments. Their difficulty and discrimination parameters were therefore already estimated in previous PISA assessments.

The answers to the trend questions from students in earlier PISA cycles, together with the answers from students in PISA 2022, were both considered when scaling PISA 2022 data to determine student proficiency, item difficulty and item discrimination. In particular, when scaling PISA 2022 data, item parameters for new items were freely estimated, but item parameters for trend items were initially fixed to their PISA 2018 values, which, in turn, were based on a concurrent calibration involving response data from multiple cycles. All constraints on trend item parameters were evaluated and, in some cases, released in order to better describe student-response patterns. See the *PISA 2022 Technical Report* (OECD, Forthcoming[2]) for details.

The extent to which the item characteristics estimated during the scaling of PISA 2018 data differ from those estimated in previous calibrations is summarised in the "link error", a quantity (expressed in score points) that reflects the uncertainty in comparing PISA results over time. A link error of zero indicates a perfect match in the parameters across calibrations, while a non-zero link error indicates that the relative difficulty of certain items or the ability of certain items to discriminate between high and low achievers has changed over time, introducing greater uncertainty in trend comparisons.

How many scales per domain? Assessing the dimensionality of PISA domains

PISA frameworks for mathematics, reading, and science assume that a single continuous scale can summarise performance in each domain for all countries. This assumption is incorporated in the item-response-theory model used in PISA. Violations of this assumption therefore result in model misfit, and can be assessed by inspecting fit indices.

After the field trial, initial estimates of model fit for each item, and for each country and language group, provide indications about the plausibility of the uni-dimensionality assumption and about the equivalence of scales across countries. These initial estimates are used to refine the item set used in each domain: problematic items are sometimes corrected (e.g. if a translation error is detected); and coding and scoring rules can be amended (e.g. to suppress a partial-credit score that affected coding reliability, or to combine responses to two or more items when the probability of a correct response to one question appears to depend on the correct answer to an earlier question). Items can also be deleted after the field trial. Deletions are carefully balanced so that the set of retained items continues to provide a good balance of all aspects of the framework. After the main study, the estimates of model fit are mainly used to refine the scaling model (some limited changes to the scoring rules and item deletions can also be considered).

Despite the evidence in favour of a uni-dimensional scale for the “major” domain (i.e. mathematics in PISA 2022), PISA nevertheless provides multiple estimates of performance, in addition to the overall scale, through so-called “subscales”. Subscales represent different framework dimensions and provide a more nuanced picture of performance in a domain. Subscales within a domain are usually highly correlated across students (thus supporting the assumption that a coherent overall scale can be formed by combining items across subscales). Despite this high correlation, interesting differences in performance across subscales can often be observed at aggregate levels (across countries, across education systems within countries, or between boys and girls).

Summary descriptions of the proficiency levels of mathematical subscales

Tables I.A1.1 to I.A1.8 (below) provide summary descriptions of proficiency levels on each mathematical subscale. In some mathematical subscales there were no test items in the PISA 2022 Mathematics assessment to describe skills at levels 1c or 1b.

PISA 2022 results on mathematics subscales are included in Annex B1 (for countries and economies) and Annex B2 (for regions within countries). Results on the percentage of students scoring at each proficiency level in mathematics subscales were estimated only for proficiency levels that had proficiency descriptors (i.e. test items measuring those levels).

Table I.A1.1. Proficiency levels on the mathematical process subscale: *Mathematical reasoning*

Level	What students can typically do
6	At Level 6, students use deductive and inductive reasoning to devise strategies to solve real-world problems that require inference and creativity to recognise the mathematical nature of the task. Tasks at this level are often presented abstractly and require reasoning to recognise how the context-specific language can be transformed into known mathematical concepts or procedures, which underlies making the mathematical context suitable for analysis. Students can solve problems that require visualising a nonstandard geometric model not explicitly shown or described in the task or that require a solid understanding of known algorithms. For example, they can transform given information to construct a visual model to represent a situation or they can use the definition of a procedure for computing a statistical measure to justify if a mathematical result is possible without having numerical values to manipulate. At this level, they use reasoning to critique the limits of a model, such as identifying if a model can or cannot be used in a particular situation, which is necessary for being able to interpret/evaluate the mathematical outcome in context. Students also use reasoning to construct mathematical arguments based on logic and contradictions, such as justifying if a conclusion can be made from a given data set or developing a counterexample in response to a claim.
5	At Level 5, students can recognise structure in problem situations that can be solved using an algorithmic approach. Students use computational thinking to design an optimal procedure, such as programming a sequence of commands, and then reflect on the solution to determine if it meets the given constraints. They can analyse situations and recognise how a known procedure or set of procedures can be applied as a way to justify, for example, if an object can fit into a particular space or if a plan for a geometric design is possible. At this level, they can determine how to develop an experiment and run simulations to collect data necessary for evaluating a context. Students can identify a counterexample or analyse a rule used in a pattern as a way to support a mathematical argument. Students also use reasoning to develop solution strategies by identifying which elements of a model vary and which are invariant.
4	At Level 4, students demonstrate reasoning ability by reflecting on solutions to explain mathematical concepts in real-world contexts. They can evaluate the reasonableness of a claim and provide mathematical justifications to either support or refute the claim, such as recognising how to apply a common procedure in a novel context or determining how to interpret data or information presented in articles, tables, or phone apps. At this level, students can use their understanding of arithmetic and algebraic properties to analyse how manipulating the variables in a model or the steps in a procedure will help explain the real-world results, or they can develop a model to derive a relationship between the variables used in an equation. Students can identify more complex geometric relationships from images of shapes or descriptions of their properties. They are able to reason inductively from sample results to inform decision making or reason about the likelihood of various outcomes related to a probability context.
3	At Level 3, students can apply reasoning by utilising definitions and making judgements necessary for transforming conceptual and contextual situations into mathematical problems. Students at this level can evaluate a claim based on devising simple strategies to connect the underlying mathematics with the context. They are able to solve problems that require making minimal assumptions, such as recognising the relative size of a region from a diagram or comparing graphs of population data. Students can reason about properties in a description of a geometric model to determine a simple algebraic relationship. At this level, they can also apply reasoning to solve problems involving familiar concepts presented in nonstandard ways, such as race results or statistical measures represented graphically on a coordinate plane.
2	At Level 2, students are able to use reasoning to infer relationships between conceptual and contextual elements in a problem or to devise a straightforward strategy for evaluating a claim. For example, they can order objects by recognising how the size of various objects relates to distance traveled or how to use given assumptions to compare two rate plans with varying prices. Students at this level can also use spatial reasoning, when provided with a model or diagram, to recognise an alternate representation of an image or to analyse simple geometric properties of the model.
1a	At Level 1a, students use reasoning to draw conclusions based on their understanding of simple mathematical concepts, such asevaluating the likelihood of an outcome in a familiar probability context.
1b	*There were no items in the PISA 2022 Mathematics assessment to describe this level on the scale.*
1c	*There were no items in the PISA 2022 Mathematics assessment to describe this level on the scale.*

Table I.A1.2. Proficiency levels for mathematical process subscale: *Formulating situations mathematically*

Level	What students can typically do
6	Students at Level 6 can typically apply a wide variety of mathematical content knowledge to transform and represent information from a broad variety of contexts into a mathematical form amenable to analysis. At this level, students can formulate and solve complex real-world problems involving significant modelling steps and extended calculations, such as applying their geometric knowledge to irregular shapes, inferring relevant parameters of a large data set, or analysing an experiment to recognise the mathematical relationship between objects. Students at Level 6 are able to identify the relationship between the key components of a problem and to develop algebraic formulations that accurately represent them.
5	At Level 5, students show an ability to use their understanding across a range of mathematical areas to transform information or data from a problem context into mathematical form, sometimes involving two or more variables. They are able to recognise a situation where statistical counting techniques can be applied or formulate inequalities based on given conditions. Students are able to manipulate relatively large data sets by determining appropriate mathematical operations to perform using a spreadsheet tool. They are able to analyse more complex geometric figures, for example, by recognising the relationship between the properties of a compound figure and the properties of individual shapes that comprise the compound figure. Students at this level can formulate a process to solve a problem where some of the information used is given as a range instead of a single value or when information is not given explicitly in the task.
4	At Level 4, students are able to solve complex problems in a variety of contexts that may require designing a sequence of steps to reach the solution. They also recognise when a single process, repeated iteratively, can lead to the solution. Students are able to run simulations to identify the underlying relationship between two or more variables. They can determine probabilities from data presented in two-way tables. Students at this level can also formulate linear algebraic expressions of relatively simple contexts involving one constraint, recognise an application of a known procedure from a data table and use that procedure to determine missing values, or formulate a method to compare information, such as the prices of several sale items. They can work with more complex geometric models of practical situations which contain all the relevant information needed for formulating the solution.
3	At Level 3, students can identify and extract information from a variety of sources, including text, geometric models, tables, and diagrams, where all necessary information is provided. They can identify basic mathematical concepts relevant for the model or identify how to transform information given in a diagram to data that can be input into a simulation. Students at this level are able to solve problems by recognising situations in which quantities are related proportionally or by performing a computation using a percentage in real-life contexts such as medical testing or ticket sales. They are able to solve simple multi-step problems where the sequence of steps needs to be determined, and each step requires translating some of the given information into a form that can be operated on mathematically.
2	At this level, students can understand clearly formulated instructions and information about simple processes and tasks in order to express them in a mathematical form. They can determine a rule used in a simple pattern, and then use that rule to extend the pattern to the next term. They are able to use information presented in tables or diagrams to identify or build a simple model of a practical situation. For example, they can revise a given formula to determine the number of seats in any row of a theatre. Students at this level are able to translate descriptions of situations to be operated on mathematically that first require identifying information relevant to the particular task. At this level, students begin to formulate situations involving non-integer quantities, provided all necessary information is given in the task.
1a	At this level, students can recognise an explicit model of a contextual situation from a list or translate a short verbal description so that it can be operated on using basic mathematical tools. Students at this level are able to work with simple models involving one operation and, at most, two variables. For example, they can select the appropriate model that represents the total number of items that can be produced based on a production rate. Students at this level are capable of formulating situations that involve whole numbers and where all relevant information is given.
1b	*There were no items in the PISA 2022 Mathematics assessment to describe this level on the scale.*
1c	*There were no items in the PISA 2022 Mathematics assessment to describe this level on the scale.*

Table I.A1.3. Proficiency levels for mathematical process subscale: *Employing mathematical concepts, facts and procedures*

Level	What students can typically do
6	Students at Level 6 are typically able to employ a strong repertoire of knowledge and procedural skills in a wide range of mathematical areas. They can solve problems involving several stages or a problem that does not have a well-defined solution method, such as computing the area of an irregularly shaped figure. They demonstrate an understanding of statistical data, and can apply that understanding, for example, to determine the probability of different events. Students at this level can observe regularities in information and use that to determine algorithms to apply to a situation. At Level 6, students' work is consistently precise and reflects a strong ability to work with different data formats and representations.
5	Students at Level 5 can employ a broader range of knowledge and skills to solve problems. They can sensibly link information in graphical and diagrammatic formats to textual information. Students can reason proportionally to find a unit rate or understand and apply the meaning of a concept to extract relevant information from a table to solve a problem. At this level, they can devise a strategy to extrapolate from a sample or to determine which of two savings options would be better in a situation involving variously priced items. Students demonstrate the ability to solve problems that require converting between units or working with constraints and can provide mathematical or conceptual arguments to support their results. They also demonstrate proficiency working with percentages and ratios.
4	At Level 4, students show an understanding of the context and can recognise efficient strategies for solving problems. For example, they can typically identify relevant data and information from contextual material and use it to perform such tasks as, calculating distances from a map, analysing a model based on percentages, or comparing the results from two different formulae to compute the same measure. They are able to determine how a rating system was used to support a claim or evaluate several construction designs to rank order them based on a given criterion. At this level, students can estimate values from a graph and use them to solve a problem or analyse statements relating quantities expressed in different numerical formats. They demonstrate an ability to work with ratios or problems that require a series of steps to be performed in a specific order.
3	Students at Level 3 demonstrate more flexibility in devising and implementing solution strategies for problems that can be solved in a variety of ways. They are able to solve problems where the information given in the task must first be analysed to determine which of a given set of processes should be implemented, such as determining a fine for exceeding a speed limit based on different driving speeds or a model for computing charges for water-usage. At this level, students are able to use the basic properties of angles to solve a geometric problem or are able to translate between graphical and tabular representations of the same data. Students show an ability to approximate a final solution from interim results or to recognise how a given constraint affects the conclusion. They can work with percentages, fractions, decimal numbers, proportional relationships, and simple non-linear contexts.
2	Students at Level 2 show an ability to work with given models in flexible ways, such as identifying the relevant information to input or manipulating information to make it amenable to use in the model (including models with multiple inputs or tasks that require using a calculator tool specific to the context). They are also able to determine the input when given the output. Students can apply familiar geometric concepts to analyse a spatial pattern. At this level, students show an understanding of place value in decimal numbers and can use that understanding to compare numbers presented in a familiar context. They can apply a known procedure that first requires understanding a data table to extract the necessary information. Students are able to solve simple problems using proportional reasoning and work with ratios.
1a	Students at Level 1a can solve well-defined problems that require minimal decisions. For example, they can make direct inferences from textual information that points to an obvious strategy to solve a given problem, particularly where the mathematical procedures are one- or two-step arithmetic operations with whole numbers or require application of a familiar procedure. Students are able to extract information presented in a variety of formats, such as advertisements, simple pie charts, diagrams, or tables, which contain all the needed information to solve a problem. At this level, students can compute simple percentages, recognise when quantities are related proportionally, find the total area of a standard region, or determine a cost saving.
1b	At Level 1b, students can employ straightforward, one-step procedures that are clearly defined in the task, and where all information is presented in simple tabular format. For example, they are able to determine the winner of a tournament, given the criterion for winning or locate information in a table based on a set of conditions.
1c	*There were no items in the PISA 2022 Mathematics assessment to describe this level on the scale.*

Table I.A1.4. Proficiency levels for mathematical process subscale: *Interpreting, applying and evaluating mathematical outcomes*

Level	What students can typically do
6	At Level 6, students are able to link multiple complex mathematical representations in an analytical way to identify and extract data and information that enables conceptual and contextual questions to be answered. Students at this level demonstrate creativity in order to evaluate claims or interpret solutions to problems that require greater insight to solve, such as using a simulation to determine a design that satisfies several conditions. They are able to interpret data sets with multiple variables that typically require having to perform two or more operations before being able to evaluate a set of given claims related to the data set. Students can recognise different possible subdivisions of an irregular shape based on interpreting a list of geometric properties of the irregular shape. At this level, students can readily interpret or evaluate percentages, frequency distributions, and statistical measures, such as means and medians, in a variety of contexts.
5	At Level 5, students demonstrate the ability to interpret complex situations that require analyses of the underlying mathematics and can apply their understanding of mathematical concepts to real-world situations to make judgements on the reasonableness of claims or results. For example, students can explain why a possible mathematical model does not fit the real-world context. They can interpret experimental results and devise a method for comparing and ranking the results based on a given criterion. At this level, students can evaluate statistical statements based on means or product ratings presented in multiple formats, or they can manipulate a data set so that the presentation facilitates interpretation of the provided information.
4	At Level 4, students are able to interpret and evaluate situations or outcomes that typically involve satisfying multiple conditions, in a range of real-world contexts. They are able to interpret simple statistical or probabilistic statements from data presented in tables or charts in such contexts as fitness levels or genetics. Students at this level are able to interpret experimental results to infer a relationship between two variables in order to evaluate a claim or explain how the computational result of an exper iment relates to a given set of specifications. They can determine if a solution is compatible with a particular context or recognise how different adjustments to an algorithm affect the results. At this level, students also are able to approach problems where their interpretation of the given information or model can influence the solution strategy they choose for the task.
3	Students at Level 3 show an ability to reflect on an outcome, or the process used to reach an outcome, in more complex contexts. For example, they can interpret an algebraic model of a design plan to determine what quantity a variable in the model represents or manipulate a set of data using a spreadsheet tool to analyse claims related to energy usage or changes in population data. Students are able to use simulation results to determine a relationship between two contextual variables or explain if a conjecture about a simple algorithm is true. Students demonstrate spatial reasoning by translating between two- and three-dimensional representations of solids or by understanding how properties of geometric figures are related. At this level, students can analyse relatively unfamiliar data presentations to support their conclusions or interpret solutions of non-integer values or ratios with respect to real-world contexts.
2	At Level 2, students can link conceptual and contextual elements of the problem to mathematics in order to solve problems in a variety of real-world contexts where the information is presented clearly. Students are able to evaluate outcomes, often without having to perform calculations, such as determining the angle measures of an object based on interpreting a description of its properties. They can interpret context-specific language into simple mathematical relationships, sometimes involving one or two constraints, or understand how relationships presented in graphical formats relate to the context, such as a graph of distance versus time. At this level, students can run simulations and interpret the results with respect to the conditions of the task involving one variable.
1a	At Level 1a, students are able to locate and utilise information in order to make sense of the context. They can interpret information that requires relating two simple data sources, such as tables. For example, they can relate information in one table showing how points are awarded to another table of match outcomes to solve a problem in a familiar context or to understand how data from one source is represented in another source. Students at this level can also recognise when some of the given information can be ignored with respect to the specific task.
1b	At Level 1b, students are able to interpret contextual information presented in one of a variety of formats, such as two-way tables or work schedules. They demonstrate an ability to process the information given basic constraints imposed by the task, such as determining which rule from a table to apply or when to plan an event.
1c	Students at Level 1c can interpret information from real-world contexts presented in simple diagrams or tables and then use that information to solve well-defined problems involving a single operation with whole numbers or straightforward comparisons.

Table I.A1.5. Proficiency levels on the mathematical content subscale: *Change and relationships*

Level	What students can typically do
6	At Level 6, students use significant insight, abstract reasoning and argumentation skills and technical knowledge and conventions to solve problems involving relationships among variables and to generalise mathematical solutions to complex real-world problems. They are able to create and use an algebraic model of a functional relationship incorporating multiple quantities. They apply deep geometrical insight to work with complex patterns. And they are typically able to use complex proportional reasoning, and complex calculations with percentage to explore quantitative relationships and change.
5	At Level 5, students solve problems by using algebraic and other formal mathematical models, including in scientific contexts. They are typically able to use complex and multi-step problem-solving skills, and to reflect on and communicate reasoning and arguments, for example in evaluating and using a formula to predct the quantitative effect of change in one variable on another. They are able to use complex proportional reasoning, for example to work with rates, and they are generally able to work competently with formulae and with expressions including inequalities.
4	Students at Level 4 are typically able to understand and work with multiple representations, including algebraic models of real-world situations. They can reason about simple functional relationships between variables, going beyond individual data points to identifying simple underlying patterns. They typically employ some flexibility in interpretation and reasoning about functional relationships (for example in exploring distance-time-speed relationships) and are able to modify a functional model or graph to fit a specified change to the situation; and they are able to communicate the resulting explanations and arguments.
3	At Level 3, students can typically solve problems that involve working with information from two related representations (text, graph, table, formulae), requiring some interpretation, and using reasoning in familiar contexts. They show some ability to communicate their arguments. Students at this level can typically make a straightforward modification to a given functional model to fit a new situation; and they use a range of calculation procedures to solve problems, including ordering data, time difference calculations, substitution of values into a formula, or linear interpolation.
2	Students at Level 2 are typically able to locate relevant information on a relationship from data provided in a table or graph and make direct comparisons, for example to match given graphs to a specified change process. They can reason about the basic meaning of simple relationships expressed in text or numeric form by linking text with a single representation of a relationship (graph, table, simple formula), and can correctly substitute numbers into simple formulae, sometimes expressed in words. At this level, student can use interpretation and reasoning skills in a straightforward context involving linked quantities.
1a	Students at Level 1a are typically able to evaluate single given statements about a relationship expressed clearly and directly in a formula, table, or graph. Their ability to reason about relationships, and change in those relationships, is limited to simple expressions and to those located in familiar situations, such as contexts involving unit rates. They may apply simple calculations needed to solve problems related to clearly expressed relationships.
1b	*There were no items in the PISA 2022 Mathematics assessment to describe this level on the scale.*
1c	*There were no items in the PISA 2022 Mathematics assessment to describe this level on the scale.*

Table I.A1.6. Proficiency levels on the mathematical content subscale: *Quantity*

Level	What students can typically do
6	At Level 6 and above, students conceptualise and work with models of complex quantitative processes and relationships; devise strategies for solving problems; formulate conclusions, arguments and precise explanations; interpret and understand complex information, and link multiple complex information sources; interpret graphical information and apply reasoning to identify, model and apply a numeric pattern. They are able to analyse and evaluate interpretive statements based on data provided; work with formal and symbolic expressions; plan and implement sequential calculations in complex and unfamiliar contexts, including working with large numbers, for example to perform a sequence of currency conversions, entering values correctly and rounding results. Students at this level work accurately with decimal fractions; they use advanced reasoning concerning proportions, geometric representations of quantities, combinatorics and integer number relationships; and they interpret and understand formal expressions of relationships among numbers, including in a scientific context.
5	At Level 5, students are able to formulate comparison models and compare outcomes to determine best price; interpret complex information about real-world situations (including graphs, drawings and complex tables, for example two graphs using different scales); they are able to generate data for two variables and evaluate propositions about the relationship between them. Students are able to communicate reasoning and argument; recognise the significance of numbers to draw inferences; provide a written argument evaluating a proposition based on data provided. They can make an estimation using daily life knowledge; calculate relative and/or absolute change; calculate an average; calculate relative and/or absolute difference, including percentage difference, given raw difference data; and they can convert units (for example calculations involving areas in different units).
4	At Level 4, students are typically able to interpret complex instructions and situations; relate text-based numerical information to a graphic representation; identify and use quantitative information from multiple sources; deduce system rules from unfamiliar representations; formulate a simple numeric model; set up comparison models; and explain their results. They are typically able to carry out accurate and more complex or repeated calculations, such as adding 13 given times in hour/minute format; carry out time calculations using given data on distance and speed of a journey; perform simple division of large multiples in context; carry out calculations involving a sequence of steps and accurately apply a given numeric algorithm involving a number of steps. Students at this level can perform calculations involving proportional reasoning, divisibility or percentages in simple models of complex situations.
3	At Level 3, students typically use basic problem-solving processes, including devising a simple strategy to test scenarios, understand and work with given constraints, use trial and error, and use simple reasoning in familiar contexts. At this level students typically can interpret a text description of a sequential calculation process, and correctly implement the process; identify and extract data presented directly in textual explanations of unfamiliar data; interpret text and diagrams describing a simple pattern; perform calculations including working with large numbers, calculations with speed and time, conversion of units (for example from an annual rate to a daily rate). They understand place value involving mixed 2- and 3-decimal values and including working with prices; and are typically able to order a small series of (4) decimal values; calculate percentages of up to 3-digit numbers; and apply calculation rules given in natural language.
2	At Level 2, students can typically interpret simple tables to identify and extract relevant quantitative information; interpret a simple quantitative model (such as a proportional relationship) and apply it using basic arithmetic calculations. They are able to identify the links between relevant textual information and tabular data to solve word problems; interpret and apply simple models involving quantitative relationships; identify the simple calculation required to solve a straight-forward problem; carry out simple calculations involving the basic arithmetic operations, as well as ordering 2- and 3-digit whole numbers and decimal numbers with one or two decimal places, and calculate percentages.
1a	At Level 1a, students are typically able to solve basic problems in which relevant information is explicitly presented, and the situation is straightforward and limited in scope. They are able to handle situations where the required computational activity is obvious and the mathematical task is basic, such as performing one or two simple arithmetic operations with whole numbers or percentages. Students at this level can manipulate quantitative information to make it amenable to computational analysis, such as determining the total number of points earned by teams given a record of their wins and losses.
1b	At Level 1b, students can solve straightforward problems that require single arithmetic operations with whole numbers or retrieving numerical information from a table or chart. For example, students can total the columns of a simple table and compare the results, or they can read and interpret a simple table of monetary amounts or a work schedule to satisfy a situation with a single constraint.
1c	*There were no items in the PISA 2022 Mathematics assessment to describe this level on the scale.*

Table I.A1.7. Proficiency levels on the mathematical content subscale: *Space and shape*

Level	What students can typically do
6	At Level 6, students are able to solve complex problems involving multiple representations or calculations; identify, extract, and link relevant information, for example by extracting relevant dimensions from a diagram or map and using scale to calculate an area or distance; they use spatial reasoning, significant insight and reflection, for example by interpreting text and related contextual material to formulate a useful geometric model and applying it taking into account contextual constraints; they are able to recall and apply relevant procedural knowledge from their mathematical knowledge base such as in circle geometry, trigonometry, Pythagoras's rule, or area and volume formulae to solve problems; and they are typically able to generalise results and findings, communicate solutions and provide justifications and argumentation.
5	At Level 5, students are typically able to solve problems that require appropriate assumptions to be made, or that involve reasoning from assumptions provided and taking into account explicitly stated constraints, for example in exploring and analysing the layout of a room and the furniture it contains. They solve problems using theorems or procedural knowledge such as symmetry properties, or similar triangle properties or formulas including those for calculating area, perimeter or volume of familiar shapes; they use well-developed spatial reasoning, argument and insight to infer relevant conclusions and to interpret and link different representations, for example to identify a direction or location on a map from textual information.
4	Students at Level 4 typically solve problems by using basic mathematical knowledge such as angle and side-length relationships in triangles, and doing so in a way that involves multistep, visual and spatial reasoning, and argumentation in unfamiliar contexts; they are able to link and integrate different representations, for example to analyse the structure of a three dimensional object based on two different perspectives of it; and typically they can compare objects using geometric properties.
3	At Level 3, students are able to solve problems that involve elementary visual and spatial reasoning in familiar contexts, such as calculating a distance or a direction from a map or a GPS device; they are typically able to link different representations of familiar objects or to appreciate properties of objects under some simple specified transformation; and at this level students can devise simple strategies and apply basic properties of triangles and circles, and can use appropriate supporting calculation techniques such as scale conversions needed to analyse distances on a map.
2	At Level 2, students are typically able to solve problems involving a single familiar geometric representation (for example, a diagram or other graphic) by comprehending and drawing conclusions in relation to clearly presented basic geometric properties and associated constraints. They can also evaluate and compare spatial characteristics of familiar objects in a situation where given constraints apply (such as comparing the height or circumference of two cylinders having the same surface area; or deciding whether a given shape can be dissected to produce another specified shape).
1a	Students at Level 1a can typically recognise and solve simple problems in a familiar context using pictures or drawings of familiar geometric objects and applying basic spatial skills such as recognising elementary symmetry properties, or comparing lengths or angle sizes, or using procedures such as dissection of shapes.
1b	*There were no items in the PISA 2022 Mathematics assessment to describe this level on the scale.*
1c	*There were no items in the PISA 2022 Mathematics assessment to describe this level on the scale.*

Table I.A1.8. Proficiency levels on the mathematical content subscale: *Uncertainty and data*

Level	What students can typically do
6	At Level 6, students are able to interpret, evaluate and critically reflect on a range of complex statistical or probabilistic data, information and situations to analyse problems. Students at this level bring insight and sustained reasoning across several problem elements; they understand the connections between data and the situations they represent and are able to make use of those connections to explore problem situations fully; they bring appropriate calculation techniques to bear to explore data or to solve probability problems; and they can produce and communicate conclusions, reasoning and explanations.
5	At Level 5, students are typically able to interpret and analyse a range of statistical or probabilistic data, information and situations to solve problems in complex contexts that require linking of different problem components. They can use proportional reasoning effectively to link sample data to the population they represent, can appropriately interpret data series over time and are systematic in their use and exploration of data. Students at this level can use statistical and probabilistic concepts and knowledge to reflect, draw inferences and produce and communicate results.
4	Students at Level 4 are typically able to activate and employ a range of data representations and statistical or probabilistic processes to interpret data, information and situations to solve problems. They can work effectively with constraints, such as statistical conditions that might apply in a sampling experiment, and they can interpret and actively translate between two related data representations (such as a graph and a data table). Students at this level can perform statistical and probabilistic reasoning to make contextual conclusions.
3	At Level 3, students are typically able to interpret and work with data and statistical information from a single representation that may include multiple data sources, such as a graph representing several variables, or from two simple related data representations such as a simple data table and graph. They are able to work with and interpret descriptive statistical, probabilistic concepts and conventions in contexts such as coin tossing or lotteries and make conclusions from data, such as calculating or using simple measures of centre and spread. Students at this level can perform basic statistical and probabilistic reasoning in simple contexts.
2	Students at Level 2 are typically able to identify, extract and comprehend statistical data presented in a simple and familiar form such as a simple table, a bar graph or pie chart; they can identify, understand and use basic descriptive statistical and probabilistic concepts in familiar contexts, such as tossing coins or rolling dice. At this level students can interpret data in simple representations, and apply suitable calculation procedures that connect given data to the problem context represented.
1a	At Level 1a, students can typically read and extract data from charts or two-way tables, and recognise how these data relate tothe context. Students at this level can also use basic concepts of randomness to identify misconceptions in familiar experimental contexts, such as flipping a coin.
1b	Students at Level 1b, can typically read information presented in a well-labelled table to locate and extract specific data values while ignoring distracting information.
1c	*There were no items in the PISA 2022 Mathematics assessment to describe this level on the scale.*

Indices from the student context questionnaire

In addition to scale scores representing performance in mathematics, reading and science, this volume uses indices derived from the PISA student questionnaires to contextualise PISA 2022 results or to estimate trends that account for demographic changes over time. The following indices and database variables are used in this report.

The PISA index of economic, social and cultural status (ESCS)

The PISA index of economic, social and cultural status (ESCS) is a composite score derived, as in previous cycles, from three variables related to family background: parents' highest level of education in years (PAREDINT), parents' highest occupational status (HISEI), and home possessions (HOMEPOS).

Parents' highest level of education in years: Students' responses to questions ST005, ST006, ST007 and ST008 regarding their parents' education were classified using ISCED-11 (UNESCO, 2012[3]). Indices on parental education were constructed by recoding educational qualifications into the following categories: (1) ISCED Level 02 (pre-primary education), (2) ISCED Level 1 (primary education), (3) ISCED Level 2 (lower secondary), (4) ISCED Level 3.3 (upper secondary education with no direct access to tertiary education), (5) ISCED Level 3.4 (upper secondary education with direct access to tertiary education), (6) ISCED Level 4 (post-secondary non-tertiary), (7) ISCED Level 5 (short-cycle tertiary education), (8) ISCED Level 6 (Bachelor's or equivalent), (9) ISCED Level 7 (Master's or equivalent) and (10) ISCED Level 8 (Doctoral or equivalent). Indices with these categories were provided for a student's mother (MISCED) and father (FISCED). In the event that student responses between ST005 and ST006 (for mother's education) or between ST007 and ST008 (for father's education) conflicted (e.g. in ST006 if a student indicated their parent having a postsecondary qualification but indicated in ST005 the parent had not completed lower secondary education), the higher education value provided by the student was used. This differs from the PISA 2018 procedure where the lower value was used. In addition, the index of highest education level of parents (HISCED) corresponded to the higher ISCED level of either parent. The index of highest education level of parents was also recoded into estimated number of years of schooling (PAREDINT). The conversion from ISCED levels to year of education is common to all countries. This international conversion was determined by using the cumulative years of education values assigned in PISA 2018 to each ISCED level. The correspondence is available in the *PISA 2022 Technical Report* (OECD, Forthcoming[2]).

To make PAREDINT scores for PISA 2012, PISA 2015, and PISA 2018 comparable to PAREDINT scores for PISA 2022, new PAREDINT scores were created for each student who participated in previous cycles using the coding scheme used in PISA 2022. These new PAREDINT scores were used in the computation of trend ESCS scores.

Parents' highest occupational status: Occupational data for both the student's father and the student's mother were obtained from responses to open-ended questions. The responses were coded to four-digit ISCO codes (ILO, 2007) and then mapped to the international socio-economic index of occupational status (ISEI) (Ganzeboom and Treiman, 2003[4]). In PISA 2022, the ISCO and ISEI in their 2008 version were used. Three indices were calculated based on this information: father's occupational status (BFMJ2); mother's occupational status (BMMJ1); and the highest occupational status of parents (HISEI), which corresponds to the higher ISEI score of either parent or to the only available parent's ISEI score. For all three indices, higher ISEI scores indicate higher levels of occupational status.

Home possessions (HOMEPOS) is a proxy measure for family wealth. In PISA 2022, students reported the availability of household items at home, including books at home and country-specific household items that were seen as appropriate measures of family wealth within the country's context. HOMEPOS is a summary index of all household and possession items (ST250, ST251, ST253, ST254, ST255, ST256). Some HOMEPOS items used in PISA 2018 were removed in PISA 2022 while new ones were added (e.g., new items developed specifically with low-income countries in mind). Furthermore, some HOMEPOS that were previously dichotomous (yes/no) items were revised to polytomous items (1, 2, 3, etc.) allowing for capturing a greater variation in responses.

For the purpose of computing the PISA index of economic, social and cultural status (ESCS), values for students with missing PAREDINT, HISEI or HOMEPOS were imputed with predicted values plus a random component based on a regression on the other two variables. If there were missing data on more than one of the three variables, ESCS was not computed and a missing value was assigned for ESCS.

In PISA 2022, ESCS was computed by attributing equal weight to the three standardised components. The three components were standardised across the OECD countries, with each OECD country contributing equally. The final ESCS variable was transformed, with 0 the score of an average OECD student and 1 the standard deviation across equally weighted OECD countries.

Immigrant background (IMMIG)

Information on the country of birth of the students and their parents was collected. Included in the database are three country-specific variables relating to the country of birth of the student, mother and father (ST019). The variables are binary and indicate whether the student, mother and father were born in the country of assessment or elsewhere. The index on immigrant background (IMMIG) is calculated from these variables, and has the following categories: (1) native students (those students who had at least one parent born in the country); (2) second-generation students (those born in the country of assessment but whose parent[s] were born in another country); and (3) first-generation students (those students born outside the country of assessment and whose parents were also born in another country). Students with missing responses for either the student or for both parents were given missing values for this variable.

Language spoken at home (ST022)

Students indicated what language they usually spoke at home, and the database includes an internationally comparable variable (ST022Q01TA) that was derived from this information and has the following categories: (1) language at home is same as the language of assessment for that student; (2) language at home is another language.

The mappings of options provided in national versions of the student questionnaire for the two possible values for the "International Language at Home" variable (ST022Q01TA) are the responsibility of national PISA centres. For example, for students in the Flemish Community of Belgium, "Flemish dialect" was considered (together with "Dutch") as equivalent to the "Language of test"; for students in the French Community and German-speaking Community (respectively), Walloon (a French dialect) and a German dialect were considered to be equivalent to "Another language".

Mathematics Anxiety (ANXMAT)

The index of mathematics anxiety (ANXMAT) was constructed using student responses to question (ST345) over the extent they strongly agreed, agreed, disagreed or strongly disagreed with the following statements when asked to think about studying mathematics: "I often worry that it will be difficult for me in mathematics classes"; "I get very tense when I have to do mathematics homework"; "I get very nervous doing mathematics problems"; "I feel helpless when doing a mathematics problem"; "I worry that I will get poor <grades> in mathematics"; and "I feel anxious about failing in mathematics".

In addition to the indices listed above, the following database variables were used in this report.

- Student gender (ST004)
- Age of arrival in country of test (ST021) (only for students who were born in a country that is different of the country of test)
- Food insecurity (ST258)

Notes

[1] "Unlikely", in this context, refers to a probability below 62%.

[2] The standard deviation of 100 score points corresponds to the standard deviation in a pooled sample of students from OECD countries, where each national sample is equally weighted.

References

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Annex A2. The PISA target population, the PISA samples, and the definition of schools

This annex to the PISA 2022 results provides further technical details on how the assessment covered its target population of 15-year-olds, how its national samples represent this population across participating countries and economies, and how the sampling procedure was adapted to accurately represent diverse education systems worldwide.

What is the PISA target population?

PISA 2022 assessed the cumulative outcomes of education and learning at a point at which most young people are still enrolled in formal education: when they are 15 years old.

International surveys of education outcomes must guarantee the comparability of their target population across participating countries and economies. One way to do this is to assess students at the same grade level. However, differences between countries in the nature and extent of early childhood education and care, age at entry into primary education, and the overall institutional structure of education systems do not allow for a definition of internationally comparable grade levels.

Other international assessments have defined their target population by the grade level that provides maximum coverage of a particular age cohort. However, this definition leads to a population particularly sensitive to the distribution of students across age and grade levels, where small changes – of assessment dates, or month of entry into primary education – can lead to the selection of different target grades. There also may be differences across or within countries in whether students who are older or younger than the desired age cohort are represented in the modal grade, further rendering such grade level-based samples difficult to compare.

To overcome these problems, PISA uses an age-based definition of its target population, one that is not tied to the institutional structures of national education systems.[1] PISA assesses students who are aged between 15 years and 3 (complete) months and 16 years and 2 (complete) months[2] at the beginning of the assessment period, plus or minus an allowed 1-month variation, and who are enrolled in an educational institution[3] at grade 7 or higher. All students who met these criteria were eligible to sit the PISA test in 2022, regardless of the type of educational institution in which they were enrolled and whether they were enrolled in full- or part-time education. This also allows PISA to evaluate students shortly before they are faced with major life choices, such as whether to continue with education or enter the workforce.

Hence, PISA makes statements about the knowledge and skills of a group of individuals who were born within a comparable reference period, but who may have been exposed to different educational experiences inside and outside of school. These students may be distributed over different ranges of grades (both in terms of the specific grade levels and the spread in grade levels) in different countries/economies, or over different tracks or streams within their respective education systems. It is important to consider these differences when comparing PISA results across countries/economies. In addition, differences in performance observed when students are 15 may diminish or disappear entirely later in life.

If a country's mean scores in mathematics, reading or science are significantly higher than those of another, it cannot automatically be inferred that schools or particular parts of the education system in the first country are more effective than those in the second. However, one can legitimately conclude that it is the cumulative impact of learning experiences in the first country, starting in early childhood and up to the age of 15, and including all experiences, whether they be at school, home or elsewhere, that have resulted in the better outcomes of the first country in the subjects that PISA assesses.[4]

How were students chosen?

The accuracy of the results from any survey depends on the quality of the information drawn from those surveyed as well as on the sampling procedures. Quality standards, procedures, instruments and verification mechanisms were developed for PISA that ensured that national samples yielded comparable data and that results could be compared across countries and economies with confidence. Experts from the PISA Consortium selected the samples for most participating countries/economies and monitored the sample-selection process closely in those countries that opted to select their own samples.

All samples in PISA 2022 were designed as two-stage stratified samples. The first stage sampled schools in which 15-year-old students may be enrolled. Schools were sampled systematically with selection probabilities proportional

to the estimated size of their (eligible) 15-year-old population. At least 150 schools[5] were selected in each country, although the requirements for national analyses often demanded a larger sample. Replacement schools for each sampled school were simultaneously identified, in case an originally sampled school chose not to participate in PISA.

The second stage of the selection process sampled students within sampled schools. Once schools were selected, a list of each sampled school's 15-year-old students was prepared. From this list, 42 students were then selected with equal probability (all 15-year-old students were selected when less than 42 eligible students were enrolled). The target number of students in a school who were to be sampled could deviate from 42 when agreed by PISA's sampling contractor but could not fall below 20 students.

Data-quality standards in PISA require minimum participation rates for schools and for students. These standards were established to minimise potential bias arising from non-response. Indeed, it was likely that any bias resulting from non-response would be negligible – typically smaller than the sampling error – in countries that met these standards.[6]

At least 85 % of the schools initially selected to take part in the PISA assessment were required to agree to conduct the test when accounting for the number of enrolled 15-year-olds. Where the initial response rate of schools was between 65% and 85%, however, an acceptable school-response rate could still be achieved using replacement schools.

Whenever a school is selected for PISA, two other schools – the most similar according to the statistical criteria used for sampling – are selected as replacement schools in case of non-response or other contingencies. However, statistical similarities notwithstanding, sampling bias is still possible if the replacement schools differ from sampled schools in ways that might not be considered for sampling. Therefore, countries/economies were encouraged to persuade as many of the schools in the original sample as possible to participate.

Schools that were included but where student participation rates of 25-50% were observed were not considered to be participating schools when determining participation rates; but data collected from these schools (from both the cognitive assessment and background questionnaires) were included in the database and contributed to the estimation of the various quantities derived from the assessment. Data from schools with a student participation rate of less than 25% were excluded from the database.

In PISA 2022, 14 countries/economies – the United States (51%), Hong Kong (China) (60%), New Zealand (61%), the Netherlands (66%), the United Kingdom (67%), the Flemish community (Belgium) (72%), Ukrainian regions (18 of 27) (80%), Belgium (80%), Brazil (81%), Canada (81%), Chinese Taipei (83%), Latvia (84%), Panama (84%) and Chile (84%) – did not meet the standard of 85% weighted school participation rate; three of them did not meet the 65% threshold for schools initially selected for PISA. Even after replacement schools were included, seven countries – the United States (63%), New Zealand (72%), Hong Kong (China) (80%), the United Kingdom (82%), Chinese Taipei (84%), Canada (86%) and the Netherlands (90%) still failed to reach target participation rates;[7] all other participating countries/economies reached the threshold for an acceptable participation rate after including replacement schools.

PISA 2022 also required that at least 80% of the students chosen in participating schools sat the PISA test. This threshold was calculated at the national level and did not have to be met in each participating school. Follow-up sessions were required in schools where too few students had participated in the planned assessment sessions. Student-participation rates were calculated over all originally selected schools and over all participating schools, including replacement schools. Students who participated in either the planned or follow-up sessions were counted in these rates; those who attended only the questionnaire session were included in the international database and contributed to the statistics presented in this publication if they provided at least a description of either parent's occupation.

The standard of 80% student participation rate was not met by nine countries/economies: Jamaica (68%), New Zealand (72%), the United Kingdom (75%), Hong Kong (China) (75%), Australia (76%), Ireland (77%), Panama (77%), Canada (77%) and Malta (79%).

Table I.A2.6 shows the response rate for students and schools, before and after including replacement schools.

- **Column 1** shows the weighted participation rate of schools before replacement; it is equivalent to Column 2 divided by Column 3 (multiplied by 100 to give a percentage).
- **Column 2** shows the number of responding schools before school replacement, weighted by student enrolment.
- **Column 3** shows the number of sampled schools before school replacement, weighted by student enrolment. This includes both responding and non-responding schools.
- **Column 4** shows the unweighted number of responding schools before school replacement.
- **Column 5** shows the unweighted number of sampled schools before school replacement, including both responding and non-responding schools.
- **Columns 6 to 10** repeat Columns 1 to 5 for schools after school replacement, i.e. after non-responding schools were substituted by the replacement schools identified during the initial sampling procedure.
- **Columns 11 to 15** repeat Columns 6 to 10 but for students in schools after school replacement. Note that the weighted and unweighted numbers of students sampled (Columns 13 and 15) include students who were assessed and those who should have been assessed but who were absent on the day of assessment. As mentioned above, any students in schools where the student response rate was less than 50% were not considered to be attending participating schools and were thus excluded from Columns 14 and 15 (and, similarly, from Columns 4, 5, 9 and 10).

What proportion of 15-year-olds does PISA represent?

All countries/economies attempted to maximise the coverage of 15-year-olds enrolled in education in their national samples, including students enrolled in special education institutions. As such, the technical standards used in PISA only allowed countries/economies to exclude up to 5% of the desired target population (i.e. 15-year-old students enrolled in educational institutions at grade 7 or higher) either by excluding schools or students within schools.

Sixteen countries and economies did not meet this standard in PISA 2022: Ukrainian regions (18 of 27) (14.9%), Denmark (11.6%), the Netherlands (8.4%), Latvia (7.9%), Sweden (7.4%), Norway (7.3%), Australia (6.9%), Scotland (United Kingdom) (6.6%), Lithuania (6.5%), the United States (6.1%), Estonia (5.9%), Canada (5.8%), Switzerland (5.8%), New Zealand (5.8%), Türkiye (5.6%) and Croatia (5.4%). In 31 countries/economies, the overall exclusion rate was less than 2% (Table I.A2.1). When language exclusions[8] were accounted for (i.e. removed from the overall exclusion rate), Switzerland, Türkiye and the United States no longer had exclusion rates greater than 5%. In Ukrainian regions (18 of 27), almost all excluded students were so considered due to the war. More details can be found in the PISA 2022 Technical Report (OECD, 2023[1]).

Exclusions that should remain within the above limits include:

- At the school level:
  - schools that were geographically inaccessible or where the implementation of the PISA assessment was not considered feasible
  - schools that provided teaching only for students in the categories defined under “within-school exclusions”, such as schools for students with special education needs.

The percentage of 15-year-olds enrolled in such schools had to be less than 2.5% of the nationally desired target population (0.5% maximum for the former group and 2% maximum for the latter group). The magnitude, nature and justification for school-level exclusions are documented in the PISA 2022 Technical Report (OECD, 2023[1]). In addition, due to differences in when schools re-opened and returned to full, in-person instruction after the COVID-19 pandemic, an additional code for student exclusions (Code 6) was used in PISA 2022 to account for those who were enrolled but received instruction virtually.

- At the student level:
  - students with an intellectual disability, i.e. a mental or emotional disability resulting in the student being so cognitively delayed that he/she could not perform in the PISA testing environment
  - students with a functional disability, i.e. a moderate to severe permanent physical disability resulting in the student being unable to perform in the PISA testing environment
  - students with limited assessment-language proficiency (these students were unable to read or speak any of the languages of assessment in the country at a sufficient level and were unable to overcome such a language barrier in the PISA testing environment; they were typically students who had received less than one year of instruction in the language of assessment)
  - students who were not attending in-person classes or going to school for tests/assessments during the PISA testing period but, rather, were receiving all of their instruction on line
  - other exclusions, a category defined by the PISA national centres in individual participating countries and approved by the PISA international consortium
  - students taught in a language of instruction for the major domain for which no materials were available.

Students could not be excluded solely because of low proficiency or common disciplinary problems. The percentage of 15-year-olds excluded within schools had to be less than 2.5% of the national desired target population.

Table I.A2.1 describes the target population of the countries/economies that participated in PISA 2022. Further information on the target population and the implementation of PISA sampling standards can be found in the PISA 2022 Technical Report (OECD, 2023[1]).

- **Column 1** shows the total number of 15-year-olds according to the most recent available information, which in most countries and economies means from 2021, the year before the assessment.
- **Column 2** shows the number of 15-year-olds enrolled in school in grade 7 or above, which is referred to as the “eligible population”.
- **Column 3** shows the national desired target population. Countries/economies were allowed to exclude up to 0.5% of students *a priori* from the eligible population, essentially for practical reasons if agreed upon with the PISA consortium.
- **Column 4** shows the number of students enrolled in schools that were excluded from the national desired target population, either from the sampling frame or later in the field during data collection. In other words, these are school-level exclusions.
- **Column 5** shows the size of the national desired target population after subtracting the students enrolled in excluded schools. This column is obtained by subtracting Column 4 from Column 3.
- **Column 6** shows the percentage of students enrolled in excluded schools. This is obtained by dividing Column 4 by Column 3 and multiplying by 100.
- **Column 7** shows the number of students who participated in PISA 2022. Note that in some cases, this number does not account for 15-year-olds assessed as part of additional national options.
- **Column 8** shows the weighted number of participating students, i.e. the number of students in the nationally defined target population that the PISA sample represents.
- **Column 9** shows the total number of students excluded within schools. In each sampled school, all eligible students – namely, those 15 years of age, regardless of grade – were listed, and a reason for the exclusion was provided for each student who was to be excluded from the sample. These reasons are further described and classified into specific categories in Table I.A2.4.
- **Column 10** shows the weighted number of students excluded within schools, i.e. the overall number of students in the national defined target population represented by the number of students from the sample excluded within schools. This weighted number is also described and classified by exclusion categories in Table I.A2.4.

- **Column 11** shows the percentage of students excluded within schools. This is equivalent to the weighted number of excluded students (Column 10) divided by the weighted number of excluded and participating students (the sum of Columns 8 and 10), multiplied by 100.
- **Column 12** shows the overall exclusion rate, which represents the weighted percentage of the national desired target population excluded from PISA either through school-level exclusions or through the exclusion of students within schools. It is equivalent to the school-level exclusion rate (Column 6) plus the product of the within-school exclusion rate and 1 minus the school-level exclusion rate expressed as a decimal (Column 6 divided by 100).[9]
- **Column 13** shows an index of the extent to which the national desired target population was covered by the PISA sample. As mentioned above, 15 countries/economies fell below the coverage of 95%. This is also known as Coverage Index 1.
- **Column 14** shows an index of the extent to which 15-year-olds *enrolled in school* were covered by the PISA sample. The index, also known as Coverage Index 2, measures the overall proportion of the national enrolled population that is covered by the non-excluded portion of the student sample, and takes into account both school- and student-level exclusions. Values close to 100 indicate that the PISA sample represents the entire (grade 7 and higher) education system as defined in PISA 2022. This is calculated in a similar manner to Column 13; however, the total enrolled population of 15-year-olds in grade 7 or above (Column 2) is used as a base instead of the national desired target population (Column 3).
- **Column 15** shows an index of the coverage of the 15-year-old population. The index is the weighted number of participating students (Column 8) divided by the total population of 15-year-old students (Column 1). This is also known as Coverage Index 3.

A high level of coverage contributes to the comparability of the assessment results. For example, even assuming that the excluded students would have systematically scored worse than those who participated, and that this relationship is moderately strong, an exclusion rate of 5% would likely lead to an overestimation of national mean scores of less than 5 score points on the PISA scale (where the standard deviation is 100 score points).[10]

Given the significant disruption caused by COVID-19 global pandemic to education systems in general, and to the administration of the PISA 2022 Main Survey in particular, coverage is of particular concern in the 2022 cycle, as it is feasibly affected both by changes in student behaviour (e.g., not returning to school when those were reopened) and by operational factors of administering PISA itself (e.g. less participating students due to interference between PISA dates and a country/economy's school reopening plan).

Table I.A2.2 provides an across-cycle perspective on:

- the estimated size of the 15-year-old cohort in a given country/economy (**Column 1** for PISA 2022),
- the estimated population size of 15-year-olds enrolled at school in grade 7 or above (**Column 2** for PISA 2022),
- the number of students that sat PISA 2022 weighted by how much they represent the population (**Column 3** for PISA 2022), and
- the coverage of the 15-year-old population (Coverage Index 3, **Column 4** for PISA 2022).

The same information is provided for previous PISA cycles until 2003. A decrease in the Coverage Index 3 between PISA 2018 and PISA 2022 was observed for 23 countries/economies. However, in only five of them this decrease was larger than 5%: the Dominican Republic, Germany, Hong Kong (China)*, the Netherlands* and Ukrainian regions (18 of 27). Nonetheless, these elevated drops in coverage are to be interpreted with due caution: sampling outcomes for Hong Kong (China) and the Netherlands struggled to meet PISA sampling standards. In Ukraine, schools in several regions were not accessible in 2022; Coverage Index 3 decreased from 86.7% in PISA 2018 to 63.9% in PISA 2022.

Conversely, all other participating countries/economies either kept or increased their coverage of the population between PISA 2018 and PISA 2022. Small increases, up to 5%, were observed in 31 countries/economies, with others showing quite elevated increase in coverage in the 2022 cycle compared to PISA 2018.

The PISA Adjudication Group, comprising the Technical Advisory Group and the Sampling Referee, reviewed the PISA 2022 data. Overall, the review found that national implementations of PISA generally adhered to PISA's technical standards despite the challenging circumstances that affected not only PISA operations but schooling more generally during the COVID-19 pandemic. Nevertheless, a number of deviations from the standards were noted and their consequences for data quality were reviewed in depth. The following overall patterns of deviations from sampling standards were identified:

- About one in five adjudicated entities had exclusion rates exceeding the limits set by the technical standards (Standard 1.7).
- Seven entities failed to meet the required school-response rates, with three of them failing to meet the stricter level of 65% before replacement (Standard 1.11). This is not inconsistent with earlier cycles of PISA, however.
- A significantly larger number of entities failed to meet the required student-response rates (Standard 1.12): ten entities did not meet this standard in PISA 2022, while only one entity did not meet the standard in PISA 2018.

Countries/economies that failed to meet the response-rate standards were requested to submit a non-response bias analysis (NRBA) report. These reports, evaluated by the PISA Adjudication Group, contained additional analyses using the national context and data sources to assess potential bias arising from school and student non-participation.

Details on the PISA Adjudication Group's assessments of the deviations from PISA standards are described in the Reader's Guide and Annex A4.

Definition of schools

In some countries, subunits within schools were sampled instead of schools, which may affect the estimate of the between-school variance. In Austria, the Czech Republic, El Salvador, Germany, Hungary, Japan and Romania, schools with more than one programme of study were split into the units delivering these programmes. In the Netherlands, locations were listed as sampling units. In the Flemish community (Belgium), each campus of a multi-campus school was sampled independently, whereas the larger administrative unit of a multi-campus school was sampled as a whole in the French community (Belgium).

In Australia and Colombia each campus of a multi-campus school was sampled independently. In Argentina each campus of a multi-campus school was sampled independently and campuses with more than one programme of study were split into the units delivering these programmes. Schools in the Basque Country (Spain) that were divided into sections by language of instruction were split into sections for sampling based on those languages.

Some schools in the United Arab Emirates were sampled as a whole unit, while others were divided by curriculum and sometimes by gender. Due to reorganisation, some schools in Sweden were split into two parts, each part with its own principal. Some schools in Portugal were organised into clusters where all units in a cluster shared the same teachers and principal; each of these clusters constituted a single sampling unit. Some schools in Singapore were sampled as a whole unit while others were split by campus or language of instruction. Some schools in Türkiye were sampled as a whole unit while others were split by programme of study. Schools in Uruguay were sampled as a whole unit, except for schools offering classes at night; night-shift sections were sampled independently from the school.

The distribution of PISA students across grades

Students assessed in PISA 2022 were enrolled in various grade levels. The percentage of students at each grade level is presented, by country, in Tables I.A2.8 and I.A2.9, and by gender within each country/economy in Tables I.A2.12 and I.A2.13.

Table I.A2.1. PISA target populations and samples, 2022 [1/4]

		Population and sample information							
		Total population of 15-year-olds	Total enrolled population of 15-year-olds at grade 7 or above	Total in national desired target population	Total school-level exclusions	Total in national desired target population after all school exclusions and before within-school exclusions	School-level exclusion rate (%)	Number of participating students	Weighted number of participating students
		(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
OECD	Australia	296 220	290 738	290 738	5 302	285 436	1.82	13 437	265 196
	Austria	85 760	82 619	82 619	1 595	81 024	1.93	6 151	76 153
	Belgium	129 814	127 559	127 537	2 438	125 100	1.91	8 286	128 642
	Canada	388 205	385 342	380 510	5 757	374 753	1.51	23 073	357 9 11
	Chile	247 550	230 294	230 175	5 831	224 344	2.53	6 488	214 108
	Colombia	805 258	685 807	685 807	632	685 175	0.09	7 804	586 683
	Costa Rica	73 787	64 582	64 582	0	64 582	0.00	6 113	57 250
	Czech Republic	109 596	102 464	102 464	1 014	101 450	0.99	8 460	100 266
	Denmark	68 110	66 650	66 650	1 160	65 490	1.74	6 200	56 909
	Estonia	14 210	14 097	14 097	457	13 640	3.25	6 392	13 345
	Finland	61 957	62 104	62 104	1 191	60 913	1.92	10 239	58 955
	France	836 624	808 703	808 703	13 612	795 091	1.68	6 770	781 286
	Germany	741 506	741 494	741 494	12 164	729 330	1.64	6 116	681 399
	Greece	107 294	102 085	102 085	529	101 556	0.52	6 403	98 087
	Hungary	102 077	93 826	93 826	2 725	91 101	2.90	6 198	87 990
	Iceland	4 623	4 602	4 602	25	4 577	0.54	3 360	4 352
	Ireland	64 051	63 256	63 256	52	63 204	0.08	5 569	65 497
	Israel	147 380	140 599	140 599	2 876	137 723	2.05	6 251	132 475
	Italy	572 210	527 539	527 539	232	527 307	0.04	10 552	496 263
	Japan	1 109 590	1 070 375	1 070 375	26 926	1 043 449	2.52	5 760	1 021 370
	Korea	418 028	417 968	417 968	3 418	414 550	0.82	6 454	428 012
	Latvia	19 801	19 501	19 501	994	18 507	5.10	5 373	16 833
	Lithuania	26 228	26 027	26 027	802	25 225	3.08	7 257	24 251
	Mexico	2 193 794	1 592 537	1 592 537	9 720	1 582 817	0.61	6 288	1 393 727
	Netherlands	198 577	193 138	193 138	12 948	180 190	6.70	5 046	155 987
	New Zealand	62 470	59 286	59 286	1 410	57 876	2.38	4 682	56 382
	Norway	64 792	64 478	64 478	974	63 504	1.51	6 6 11	58 970
	Poland	382 777	359 547	359 547	13 321	346 226	3.70	6 0 11	341 562
	Portugal	104 433	102 916	102 916	1 038	101 878	1.01	6 793	96 607
	Slovak Republic	49 662	48 584	48 584	476	48 108	0.98	5 824	47 453
	Slovenia	18 932	19 728	19 728	434	19 294	2.20	6 721	18 850
	Spain	507 740	487 620	487 620	2 432	485 188	0.50	30 800	459 029
	Sweden	121 723	121 197	121 197	1 450	119 747	1.20	6 072	108 499
	Switzerland	83 388	81 012	81 012	2 904	78 108	3.58	6 829	75 696
	Türkiye	1 266 433	1 153 239	1 153 239	43 932	1 109 307	3.81	7 250	933 402
	United Kingdom	754 547	744 428	744 428	17 491	726 937	2.35	12 972	731 225
	United States	4 235 296	4 141 007	4 141 007	20 265	4 120 742	0.49	4 552	3 661 328

Table I.A2.1. PISA target populations and samples, 2022 [2/4]

		Population and sample information							
		Total population of 15-year-olds	Total enrolled population of 15-year-olds at grade 7 or above	Total in national desired target population	Total school-level exclusions	Total in national desired target population after all school exclusions and before within-school exclusions	School-level exclusion rate (%)	Number of participating students	Weighted number of participating students
		(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Partners	Albania	35 891	29 095	29 095	56	29 039	0.19	6 129	28 426
	Argentina	712 733	693 636	693 636	5 376	688 260	0.78	12 111	596 301
	Baku (Azerbaijan)	41 633	29 636	29 636	1 161	28 475	3.92	7 720	30 529
	Brazil	2 973 643	2 757 493	2 757 493	64 960	2 692 533	2.36	10 798	2 262 972
	Brunei Darussalam	6 100	6 633	6 633	0	6 633	0.00	5 576	5 980
	Bulgaria	66 769	56 791	56 791	730	56 061	1.29	6 107	53 421
	Cambodia	348 485	203 291	203 291	1 329	201 962	0.65	5 279	126 409
	Croatia	39 271	39 114	39 114	1 562	37 552	3.99	6 135	35 033
	Cyprus	9 324	9 324	9 323	210	9 113	2.25	6 515	8 795
	Dominican Republic	189 635	138 535	138 535	1 705	136 830	1.23	6 868	121 876
	El Salvador	111 637	75 686	75 686	686	75 000	0.91	6 705	68 170
	Georgia	46 845	45 174	45 174	1 437	43 737	3.18	6 583	40 416
	Guatemala	353 214	168 154	168 154	0	168 154	0.00	5 190	168 484
	Hong Kong (China)	59 241	55 505	55 505	1 076	54 429	1.94	5 907	48 245
	Indonesia	4 462 518	4 069 960	4 069 960	61 569	4 008 391	1.51	13 439	3 790 846
	Jamaica	43 643	51 024	51 024	264	50 760	0.52	3 873	25 495
	Jordan	153 442	142 601	142 601	1 158	141 443	0.81	7 799	144 269
	Kazakhstan	291 678	291 490	291 490	5 246	286 244	1.80	19 769	272 446
	Kosovo	24 400	24 238	24 238	102	24 136	0.42	6 027	21 045
	Macao (China)	4 500	4 469	4 469	16	4 453	0.36	4 384	4 423
	Malaysia	521 400	424 736	424 736	3 184	421 552	0.75	7 069	390 447
	Malta	4 273	4 177	4 177	52	4 125	1.24	3 127	3 955
	Moldova	29 660	29 638	29 638	5	29 633	0.02	6 235	28 879
	Mongolia	46 889	43 616	43 616	350	43 266	0.80	6 999	40 828
	Montenegro	6 825	6 808	6 808	73	6 735	1.07	5 793	6 340
	Morocco	597 425	482 740	482 740	1 917	480 823	0.40	6 867	454 986
	North Macedonia	18 249	18 249	18 249	330	17 919	1.81	6 610	16 548
	Palestinian Authority	113 056	95 013	95 013	284	94 729	0.30	7 905	88 383
	Panama	73 004	65 523	65 523	711	64 812	1.09	4 544	42 090
	Paraguay	112 659	92 326	92 326	1 183	91 143	1.28	5 084	81 004
	Peru	578 489	536 459	536 459	16 350	520 109	3.05	6 968	499 075
	Philippines	2 140 435	1 767 303	1 727 028	17 533	1 709 495	1.02	7 193	1 782 896
	Qatar	19 574	19 427	19 427	301	19 126	1.55	7 676	18 348
	Romania	212 530	173 572	173 572	4 400	169 172	2.53	7 364	162 019
	Saudi Arabia	389 709	367 963	347 934	11 217	336 717	3.22	6 928	317 452
	Serbia	68 172	65 603	65 603	655	64 948	1,00	6 413	59 250
	Singapore	44 037	43 215	43 215	589	42 626	1.36	6 606	41 958
	Chinese Taipei	205 632	201 379	201 379	1 760	199 619	0.87	5 857	190 787
	Thailand	810 264	708 606	708 606	9 065	699 541	1.28	8 495	604 573
	Ukrainian regions (18 of 27)	258 974	234 139	232 639	5 119	227 520	2.20	3 876	165 592
	Ukraine	398 426	335 307	333 807	88 853	244 954	26.62	3 876	165 592
	United Arab Emirates	64 967	64 914	64 867	838	64 029	1.29	24 600	60 765
	Uruguay	48 233	43 849	43 849	75	43 774	0.17	6 618	40 778
	Uzbekistan	547 432	529 571	529 571	19 623	509 948	3.71	7 293	482 059
	Viet Nam	1 374 000	1 164 190	1 164 190	7 455	1 156 735	0.64	6 068	939 459

Table I.A2.1. PISA target populations and samples, 2022 [3/4]

		Population and sample information				Coverage indices		
		Number of excluded students	Weighted number of excluded students	Within-school exclusion rate (%)	Overall exclusion rate (%)	Coverage Index 1: Coverage of national desired population	Coverage Index 2: Coverage of national enrolled population	Coverage Index 3: Coverage of 15-year-old population
		(9)	(10)	(11)	(12)	(13)	(14)	(15)
OECD	Australia	1 045	14 375	5.14	6.87	0.931	0.931	0.895
	Austria	97	1 253	1.62	3.52	0.965	0.965	0.888
	Belgium	53	663	0.51	2.41	0.976	0.976	0.991
	Canada	1 120	16 390	4.38	5.83	0.942	0.930	0.922
	Chile	21	738	0.34	2.87	0.971	0.971	0.865
	Colombia	40	2 882	0.49	0.58	0.994	0.994	0.729
	Costa Rica	5	35	0.06	0.06	0.999	0.999	0.776
	Czech Republic	73	1 005	0.99	1.97	0.980	0.980	0.915
	Denmark	902	6 311	9.98	11.55	0.884	0.884	0.836
	Estonia	190	373	2.72	5.88	0.941	0.941	0.939
	Finland	200	832	1.39	3.28	0.967	0.967	0.952
	France	170	16 501	2.07	3.72	0.963	0.963	0.934
	Germany	59	5 935	0.86	2.49	0.975	0.975	0.919
	Greece	40	932	0.94	1.45	0.985	0.985	0.914
	Hungary	103	1 639	1.83	4.68	0.953	0.953	0.862
	Iceland	188	195	4.30	4.82	0.952	0.952	0.941
	Ireland	266	2 409	3.55	3.63	0.964	0.964	1.023
	Israel	129	2 354	1.75	3.76	0.962	0.962	0.899
	Italy	399	15 467	3.02	3.07	0.969	0.969	0.867
	Japan	0	0	0.00	2.52	0.975	0.975	0.920
	Korea	37	2 835	0.66	1.47	0.985	0.985	1.024
	Latvia	178	514	2.96	7.91	0.921	0.921	0.850
	Lithuania	288	887	3.53	6.50	0.935	0.935	0.925
	Mexico	50	11 244	0.80	1.41	0.986	0.986	0.635
	Netherlands	118	2 939	1.85	8.43	0.916	0.916	0.786
	New Zealand	239	2 031	3.48	5.77	0.942	0.942	0.903
	Norway	464	3 659	5.84	7.27	0.927	0.927	0.910
	Poland	80	3 872	1.12	4.78	0.952	0.952	0.892
	Portugal	248	3 028	3.04	4.02	0.960	0.960	0.925
	Slovak Republic	81	729	1.51	2.48	0.975	0.975	0.956
	Slovenia	59	125	0.66	2.84	0.972	0.972	0.996
	Spain	1 266	16 836	3.54	4.02	0.960	0.960	0.904
	Sweden	473	7 251	6.26	7.39	0.926	0.926	0.891
	Switzerland	167	1 760	2.27	5.77	0.942	0.942	0.908
	Türkiye	130	17 393	1.83	5.57	0.944	0.944	0.737
	United Kingdom	512	19 772	2.63	4.92	0.951	0.951	0.969
	United States	330	220 753	5.69	6.15	0.939	0.939	0.864

Table I.A2.1. PISA target populations and samples, 2022 [4/4]

		Population and sample information				Coverage indices		
		Number of excluded students	Weighted number of excluded students	Within-school exclusion rate (%)	Overall exclusion rate (%)	Coverage Index 1: Coverage of national desired population	Coverage Index 2: Coverage of national enrolled population	Coverage Index 3: Coverage of 15-year-old population
		(9)	(10)	(11)	(12)	(13)	(14)	(15)
Partners	Albania	22	135	0.47	0.66	0.993	0.993	0.792
	Argentina	204	5228	0.87	1.64	0.984	0.984	0.837
	Baku (Azerbaijan)	20	76	0.25	4.16	0.958	0.958	0.733
	Brazil	115	18927	0.83	3.17	0.968	0.968	0.761
	Brunei Darussalam	53	53	0.88	0.88	0.991	0.991	0.980
	Bulgaria	87	777	1.43	2.70	0.973	0.973	0.800
	Cambodia	2	35	0.03	0.68	0.993	0.993	0.363
	Croatia	104	533	1.50	5.43	0.946	0.946	0.892
	Cyprus	137	205	2.28	4.48	0.955	0.955	0.943
	Dominican Republic	12	204	0.17	1.40	0.986	0.986	0.643
	El Salvador	18	165	0.24	1.15	0.989	0.989	0.611
	Georgia	126	717	1.74	4.87	0.951	0.951	0.863
	Guatemala	8	232	0.14	0.14	0.999	0.999	0.477
	Hong Kong (China)	184	1204	2.43	4.33	0.957	0.957	0.814
	Indonesia	0	0	0.00	1.51	0.985	0.985	0.849
	Jamaica	33	86	0.34	0.85	0.991	0.991	0.584
	Jordan	28	597	0.41	1.22	0.988	0.988	0.940
	Kazakhstan	358	6879	2.46	4.22	0.958	0.958	0.934
	Kosovo	13	38	0.18	0.60	0.994	0.994	0.863
	Macao (China)	0	0	0.00	0.36	0.996	0.996	0.983
	Malaysia	56	2807	0.71	1.46	0.985	0.985	0.749
	Malta	108	108	2.66	3.87	0.961	0.961	0.926
	Moldova	110	508	1.73	1.75	0.983	0.983	0.974
	Mongolia	1	8	0.02	0.82	0.992	0.992	0.871
	Montenegro	65	191	2.92	3.96	0.960	0.960	0.929
	Morocco	5	324	0.07	0.47	0.995	0.995	0.762
	North Macedonia	162	330	1.96	3.73	0.963	0.963	0.907
	Palestinian Authority	3	16	0.02	0.32	0.997	0.997	0.782
	Panama	2	20	0.05	1.13	0.989	0.989	0.577
	Paraguay	10	153	0.19	1.47	0.985	0.985	0.719
	Peru	19	1275	0.25	3.29	0.967	0.967	0.863
	Philippines	23	5144	0.29	1.30	0.987	0.965	0.833
	Qatar	132	217	1.17	2.70	0.973	0.973	0.937
	Romania	20	672	0.41	2.94	0.971	0.971	0.762
	Saudi Arabia	0	0	0.00	3.22	0.968	0.915	0.815
	Serbia	516	1753	2.87	3.84	0.962	0.962	0.869
	Singapore	43	239	0.57	1.92	0.981	0.981	0.953
	Chinese Taipei	44	1136	0.59	1.46	0.985	0.985	0.928
	Thailand	21	1121	0.18	1.46	0.985	0.985	0.746
	Ukrainian regions (18 of 27)	708	24674	12.97	14.92	0.851	0.846	0.639
	Ukraine	708	24674	12.97	36.13	0.639	0.636	0.416
	United Arab Emirates	351	798	1.30	2.57	0.974	0.974	0.935
	Uruguay	13	61	0.15	0.32	0.997	0.997	0.845
	Uzbekistan	36	2437	0.50	4.19	0.958	0.958	0.881
	Viet Nam	2	686	0.07	0.71	0.993	0.993	0.684

Table I.A2.2. Change in the enrolment of 15-year-olds in grade 7 and above (PISA 2003 through PISA 2022) [1/6]

		PISA 2022				PISA 2018				
		Total population of 15-year-olds	Total population of 15-year-olds enrolled in grade 7 or above	Weighted number of participating students	Coverage index 3. Coverage of the national 15-year-old population	Total population of 15-year-olds	Total population of 15-year-olds enrolled in grade 7 or above	Weighted number of participating students	Coverage index 3. Coverage of the national 15-year-old population	Revised data
OECD	Australia	296 220	290 738	265 196	0.90	288 195	284 687	257 779	0.89	
	Austria	85 760	82 619	76 153	0.89	84 473	80 108	75 077	0.89	
	Belgium	129 814	127 559	128 642	0.99	126 031	122 808	118 025	0.94	
	Canada	388 205	385 342	357 911	0.92	388 205	400 139	335 197	0.86	
	Chile	247 550	230 294	214 108	0.86	246 398	215 580	213 832	0.87	Yes
	Colombia	805 258	685 807	586 683	0.73	856 081	645 339	529 976	0.62	
	Costa Rica	73 787	64 582	57 250	0.78	72 444	58 789	45 475	0.63	
	Czech Republic	109 596	102 464	100 266	0.91	92 013	90 835	87 808	0.95	
	Denmark	68 110	66 650	56 909	0.84	68 313	67 414	59 967	0.88	
	Estonia	14 210	14 097	13 345	0.94	12 257	12 120	11 414	0.93	
	Finland	61 957	62 104	58 955	0.95	58 325	57 552	56 172	0.96	
	France	836 624	808 703	781 286	0.93	828 196	798 480	756 477	0.91	
	Germany	741 506	741 494	681 399	0.92	739 792	739 792	734 915	0.99	
	Greece	107 294	102 085	98 087	0.91	102 868	100 203	95 370	0.93	
	Hungary	102 077	93 826	87 990	0.86	96 838	91 297	86 754	0.90	
	Iceland	4 623	4 602	4 352	0.94	4 206	4 177	3 875	0.92	Yes
	Ireland	64 051	63 256	65 497	1.02	65 640	61 188	59 639	0.91	Yes
	Israel	147 380	140 599	132 475	0.90	136 848	128 419	110 645	0.81	
	Italy	572 210	527 539	496 263	0.87	616 185	544 279	521 223	0.85	
	Japan	1 109 590	1 070 375	1 021 370	0.92	1 186 849	1 159 226	1 078 921	0.91	
	Korea	418 028	417 968	428 012	1.02	517 040	517 040	455 544	0.88	
	Latvia	19 801	19 501	16 833	0.85	17 977	17 677	15 932	0.89	
	Lithuania	26 228	26 027	24 251	0.92	27 075	25 998	24 453	0.90	
	Mexico	2 193 794	1 592 537	1 393 727	0.64	2 228 222	1 697 100	1 480 904	0.66	Yes
	Netherlands	198 577	193 138	155 987	0.79	208 704	204 753	190 281	0.91	
	New Zealand	62 470	59 286	56 382	0.90	59 700	58 131	53 000	0.89	
	Norway	64 792	64 478	58 970	0.91	60 968	60 794	55 566	0.91	
	Poland	382 777	359 547	341 562	0.89	354 020	331 850	318 724	0.90	
	Portugal	104 433	102 916	96 607	0.93	112 977	110 732	98 628	0.87	
	Slovak Republic	49 662	48 584	47 453	0.96	51 526	50 100	44 418	0.86	
	Slovenia	18 932	19 728	18 850	1.00	17 501	18 236	17 138	0.98	
	Spain	507 740	487 620	459 029	0.90	454 168	436 560	416 703	0.92	
	Sweden	121 723	121 197	108 499	0.89	108 622	107 824	93 129	0.86	
	Switzerland	83 388	81 012	75 696	0.91	80 590	78 059	71 683	0.89	
	Türkiye	1 266 433	1 153 239	933 402	0.74	1 218 693	1 038 993	884 971	0.73	
	United Kingdom	754 547	744 428	731 225	0.97	703 991	697 603	597 240	0.85	
	United States	4 235 296	4 141 007	3 661 328	0.86	4 133 719	4 058 637	3 559 045	0.86	

Notes: Costa Rica, Georgia, Malaysia, Malta, Moldova and United Arab Emirates conducted the PISA 2009 assessment in 2010 as part of PISA 2009+.
For Albania, Brazil, Chile, Jordan, Netherlands, Romania and Uruguay, estimates of the Total population of 15-year-olds across years have been updated to align data sources with those used in 2018. Therefore, the estimates reported in this table do not match those that appear in previous PISA reports.
For Mexico, in 2015, the Total population of 15-year-olds enrolled in grade 7 or above is an estimate of the target population size of the sample frame from which the 15-year-old students were selected for the PISA test. At the time Mexico provided the information to PISA, the official figure for this population was 1 573 952.

Table I.A2.2. Change in the enrolment of 15-year-olds in grade 7 and above (PISA 2003 through PISA 2022) [2/6]

		PISA 2022				PISA 2018				
		Total population of 15-year-olds	Total population of 15-year-olds enrolled in grade 7 or above	Weighted number of participating students	Coverage index 3. Coverage of the national 15-year-old population	Total population of 15-year-olds	Total population of 15-year-olds enrolled in grade 7 or above	Weighted number of participating students	Coverage index 3. Coverage of the national 15-year-old population	Revised data
Partners	Albania	35 891	29 095	28 426	0.79	36 955	30 160	27 963	0.76	
	Argentina	712 733	693 636	596 301	0.84	702 788	678 151	566 486	0.81	
	Baku (Azerbaijan)	41 633	29 636	30 529	0.73	43 798	22 672	20 271	0.46	
	Brazil	2 973 643	2 757 493	2 262 972	0.76	3 132 463	2 980 084	2 036 861	0.65	
	Brunei Darussalam	6 100	6 633	5 980	0.98	7 081	7 384	6 899	0.97	
	Bulgaria	66 769	56 791	53 421	0.80	66 499	51 674	47 851	0.72	
	Cambodia	348 485	203 291	126 409	0.36	m	m	m	m	
	Croatia	39 271	39 114	35 033	0.89	39 812	30 534	35 462	0.89	
	Cyprus	9 324	9 324	8 795	0.94	8 285	8 285	7 639	0.92	
	Dominican Republic	189 635	138 535	121 876	0.64	192 198	148 033	140 330	0.73	
	El Salvador	111 637	75 686	68 170	0.61	m	m	m	m	
	Georgia	46 845	45 174	40 416	0.86	46 605	41 750	38 489	0.83	
	Guatemala	353 214	168 154	168 484	0.48	m	m	m	m	
	Hong Kong (China)	59 241	55 505	48 245	0.81	51 935	51 328	51 101	0.98	
	Indonesia	4 462 518	4 069 960	3 790 846	0.85	4 439 086	3 684 980	3 768 508	0.85	
	Jamaica	43 643	51 024	25 495	0.58	m	m	m	m	
	Jordan	149 213	142 601	144 269	0.94	131 210	132 291	114 901	0.88	Yes
	Kazakhstan	291 678	291 490	272 446	0.93	230 646	230 018	212 229	0.92	
	Kosovo	24 400	24 238	21 045	0.86	30 494	27 288	25 739	0.84	
	Macao (China)	4 500	4 469	4 423	0.98	4 300	3 845	3 799	0.88	
	Malaysia	521 400	424 736	390 447	0.75	537 800	455 358	388 638	0.72	
	Malta	4 273	4 177	3 955	0.93	4 039	4 056	3 925	0.97	
	Moldova	29 660	29 638	28 879	0.97	29 716	29 467	28 252	0.95	
	Mongolia	46 889	43 616	40 828	0.87	m	m	m	m	
	Montenegro	6 825	6 808	6 340	0.93	7 484	7 432	7 087	0.95	
	Morocco	597 425	482 740	454 986	0.76	601 250	415 806	386 408	0.64	
	North Macedonia	18 249	18 249	16 548	0.91	18 812	18 812	17 820	0.95	
	Palestinian Authority	113 056	95 013	88 383	0.78	m	m	m	m	
	Panama	73 004	65 523	42 090	0.58	72 084	60 057	38 540	0.53	
	Paraguay	112 659	92 326	81 004	0.72	m	m	m	m	
	Peru	578 489	536 459	499 075	0.86	580 690	484 352	424 586	0.73	
	Philippines	2 140 435	1 767 303	1 782 896	0.83	2 063 564	1 734 997	1 400 584	0.68	
	Qatar	19 574	19 427	18 348	0.94	16 492	16 408	15 228	0.92	
	Romania	212 530	173 572	162 019	0.76	204 009	171 685	148 098	0.73	Yes
	Saudi Arabia	389 709	367 963	317 452	0.81	418 788	406 768	354 013	0.85	
	Serbia	68 172	65 603	59 250	0.87	69 972	66 729	61 895	0.88	
	Singapore	44 037	43 215	41 958	0.95	46 229	45 178	44 058	0.95	
	Chinese Taipei	205 632	201 379	190 787	0.93	246 260	240 241	226 698	0.92	
	Thailand	810 264	708 606	604 573	0.75	795 130	696 833	575 713	0.72	
	Ukrainian regions (18 of 27)	258 974	234 139	165 592	0.64	m	m	m	m	
	Ukraine	398 426	335 307	165 592	0.42	351 424	321 833	304 855	0.87	
	United Arab Emirates	64 967	64 914	60 765	0.94	59 275	59 203	54 403	0.92	
	Uruguay	48 233	43 849	40 778	0.85	50 965	46 768	39 746	0.78	
	Uzbekistan	547 432	529 571	482 059	0.88	m	m	m	m	
	Viet Nam	1 374 000	1 164 190	939 459	0.68	1 332 000	1 251 842	926 260	0.70	

Notes: Costa Rica, Georgia, Malaysia, Malta, Moldova and United Arab Emirates conducted the PISA 2009 assessment in 2010 as part of PISA 2009+.
For Albania, Brazil, Chile, Jordan, Netherlands, Romania and Uruguay, estimates of the Total population of 15-year-olds across years have been updated to align data sources with those used in 2018. Therefore, the estimates reported in this table do not match those that appear in previous PISA reports.
For Mexico, in 2015, the Total population of 15-year-olds enrolled in grade 7 or above is an estimate of the target population size of the sample frame from which the 15-year-old students were selected for the PISA test. At the time Mexico provided the information to PISA, the official figure for this population was 1 573 952.

Table I.A2.2. Change in the enrolment of 15-year-olds in grade 7 and above (PISA 2003 through PISA 2022) [3/6]

		PISA 2015					PISA 2012				
		Total population of 15-year-olds	Total population of 15-year-olds enrolled in grade 7 or above	Weighted number of participating students	Coverage index 3. Coverage of the national 15-year-old population	Revised data	Total population of 15-year-olds	Total population of 15-year-olds enrolled in grade 7 or above	Weighted number of participating students	Coverage index 3. Coverage of the national 15-year-old population	Revised data
OECD	Australia	282 888	282 547	256 329	0.91		291 967	288 159	250 779	0.86	
	Austria	88 013	82 683	73 379	0.83		93 537	89 073	82 242	0.88	
	Belgium	123 630	121 954	114 902	0.93		123 469	121 493	117 912	0.95	
	Canada	396 966	381 660	331 546	0.84		417 873	409 453	348 070	0.83	
	Chile	256 772	245 947	203 782	0.79	Yes	270 812	252 733	229 199	0.85	Yes
	Colombia	760 919	674 079	567 848	0.75		889 729	620 422	560 805	0.63	
	Costa Rica	81 773	66 524	51 897	0.63		81 489	64 326	40 384	0.50	
	Czech Republic	90 391	90 076	84 519	0.94		96 946	93 214	82 101	0.85	
	Denmark	68 174	67 466	60 655	0.89		72 310	70 854	65 642	0.91	
	Estonia	11 676	11 491	10 834	0.93		12 649	12 438	11 634	0.92	
	Finland	58 526	58 955	56 934	0.97		62 523	62 195	60 047	0.96	
	France	807 867	778 679	734 944	0.91		792 983	755 447	701 399	0.88	
	Germany	774 149	774 149	743 969	0.96		798 136	798 136	756 907	0.95	
	Greece	105 530	105 253	96 157	0.91		110 521	105 096	96 640	0.87	
	Hungary	94 515	90 065	84 644	0.90		111 761	108 816	91 179	0.82	
	Iceland	4 254	4 195	3 966	0.93	Yes	4 500	4 491	4 169	0.93	Yes
	Ireland	62 066	59 811	59 082	0.95	Yes	58 668	57 979	54 010	0.92	Yes
	Israel	124 852	118 997	117 031	0.94		118 953	113 278	107 745	0.91	
	Italy	616 761	567 268	495 093	0.80		605 490	566 973	521 288	0.86	
	Japan	1 201 615	1 175 907	1 138 349	0.95		1 241 786	1 214 756	1 128 179	0.91	
	Korea	620 687	619 950	569 106	0.92		687 104	672 101	603 632	0.88	
	Latvia	17 255	16 955	15 320	0.89		18 789	18 389	16 054	0.85	
	Lithuania	33 163	32 097	29 915	0.90		38 524	35 567	33 042	0.86	
	Mexico	2 220 004	1 401 247	1 392 995	0.63	Yes	2 226 585	1 472 875	1 326 025	0.60	Yes
	Netherlands	203 234	200 976	191 817	0.94		194 000	193 190	196 262	1.01	
	New Zealand	60 162	57 448	54 274	0.90		60 940	59 118	53 414	0.88	
	Norway	63 642	63 491	58 083	0.91		64 917	64 777	59 432	0.92	
	Poland	380 366	361 600	345 709	0.91		425 597	410 700	379 275	0.89	
	Portugal	110 939	101 107	97 214	0.88		108 728	127 537	96 034	0.88	
	Slovak Republic	55 674	55 203	49 654	0.89		59 723	59 367	54 486	0.91	
	Slovenia	18 078	17 689	16 773	0.93		19 471	18 935	18 303	0.94	
	Spain	440 337	414 276	399 935	0.91	Yes	422 658	404 374	374 266	0.89	Yes
	Sweden	97 749	97 210	91 491	0.94		102 087	102 027	94 988	0.93	
	Switzerland	85 495	83 655	82 223	0.96		87 200	85 239	79 679	0.91	
	Türkiye	1 324 089	1 100 074	925 366	0.70		1 266 638	965 736	866 681	0.68	
	United Kingdom	747 593	746 328	627 703	0.84		738 066	745 581	688 236	0.93	
	United States	4 220 325	3 992 053	3 524 497	0.84		3 985 714	4 074 457	3 536 153	0.89	

Notes: Costa Rica, Georgia, Malaysia, Malta, Moldova and United Arab Emirates conducted the PISA 2009 assessment in 2010 as part of PISA 2009+.
For Albania, Brazil, Chile, Jordan, Netherlands, Romania and Uruguay, estimates of the Total population of 15-year-olds across years have been updated to align data sources with those used in 2018. Therefore, the estimates reported in this table do not match those that appear in previous PISA reports.
For Mexico, in 2015, the Total population of 15-year-olds enrolled in grade 7 or above is an estimate of the target population size of the sample frame from which the 15-year-old students were selected for the PISA test. At the time Mexico provided the information to PISA, the official figure for this population was 1 573 952.

Table I.A2.2. Change in the enrolment of 15-year-olds in grade 7 and above (PISA 2003 through PISA 2022) [4/6]

		PISA 2015					PISA 2012				
		Total population of 15-year-olds	Total population of 15-year-olds enrolled in grade 7 or above	Weighted number of participating students	Coverage index 3. Coverage of the national 15-year-old population	Revised data	Total population of 15-year-olds	Total population of 15-year-olds enrolled in grade 7 or above	Weighted number of participating students	Coverage index 3. Coverage of the national 15-year-old population	Revised data
Partners	Albania	45 667	45 163	40 896	0.90		55 099	50 157	42 466	0.77	
	Argentina	718 635	578 308	394 917	0.55		684 879	637 603	545 942	0.80	
	Baku (Azerbaijan)	m	m	m	m		m	m	m	m	
	Brazil	3 379 467	2 853 388	2 425 961	0.72		3 520 371	2 786 064	2 470 804	0.70	
	Brunei Darussalam	m	m	m	m		m	m	m	m	
	Bulgaria	66 601	59 397	53 685	0.81		70 188	59 684	54 255	0.77	
	Cambodia	m	m	m	m		m	m	m	m	
	Croatia	45 031	35 920	40 899	0.91		48 155	46 550	45 502	0.94	
	Cyprus	9 255	9 255	8 785	0.95		9 956	9 956	9 650	0.97	
	Dominican Republic	193 153	139 555	132 300	0.68		m	m	m	m	
	El Salvador	m	m	m	m		m	m	m	m	
	Georgia	48 695	43 197	38 334	0.79		m	m	m	m	
	Guatemala	m	m	m	m		m	m	m	m	
	Hong Kong (China)	65 100	61 630	57 662	0.89		84 200	77 864	70 636	0.84	
	Indonesia	4 534 216	3 182 816	3 092 773	0.68		4 174 217	3 599 844	2 645 155	0.63	
	Jamaica	m	m	m	m		m	m	m	m	
	Jordan	147 487	121 729	108 669	0.74	Yes	153 293	125 333	111 098	0.72	Yes
	Kazakhstan	211 407	209 555	192 909	0.91		258 716	247 048	208 411	0.81	
	Kosovo	31 546	28 229	22 333	0.71		m	m	m	m	
	Macao (China)	5 100	4 417	4 507	0.88		6 600	5 416	5 366	0.81	
	Malaysia	540 000	448 838	412 524	0.76		544 302	457 999	432 080	0.79	
	Malta	4 397	4 406	4 296	0.98		m	m	m	m	
	Moldova	31 576	30 601	29 341	0.93		m	m	m	m	
	Mongolia	m	m	m	m		m	m	m	m	
	Montenegro	7 524	7 506	6 777	0.90		8 600	8 600	7 714	0.90	
	Morocco	m	m	m	m		m	m	m	m	
	North Macedonia	16 719	16 717	15 847	0.95		m	m	m	m	
	Palestinian Authority	m	m	m	m		m	m	m	m	
	Panama	m	m	m	m		m	m	m	m	
	Paraguay	m	m	m	m		m	m	m	m	
	Peru	580 371	478 229	431 738	0.74		584 294	508 969	419 945	0.72	
	Philippines	m	m	m	m		m	m	m	m	
	Qatar	13 871	13 850	12 951	0.93		11 667	11 532	11 003	0.94	
	Romania	218 846	176 334	164 216	0.75		212 694	146 243	140 915	0.66	
	Saudi Arabia	m	m	m	m		m	m	m	m	
	Serbia	m	m	m	m		85 121	75 870	67 934	0.80	
	Singapore	48 218	47 050	46 224	0.96		53 637	52 163	51 088	0.95	
	Chinese Taipei	m	m	m	m		m	m	m	m	
	Thailand	895 513	756 917	634 795	0.71		982 080	784 897	703 012	0.72	
	Ukrainian regions (18 of 27)	m	m	m	m		m	m	m	m	
	Ukraine	m	m	m	m		m	m	m	m	
	United Arab Emirates	51 687	51 518	46 950	0.91		48 824	48 446	40 612	0.83	
	Uruguay	52 541	43 865	38 287	0.73	Yes	55 128	46 442	39 771	0.72	Yes
	Uzbekistan	m	m	m	m		m	m	m	m	
	Viet Nam	1 340 000	1 032 599	874 859	0.65		1 393 000	1 091 462	956 517	0.69	

Notes: Costa Rica, Georgia, Malaysia, Malta, Moldova and United Arab Emirates conducted the PISA 2009 assessment in 2010 as part of PISA 2009+. For Albania, Brazil, Chile, Jordan, Netherlands, Romania and Uruguay, estimates of the Total population of 15-year-olds across years have been updated to align data sources with those used in 2018. Therefore, the estimates reported in this table do not match those that appear in previous PISA reports. For Mexico, in 2015, the Total population of 15-year-olds enrolled in grade 7 or above is an estimate of the target population size of the sample frame from which the 15-year-old students were selected for the PISA test. At the time Mexico provided the information to PISA, the official figure for this population was 1 573 952.

Table I.A2.2. Change in the enrolment of 15-year-olds in grade 7 and above (PISA 2003 through PISA 2022) [5/6]

		PISA 2009				PISA 2006				PISA 2003			
		Total population of 15-year-olds	Total population of 15-year-olds enrolled in grade 7 or above	Weighted number of participating students	Coverage index 3. Coverage of the national 15-year-old population	Total population of 15-year-olds	Total population of 15-year-olds enrolled in grade 7 or above	Weighted number of participating students	Coverage index 3. Coverage of the national 15-year-old population	Total population of 15-year-olds	Total population of 15-year-olds enrolled in grade 7 or above	Weighted number of participating students	Coverage index 3. Coverage of the national 15-year-old population
OECD	Australia	286 334	269 669	240 851	0.84	270 115	256 754	234 940	0.87	268 164	250 635	235 591	0.88
	Austria	99 818	94 192	87 326	0.87	97 337	92 149	89 925	0.92	94 515	89 049	85 931	0.91
	Belgium	126 377	126 335	119 140	0.94	124 943	124 557	123 161	0.99	120 802	118 185	111 831	0.93
	Canada	430 791	426 590	360 286	0.84	426 967	428 876	370 879	0.87	398 865	399 265	330 436	0.83
	Chile	290 056	265 542	247 270	0.85	297 085	255 459	233 526	0.79	m	m	m	m
	Colombia	893 057	582 640	522 388	0.58	897 477	543 630	537 262	0.60	m	m	m	m
	Costa Rica	80 523	63 603	42 954	0.53	m	m	m	m	m	m	m	m
	Czech Republic	122 027	116 153	113 951	0.93	127 748	124 764	128 827	1.01	130 679	126 348	121 183	0.93
	Denmark	70 522	68 897	60 855	0.86	66 989	65 984	57 013	0.85	59 156	58 188	51 741	0.87
	Estonia	14 248	14 106	12 978	0.91	19 871	19 623	18 662	0.94	m	m	m	m
	Finland	66 198	66 198	61 463	0.93	66 232	66 232	61 387	0.93	61 107	61 107	57 883	0.95
	France	749 808	732 825	677 620	0.90	809 375	809 375	739 428	0.91	809 053	808 276	734 579	0.91
	Germany	852 044	852 044	766 993	0.90	951 535	1 062 920	903 512	0.95	951 800	916 869	884 358	0.93
	Greece	102 229	105 664	93 088	0.91	107 505	110 663	96 412	0.90	111 286	108 314	105 131	0.94
	Hungary	121 155	118 387	105 6 11	0.87	124 444	120 061	106 010	0.85	129 138	123 762	107 044	0.83
	Iceland	4 738	4 738	4 410	0.93	4 820	4 777	4 624	0.96	4 168	4 112	3 928	0.94
	Ireland	56 635	55 464	52 794	0.93	58 667	57 648	55 114	0.94	61 535	58 997	54 850	0.89
	Israel	122 701	112 254	103 184	0.84	122 626	109 370	93 347	0.76	m	m	m	m
	Italy	586 904	573 542	506 733	0.86	578 131	639 971	520 055	0.90	561 304	574 6 11	481 521	0.86
	Japan	1 2 11 642	1 189 263	1 113 403	0.92	1 246 207	1 222 171	1 113 701	0.89	1 365 471	1 328 498	1 240 054	0.91
	Korea	717 164	700 226	630 030	0.88	660 812	627 868	576 669	0.87	606 722	606 370	533 504	0.88
	Latvia	28 749	28 149	23 362	0.81	34 277	33 659	29 232	0.85	37 544	37 138	33 643	0.90
	Lithuania	51 822	43 967	40 530	0.78	53 931	51 808	50 329	0.93	m	m	m	m
	Mexico	2 151 771	1 425 397	1 305 461	0.61	2 200 916	1 383 364	1 190 420	0.54	2 192 452	1 273 163	1 071 650	0.49
	Netherlands	199 000	198 334	183 546	0.92	197 046	193 769	189 576	0.96	194 216	194 216	184 943	0.95
	New Zealand	63 460	60 083	55 129	0.87	63 800	59 341	53 398	0.84	55 440	53 293	48 638	0.88
	Norway	63 352	62 948	57 367	0.91	61 708	61 449	59 884	0.97	56 060	55 648	52 816	0.94
	Poland	482 500	473 700	448 866	0.93	549 000	546 000	515 993	0.94	589 506	569 294	534 900	0.91
	Portugal	115 669	107 583	96 820	0.84	115 426	100 816	90 079	0.78	109 149	99 216	96 857	0.89
	Slovak Republic	72 826	72 454	69 274	0.95	79 989	78 427	76 201	0.95	84 242	81 945	77 067	0.91
	Slovenia	20 314	19 571	18 773	0.92	23 431	23 018	20 595	0.88	m	m	m	m
	Spain	433 224	425 336	387 054	0.89	439 415	436 885	381 686	0.87	454 064	418 005	344 372	0.76
	Sweden	121 486	121 216	113 054	0.93	129 734	127 036	126 393	0.97	109 482	112 258	107 104	0.98
	Switzerland	90 623	89 423	80 839	0.89	87 766	86 108	89 651	1.02	83 247	81 020	86 491	1.04
	Türkiye	1 336 842	859 172	757 298	0.57	1 423 514	800 968	665 477	0.47	1 351 492	725 030	481 279	0.36
	United Kingdom	786 626	786 825	683 380	0.87	779 076	767 248	732 004	0.94	768 180	736 785	698 579	0.91
	United States	4 103 738	4 210 475	3 373 264	0.82	4 192 939	4 192 939	3 578 040	0.85	3 979 116	3 979 116	3 147 089	0.79

Notes: Costa Rica, Georgia, Malaysia, Malta, Moldova and United Arab Emirates conducted the PISA 2009 assessment in 2010 as part of PISA 2009+.
For Albania, Brazil, Chile, Jordan, Netherlands, Romania and Uruguay, estimates of the Total population of 15-year-olds across years have been updated to align data sources with those used in 2018. Therefore, the estimates reported in this table do not match those that appear in previous PISA reports.
For Mexico, in 2015, the Total population of 15-year-olds enrolled in grade 7 or above is an estimate of the target population size of the sample frame from which the 15-year-old students were selected for the PISA test. At the time Mexico provided the information to PISA, the official figure for this population was 1 573 952.

Table I.A2.2. Change in the enrolment of 15-year-olds in grade 7 and above (PISA 2003 through PISA 2022) [6/6]

		PISA 2009				PISA 2006				PISA 2003			
		Total population of 15-year-olds	Total population of 15-year-olds enrolled in grade 7 or above	Weighted number of participating students	Coverage index 3. Coverage of the national 15-year-old population	Total population of 15-year-olds	Total population of 15-year-olds enrolled in grade 7 or above	Weighted number of participating students	Coverage index 3. Coverage of the national 15-year-old population	Total population of 15-year-olds	Total population of 15-year-olds enrolled in grade 7 or above	Weighted number of participating students	Coverage index 3. Coverage of the national 15-year-old population
Partners	Albania	55 587	42 767	34 134	0.61	m	m	m	m	m	m	m	m
	Argentina	688 434	636 713	472 106	0.69	662 686	579 222	523 048	0.79	m	m	m	m
	Baku (Azerbaijan)	m	m	m	m	m	m	m	m	m	m	m	m
	Brazil	3 434 101	2 654 489	2 080 159	0.61	3 439 795	2 374 044	1 875 461	0.55	3 560 650	2 359 854	1 952 253	0.55
	Brunei Darussalam	m	m	m	m	m	m	m	m	m	m	m	m
	Bulgaria	80 226	70 688	57 833	0.72	89 751	88 071	74 326	0.83	m	m	m	m
	Cambodia	m	m	m	m	m	m	m	m	m	m	m	m
	Croatia	48 491	46 256	43 065	0.89	54 500	51 318	46 523	0.85	m	m	m	m
	Cyprus	m	m	m	m	m	m	m	m	m	m	m	m
	Dominican Republic	m	m	m	m	m	m	m	m	m	m	m	m
	El Salvador	m	m	m	m	m	m	m	m	m	m	m	m
	Georgia	56 070	51 351	42 641	0.76	m	m	m	m	m	m	m	m
	Guatemala	m	m	m	m	m	m	m	m	m	m	m	m
	Hong Kong (China)	85 000	78 224	75 548	0.89	77 398	75 542	75 145	0.97	75 000	72 631	72 484	0.97
	Indonesia	4 267 801	3 158 173	2 259 118	0.53	4 238 600	3 119 393	2 248 313	0.53	4 281 895	3 113 548	1 971 476	0.46
	Jamaica	m	m	m	m	m	m	m	m	m	m	m	m
	Jordan	133 953	107 254	104 056	0.78	122 354	126 708	90 267	0.74	m	m	m	m
	Kazakhstan	281 659	263 206	250 657	0.89	m	m	m	m	m	m	m	m
	Kosovo	m	m	m	m	m	m	m	m	m	m	m	m
	Macao (China)	7 500	5 969	5 978	0.80	m	m	m	m	8 318	6 939	6 546	0.79
	Malaysia	539 295	492 758	421 448	0.78	m	m	m	m	m	m	m	m
	Malta	5 152	4 930	4 807	0.93	m	m	m	m	m	m	m	m
	Moldova	47 873	44 069	43 195	0.90	m	m	m	m	m	m	m	m
	Mongolia	m	m	m	m	m	m	m	m	m	m	m	m
	Montenegro	8 500	8 493	7 728	0.91	9 190	8 973	7 734	0.84	m	m	m	m
	Morocco	m	m	m	m	m	m	m	m	m	m	m	m
	North Macedonia	m	m	m	m	m	m	m	m	m	m	m	m
	Palestinian Authority	m	m	m	m	m	m	m	m	m	m	m	m
	Panama	57 919	43 623	30 510	0.53	m	m	m	m	m	m	m	m
	Paraguay	m	m	m	m	m	m	m	m	m	m	m	m
	Peru	585 567	491 514	427 607	0.73	m	m	m	m	m	m	m	m
	Philippines	m	m	m	m	m	m	m	m	m	m	m	m
	Qatar	10 974	10 665	9 806	0.89	8 053	7 865	7 271	0.90	m	m	m	m
	Romania	220 264	152 084	151 130	0.69	312 483	241 890	223 887	0.72	m	m	m	m
	Saudi Arabia	m	m	m	m	m	m	m	m	m	m	m	m
	Serbia	85 121	75 128	70 796	0.83	88 584	80 692	73 907	0.83	m	m	m	m
	Singapore	54 982	54 212	51 874	0.94	m	m	m	m	m	m	m	m
	Chinese Taipei	m	m	m	m	m	m	m	m	m	m	m	m
	Thailand	949 891	763 679	691 916	0.73	895 924	727 860	644 125	0.72	927 070	778 267	637 076	0.69
	Ukrainian regions (18 of 27)	m	m	m	m	m	m	m	m	m	m	m	m
	Ukraine	m	m	m	m	m	m	m	m	m	m	m	m
	United Arab Emirates	41 564	40 447	38 707	0.93	m	m	m	m	m	m	m	m
	Uruguay	53 801	43 281	33 971	0.63	52 119	40 815	36 011	0.69	53 948	40 023	33 775	0.63
	Uzbekistan	m	m	m	m	m	m	m	m	m	m	m	m
	Viet Nam	m	m	m	m	m	m	m	m	m	m	m	m

Notes: Costa Rica, Georgia, Malaysia, Malta, Moldova and United Arab Emirates conducted the PISA 2009 assessment in 2010 as part of PISA 2009+. For Albania, Brazil, Chile, Jordan, Netherlands, Romania and Uruguay, estimates of the Total population of 15-year-olds across years have been updated to align data sources with those used in 2018. Therefore, the estimates reported in this table do not match those that appear in previous PISA reports. For Mexico, in 2015, the Total population of 15-year-olds enrolled in grade 7 or above is an estimate of the target population size of the sample frame from which the 15-year-old students were selected for the PISA test. At the time Mexico provided the information to PISA, the official figure for this population was 1 573 952.

Table I.A2.4. Exclusions, PISA 2022 [1/4]

		Student exclusions (unweighted)						
		Number of excluded students with functional disability (Code 1)	Number of excluded students with intellectual disability (Code 2)	Number of excluded students because of language (Code 3)	Number of excluded students because of no materials available in the language of instruction (Code 4)	Number of excluded students for other reasons (Code 5)	Number of excluded students because online/ virtual (Code 6)	Total number of excluded students
		(1)	(2)	(3)	(4)	(5)	(6)	(7)
OECD	Australia	72	808	164	0	1	0	1 045
	Austria	6	54	32	0	0	5	97
	Belgium	7	29	17	0	0	0	53
	Canada	58	464	103	0	0	495	1 120
	Chile	0	19	2	0	0	0	21
	Colombia	1	36	1	0	0	2	40
	Costa Rica	0	1	0	0	3	1	5
	Czech Republic	4	41	23	0	0	5	73
	Denmark	14	330	102	0	456	0	902
	Estonia	3	131	13	0	0	43	190
	Finland	6	129	46	4	9	6	200
	France	29	107	33	1	0	0	170
	Germany	3	30	26	0	0	0	59
	Greece	9	18	10	0	0	3	40
	Hungary	4	33	14	0	52	0	103
	Iceland	11	87	58	13	19	0	188
	Ireland	22	152	53	0	39	0	266
	Israel	14	81	27	0	0	7	129
	Italy	0	0	0	0	399	0	399
	Japan	0	0	0	0	0	0	0
	Korea	3	23	11	0	0	0	37
	Latvia	3	4	12	0	0	159	178
	Lithuania	14	225	25	0	0	24	288
	Mexico	4	18	1	0	0	27	50
	Netherlands	17	88	12	0	0	1	118
	New Zealand	20	185	34	0	0	0	239
	Norway	17	355	88	0	0	4	464
	Poland	10	42	28	0	0	0	80
	Portugal	8	195	38	0	0	7	248
	Slovak Republic	6	69	1	0	0	5	81
	Slovenia	9	19	16	0	0	15	59
	Spain	55	860	293	18	0	40	1 266
	Sweden	0	0	0	0	473	0	473
	Switzerland	6	100	61	0	0	0	167
	Türkiye	4	54	72	0	0	0	130
	United Kingdom	47	359	57	0	0	49	512
	United States	49	167	77	0	2	35	330

* For this entity, the use of code 6 exclusions was expanded beyond the scope of exclusion just for Covid and used for students who met the definition but due to the war in addition to Covid.

Table I.A2.4. Exclusions, PISA 2022 [2/4]

		Student exclusions (unweighted)						
		Number of excluded students with functional disability (Code 1)	Number of excluded students with intellectual disability (Code 2)	Number of excluded students because of language (Code 3)	Number of excluded students because of no materials available in the language of instruction (Code 4)	Number of excluded students for other reasons (Code 5)	Number of excluded students because online/virtual (Code 6)	Total number of excluded students
		(1)	(2)	(3)	(4)	(5)	(6)	(7)
Partners	Albania	3	12	2	5	0	0	22
	Argentina	12	168	3	2	0	19	204
	Baku (Azerbaijan)	17	3	0	0	0	0	20
	Brazil	3	25	0	6	0	81	115
	Brunei Darussalam	7	44	2	0	0	0	53
	Bulgaria	1	53	2	0	0	31	87
	Cambodia	1	0	1	0	0	0	2
	Croatia	12	87	5	0	0	0	104
	Cyprus	9	73	49	0	0	6	137
	Dominican Republic	2	9	1	0	0	0	12
	El Salvador	1	4	0	0	0	13	18
	Georgia	3	11	1	0	0	111	126
	Guatemala	1	0	0	0	0	7	8
	Hong Kong (China)	0	0	0	0	0	184	184
	Indonesia	0	0	0	0	0	0	0
	Jamaica	5	27	0	0	0	0	33
	Jordan	8	8	3	0	0	9	28
	Kazakhstan	82	126	24	123	0	2	358
	Kosovo	0	0	2	11	0	0	13
	Macao (China)	0	0	0	0	0	0	0
	Malaysia	1	55	0	0	0	0	56
	Malta	8	83	13	2	0	2	108
	Moldova	32	73	3	0	0	2	110
	Mongolia	0	1	0	0	0	0	1
	Montenegro	25	13	26	0	0	1	65
	Morocco	4	1	0	0	0	0	5
	North Macedonia	6	9	19	120	0	8	162
	Palestinian Authority	2	1	0	0	0	0	3
	Panama	0	2	0	0	0	0	2
	Paraguay	0	2	1	0	0	7	10
	Peru	5	14	0	0	0	0	19
	Philippines	2	2	0	0	0	19	23
	Qatar	27	102	0	0	0	3	132
	Romania	5	8	0	7	0	0	20
	Saudi Arabia	0	0	0	0	0	0	0
	Serbia	2	14	2	495	0	3	516
	Singapore	2	35	6	0	0	0	43
	Chinese Taipei	9	35	0	0	0	0	44
	Thailand	3	16	0	0	0	2	21
	Ukrainian regions (18 of 27)	3	1	0	0	0	704*	708
	United Arab Emirates	16	107	8	0	0	220	351
	Uruguay	2	8	0	0	3	0	13
	Uzbekistan	10	9	17	0	0	0	36
	Viet Nam	0	2	0	0	0	0	2

* For this entity, the use of code 6 exclusions was expanded beyond the scope of exclusion just for Covid and used for students who met the definition but due to the war in addition to Covid.

* For this entity, the use of code 6 exclusions was expanded beyond the scope of exclusion just for Covid and used for students who met the definition but due to the war in addition to Covid.

Table I.A2.4. Exclusions, PISA 2022 [3/4]

		Student exclusions (weighted)						
		Weighted number of excluded students with functional disability (Code 1)	Weighted number of excluded students with intellectual disability (Code 2)	Weighted number of excluded students because of language (Code 3)	Weighted number of excluded students because of no materials available in the language of instruction (Code 4)	Weighted number of excluded students for other reasons (Code 5)	Weighted number of excluded students because online/virtual (Code 6)	Total weighted number of excluded students
		(8)	(9)	(10)	(11)	(12)	(13)	(14)
OECD	Australia	1 032	11 246	2 079	0	17	0	14 375
OECD	Austria	89	758	346	0	0	60	1 253
OECD	Belgium	107	379	177	0	0	0	663
OECD	Canada	759	5 982	1 757	0	0	7 891	16 390
OECD	Chile	0	676	62	0	0	0	738
OECD	Colombia	93	2 481	78	0	0	231	2 882
OECD	Costa Rica	0	7	0	0	20	8	35
OECD	Czech Republic	46	599	307	0	0	54	1 005
OECD	Denmark	91	2 399	449	0	3 371	0	6 311
OECD	Estonia	4	251	27	0	0	91	373
OECD	Finland	29	608	103	11	50	32	832
OECD	France	2 446	10 836	3 088	132	0	0	16 501
OECD	Germany	248	3 131	2 556	0	0	0	5 935
OECD	Greece	192	456	242	0	0	41	932
OECD	Hungary	75	632	193	0	738	0	1 639
OECD	Iceland	11	90	61	14	19	0	195
OECD	Ireland	193	1 371	488	0	357	0	2 409
OECD	Israel	233	1 466	452	0	0	203	2 354
OECD	Italy	0	0	0	0	15 467	0	15 467
OECD	Japan	0	0	0	0	0	0	0
OECD	Korea	214	1 692	928	0	0	0	2 835
OECD	Latvia	8	10	33	0	0	463	514
OECD	Lithuania	44	699	64	0	0	80	887
OECD	Mexico	579	2 634	100	0	0	7 931	11 244
OECD	Netherlands	381	2 213	278	0	0	67	2 939
OECD	New Zealand	178	1 543	310	0	0	0	2 031
OECD	Norway	134	2 789	692	0	0	45	3 659
OECD	Poland	516	2 110	1 245	0	0	0	3 872
OECD	Portugal	87	2 405	440	0	0	95	3 028
OECD	Slovak Republic	67	616	10	0	0	36	729
OECD	Slovenia	25	52	20	0	0	27	125
OECD	Spain	476	11 697	4 047	203	0	413	16 836
OECD	Sweden	0	0	0	0	7 251	0	7 251
OECD	Switzerland	57	1 038	665	0	0	0	1 760
OECD	Türkiye	392	6 679	10 322	0	0	0	17 393
OECD	United Kingdom	2 163	12 290	2 799	0	0	2 520	19 772
OECD	United States	33 347	113 102	52 436	0	1 370	20 498	220 753

* For this entity, the use of code 6 exclusions was expanded beyond the scope of exclusion just for Covid and used for students who met the definition but due to the war in addition to Covid.

* For this entity, the use of code 6 exclusions was expanded beyond the scope of exclusion just for Covid and used for students who met the definition but due to the war in addition to Covid.

Table I.A2.4. Exclusions, PISA 2022 [4/4]

		Student exclusions (weighted)						
		Weighted number of excluded students with functional disability (Code 1)	Weighted number of excluded students with intellectual disability (Code 2)	Weighted number of excluded students because of language (Code 3)	Weighted number of excluded students because of no materials available in the language of instruction (Code 4)	Weighted number of excluded students for other reasons (Code 5)	Weighted number of excluded students because online/virtual (Code 6)	Total weighted number of excluded students
		(8)	(9)	(10)	(11)	(12)	(13)	(14)
Partners	Albania	15	74	9	37	0	0	135
	Argentina	381	4 524	47	27	0	249	5 228
	Baku (Azerbaijan)	64	12	0	0	0	0	76
	Brazil	766	3 991	0	1 225	0	12 945	18 927
	Brunei Darussalam	7	44	2	0	0	0	53
	Bulgaria	8	489	22	0	0	259	777
	Cambodia	16	0	19	0	0	0	35
	Croatia	55	452	26	0	0	0	533
	Cyprus	13	118	67	0	0	7	205
	Dominican Republic	51	136	17	0	0	0	204
	El Salvador	16	44	0	0	0	106	165
	Georgia	16	68	12	0	0	621	717
	Guatemala	46	0	0	0	0	186	232
	Hong Kong (China)	0	0	0	0	0	1 204	1 204
	Indonesia	0	0	0	0	0	0	0
	Jamaica	8	76	0	0	0	0	86
	Jordan	145	225	68	0	0	158	597
	Kazakhstan	1 109	1 749	786	3 206	0	13	6 879
	Kosovo	0	0	8	30	0	0	38
	Macao (China)	0	0	0	0	0	0	0
	Malaysia	59	2 748	0	0	0	0	2 807
	Malta	8	83	13	2	0	2	108
	Moldova	144	342	14	0	0	8	508
	Mongolia	0	8	0	0	0	0	8
	Montenegro	70	28	90	0	0	2	191
	Morocco	261	62	0	0	0	0	324
	North Macedonia	12	16	39	250	0	14	330
	Palestinian Authority	15	2	0	0	0	0	16
	Panama	0	20	0	0	0	0	20
	Paraguay	0	32	14	0	0	106	153
	Peru	393	882	0	0	0	0	1 275
	Philippines	426	428	0	0	0	4 291	5 144
	Qatar	56	156	0	0	0	5	217
	Romania	180	281	0	211	0	0	672
	Saudi Arabia	0	0	0	0	0	0	0
	Serbia	16	114	29	1 569	0	24	1 753
	Singapore	11	193	34	0	0	0	239
	Chinese Taipei	281	854	0	0	0	0	1 136
	Thailand	268	845	0	0	0	7	1 121
	Ukrainian regions (18 of 27)	127	27	0	0	0	24 520	24 674
	United Arab Emirates	29	209	16	0	0	544	798
	Uruguay	10	38	0	0	13	0	61
	Uzbekistan	617	622	1 198	0	0	0	2 437
	Viet Nam	0	686	0	0	0	0	686

* For this entity, the use of code 6 exclusions was expanded beyond the scope of exclusion just for Covid and used for students who met the definition but due to the war in addition to Covid.

Table I.A2.6. Response rates, PISA 2022 [1/4]

		Initial sample - before school replacement					Final sample - after school replacement				
		Weighted school participation rate before replacement (%)	Weighted number of responding schools (weighted also by enrolment)	Weighted number of schools sampled (responding and non-responding) (weighted also by enrolment)	Number of responding schools (unweighted)	Number of responding and non-responding schools (unweighted)	Weighted school participation rate after replacement (%)	Weighted number of responding schools (weighted also by enrolment)	Weighted number of schools sampled (responding and non-responding) (weighted also by enrolment)	Number of responding schools (unweighted)	Number of responding and non-responding schools (unweighted)
		(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
OECD	Australia	92	260 643	281 781	722	794	96	269 918	282 241	743	794
	Austria	96	77 289	80 733	300	318	96	77 799	80 750	302	318
	Belgium	80	101 303	126 138	243	318	91	115 591	126 446	285	318
	Canada	81	305 746	375 877	828	1 049	86	321 877	376 040	867	1 049
	Chile	84	187 116	222 091	205	250	94	208 702	221 439	230	250
	Colombia	97	658 016	681 141	249	264	99	683 439	688 995	262	264
	Costa Rica	99	64 480	65 122	198	200	99	64 480	65 122	198	200
	Czech Republic	100	98 609	98 609	430	430	100	98 609	98 609	430	430
	Denmark	90	53 540	59 431	325	371	96	57 254	59 517	347	371
	Estonia	99	13 659	13 745	196	199	99	13 659	13 745	196	199
	Finland	99	60 180	60 501	241	245	99	60 180	60 501	241	245
	France	100	790 568	794 003	282	283	100	790 568	794 003	282	283
	Germany	93	674 828	726 200	241	264	98	712 724	725 905	257	264
	Greece	90	90 812	100 785	217	242	96	96 821	100 772	230	242
	Hungary	89	82 009	92 393	249	279	99	90 673	91 964	270	279
	Iceland	96	4 435	4 601	134	149	96	4 435	4 601	134	149
	Ireland	99	68 814	69 234	169	170	100	69 234	69 234	170	170
	Israel	91	124 237	137 007	188	210	93	127 287	137 007	193	210
	Italy	96	493 350	513 656	334	350	99	510 819	513 842	345	350
	Japan	92	949 447	1 033 001	182	199	92	949 447	1 033 001	182	199
	Korea	89	369 002	415 104	166	187	100	413 724	415 104	186	187
	Latvia	84	15 494	18 464	208	259	89	16 424	18 516	225	259
	Lithuania	100	25 311	25 418	288	293	100	25 408	25 414	292	293
	Mexico	96	1 473 466	1 535 688	272	289	99	1 519 261	1 535 688	280	289
	Netherlands	66	116 517	177 833	114	175	90	159 228	177 613	154	175
	New Zealand	61	35 524	57 847	140	227	72	41 871	57 865	169	227
	Norway	99	62 129	62 943	266	271	99	62 393	62 943	267	271
	Poland	89	309 061	348 856	223	252	96	335 389	348 856	240	252
	Portugal	95	95 312	100 641	213	227	99	99 768	100 578	224	227
	Slovak Republic	91	44 081	48 692	271	301	96	46 387	48 549	288	301
	Slovenia	97	18 729	19 264	344	375	97	18 747	19 264	345	375
	Spain	98	473 996	485 037	959	985	99	480 541	485 037	966	985
	Sweden	98	113 994	116 574	259	268	99	115 248	116 574	262	268
	Switzerland	95	73 464	77 247	249	267	98	76 060	77 488	259	267
	Türkiye	99	1 079 992	1 086 638	195	196	100	1 086 638	1 086 638	196	196
	United Kingdom	67	490 313	728 369	388	580	82	593 600	725 986	451	580
	United States	51	2 019 439	3 927 302	125	253	63	2 485 876	3 926 991	154	253

Table I.A2.6. Response rates, PISA 2022 [2/4]

		Initial sample - before school replacement					Final sample - after school replacement				
		Weighted school participation rate before replacement (%)	Weighted number of responding schools (weighted also by enrolment)	Weighted number of schools sampled (responding and non-responding) (weighted also by enrolment)	Number of responding schools (unweighted)	Number of responding and non-responding schools (unweighted)	Weighted school participation rate after replacement (%)	Weighted number of responding schools (weighted also by enrolment)	Weighted number of schools sampled (responding and non-responding) (weighted also by enrolment)	Number of responding schools (unweighted)	Number of responding and non-responding schools (unweighted)
		(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Partners	Albania	95	27 530	29 067	274	294	95	27 530	29 067	274	294
	Argentina	98	661 503	673 069	454	461	99	668 001	673 236	457	461
	Baku (Azerbaijan)	100	31 925	31 925	178	178	100	31 925	31 925	178	178
	Brazil	81	2 153 176	2 660 537	505	636	96	2 541 343	2 659 664	599	636
	Brunei Darussalam	100	6 675	6 675	54	54	100	6 675	6 675	54	54
	Bulgaria	85	47 378	56 052	177	207	98	54 795	56 079	202	207
	Cambodia	100	205 960	206 763	182	183	100	207 046	207 046	183	183
	Croatia	100	37 398	37 475	180	182	100	37 398	37 475	180	182
	Cyprus	98	8 875	9 100	101	105	98	8 875	9 100	101	105
	Dominican Republic	98	131 827	133 900	249	257	99	133 159	133 900	253	257
	El Salvador	100	73 847	74 135	288	291	100	74 136	74 212	290	291
	Georgia	94	40 653	43 421	250	268	100	43 539	43 611	267	268
	Guatemala	85	143 290	168 547	265	361	93	155 960	168 475	290	361
	Hong Kong (China)	60	32 428	54 402	122	204	80	43 491	54 402	163	204
	Indonesia	99	3 985 101	4 011 189	408	411	100	4 002 841	4 011 189	410	411
	Jamaica	90	41 020	45 680	145	163	91	41 545	45 680	147	163
	Jordan	100	146 365	146 365	260	260	100	146 365	146 365	260	260
	Kazakhstan	99	279 305	283 489	565	571	100	283 481	283 481	571	571
	Kosovo	96	23 183	24 127	229	251	96	23 183	24 127	229	251
	Macao (China)	100	4 453	4 453	46	46	100	4 453	4 453	46	46
	Malaysia	100	406 803	407 861	199	200	100	406 803	407 861	199	200
	Malta	100	4 114	4 114	46	46	100	4 114	4 114	46	46
	Moldova	100	29 607	29 687	265	268	100	29 607	29 687	265	268
	Mongolia	100	43 631	43 631	195	195	100	43 631	43 631	195	195
	Montenegro	99	6 581	6 659	63	64	99	6 581	6 659	63	64
	Morocco	100	479 666	480 608	177	178	100	479 939	479 939	178	178
	North Macedonia	100	17 919	17 919	111	111	100	17 919	17 919	111	111
	Palestinian Authority	99	94 105	95 053	271	274	100	94 988	95 027	273	274
	Panama	84	54 532	64 834	190	243	91	59 341	64 996	215	243
	Paraguay	99	87 772	88 922	278	284	100	88 602	88 922	281	284
	Peru	94	489 130	520 113	308	338	100	521 500	522 136	337	338
	Philippines	100	1 719 012	1 719 012	188	188	100	1 719 012	1 719 012	188	188
	Qatar	100	18 927	18 927	229	229	100	18 927	18 927	229	229
	Romania	100	167 589	167 589	262	262	100	167 589	167 589	262	262
	Saudi Arabia	92	300 026	326 333	178	195	100	325 174	326 372	193	195
	Serbia	99	63 599	64 435	183	189	99	63 599	64 435	183	189
	Singapore	98	41 915	42 567	164	167	98	41 915	42 567	164	167
	Chinese Taipei	83	161 354	195 232	180	216	84	163 590	195 232	182	216
	Thailand	99	685 471	693 755	276	280	100	690 286	693 755	279	280
	Ukrainian regions (18 of 27)	80	178 606	223 859	141	189	91	204 043	224 119	164	189
	United Arab Emirates	100	63 395	63 507	840	843	100	63 395	63 507	840	843
	Uruguay	99	43 188	43 447	221	223	100	43 395	43 447	222	223
	Uzbekistan	100	510 406	510 406	202	202	100	510 406	510 406	202	202
	Viet Nam	100	1 020 528	1 020 528	178	178	100	1 020 528	1 020 528	178	178

Table I.A2.6. Response rates, PISA 2022 [3/4]

		Final sample - students within schools after school replacement				
		Weighted student participation rate after replacement (%)	Number of students assessed (weighted)	Number of students sampled (assessed and absent) (weighted)	Number of students assessed (unweighted)	Number of students sampled (assessed and absent) (unweighted)
		(11)	(12)	(13)	(14)	(15)
OECD	Australia	76	193 102	253 899	13 437	17 771
	Austria	89	65 057	73 230	6 151	7 092
	Belgium	87	101 344	117 082	8 286	9 533
	Canada	77	233 773	303 622	23 073	29 234
	Chile	84	168 773	201 037	6 488	7 627
	Colombia	92	532 284	580 114	7 804	8 469
	Costa Rica	92	52 220	56 750	6 113	6 656
	Czech Republic	91	91 518	100 330	8 460	9 282
	Denmark	84	46 126	54 775	6 200	7 455
	Estonia	88	11 693	13 262	6 392	7 236
	Finland	89	52 007	58 641	10 239	11 811
	France	91	705 197	777 730	6 770	7 509
	Germany	88	588 741	669 277	6 116	6 964
	Greece	92	87 038	94 215	6 403	6 921
	Hungary	92	80 160	86 877	6 198	6 705
	Iceland	80	3 360	4 195	3 360	4 195
	Ireland	77	50 274	65 497	5 569	7 258
	Israel	84	103 556	123 165	6 251	7 437
	Italy	92	452 653	492 440	10 552	11 429
	Japan	92	858 514	934 656	5 760	6 290
	Korea	94	383 999	406 986	6 454	6 840
	Latvia	88	13 215	14 935	5 373	6 067
	Lithuania	93	22 470	24 245	7 257	7 826
	Mexico	95	1 313 477	1 383 827	6 288	6 675
	Netherlands	81	113 351	140 125	5 046	6 221
	New Zealand	72	29 219	40 758	4 682	6 567
	Norway	87	50 577	58 362	6 611	7 635
	Poland	81	266 114	328 452	6 011	7 422
	Portugal	86	82 496	95 838	6 793	7 888
	Slovak Republic	91	41 319	45 438	5 824	6 375
	Slovenia	82	15 142	18 355	6 721	8 134
	Spain	86	392 413	454 692	30 800	35 472
	Sweden	85	91 230	107 261	6 072	7 133
	Switzerland	91	67 555	74 335	6 829	7 471
	Türkiye	98	914 714	933 402	7 250	7 387
	United Kingdom	75	448 396	596 519	12 972	17 023
	United States	80	1 866 014	2 336 430	4 552	5 719

Table I.A2.6. Response rates, PISA 2022 [4/4]

		Final sample - students within schools after school replacement				
		Weighted student participation rate after replacement (%)	Number of students assessed (weighted)	Number of students sampled (assessed and absent) (weighted)	Number of students assessed (unweighted)	Number of students sampled (assessed and absent) (unweighted)
		(11)	(12)	(13)	(14)	(15)
Partners	Albania	86	23 274	26 915	6 129	7 089
	Argentina	86	508 035	592 257	12 111	14 014
	Baku (Azerbaijan)	88	26 799	30 529	7 720	8 793
	Brazil	84	1 832 626	2 177 600	10 798	12 879
	Brunei Darussalam	93	5 576	5 980	5 576	5 980
	Bulgaria	89	46 335	52 192	6 107	6 878
	Cambodia	99	125 643	126 409	5 279	5 308
	Croatia	85	29 804	34 963	6 135	7 194
	Cyprus	84	7 190	8 578	6 515	7 765
	Dominican Republic	93	112 417	121 281	6 868	7 417
	El Salvador	94	63 767	68 101	6 705	7 158
	Georgia	98	39 587	40 348	6 583	6 712
	Guatemala	91	143 084	156 600	5 190	5 709
	Hong Kong (China)	75	29 278	38 858	5 907	7 819
	Indonesia	95	3 602 554	3 782 864	13 439	14 040
	Jamaica	68	15 622	23 123	3 873	5 791
	Jordan	97	140 640	144 269	7 799	8 014
	Kazakhstan	98	267 773	272 446	19 769	20 128
	Kosovo	91	18 427	20 220	6 027	6 616
	Macao (China)	99	4 384	4 423	4 384	4 423
	Malaysia	94	362 809	387 928	7 069	7 554
	Malta	79	3 127	3 955	3 127	3 955
	Moldova	94	27 114	28 799	6 235	6 623
	Mongolia	98	39 969	40 828	6 999	7 155
	Montenegro	95	5 954	6 291	5 793	6 117
	Morocco	98	446 431	454 986	6 867	7 000
	North Macedonia	90	14 832	16 548	6 610	7 380
	Palestinian Authority	96	85 017	88 348	7 905	8 239
	Panama	77	29 491	38 418	4 544	6 017
	Paraguay	92	74 217	80 700	5 084	5 522
	Peru	97	486 292	498 888	6 968	7 136
	Philippines	95	1 698 135	1 782 896	7 193	7 550
	Qatar	89	16 346	18 361	7 676	8 649
	Romania	97	157 838	162 019	7 364	7 543
	Saudi Arabia	97	307 363	316 501	6 928	7 144
	Serbia	91	53 150	58 297	6 413	7 033
	Singapore	91	37 797	41 358	6 606	7 235
	Chinese Taipei	82	131 517	159 821	5 857	7 038
	Thailand	96	580 014	601 524	8 495	8 816
	Ukrainian regions (18 of 27)	87	131 271	151 104	3 876	4 508
	United Arab Emirates	93	56 369	60 658	24 600	26 592
	Uruguay	87	35 308	40 728	6 618	7 637
	Uzbekistan	98	472 726	482 059	7 293	7 445
	Viet Nam	99	933 854	939 459	6 068	6 105

Table I.A2.8. The PISA target population, the PISA samples, and the definition of schools annex tables

	Table I.A2.1	PISA target populations and samples, 2022
	Table I.A2.2	Change in the enrolment of 15-year-olds in grade 7 and above (PISA 2003 through PISA 2022)
	Table I.A2.3	PISA target populations and samples in adjudicated regions, 2022
	Table I.A2.4	Exclusions, PISA 2022
WEB	Table I.A2.5	Exclusions in adjudicated regions, PISA 2022
	Table I.A2.6	Response rates, PISA 2022
WEB	Table I.A2.7	Response rates in adjudicated regions, PISA 2022

StatLink https://stat.link/hpg9nd

Notes

[1] To accommodate countries that requested grade-based results for the purpose of national analyses, PISA 2022 provided a sampling option to supplement the age-based sampling from the target population with an additional grade-based sample.

[2] More precisely, PISA assessed students who were at least 15 years and 3 complete months old and who were at most 16 years and 3 complete months old (i.e., younger than 16 years, 2 months and roughly 30 days old), with a tolerance of one month on each side of this age window. If the PISA assessment was conducted in April 2022, as was the case in many countries and economies, all students born in 2006 would have been eligible.

[3] Educational institutions are generally referred to as schools in this publication, although some educational institutions (in particular, some types of vocational education establishments) may not be referred to as schools in certain countries.

[4] Such a comparison is complicated by first-generation immigrant students, who received part of their education in a country other than the one in which they were assessed. Mean scores in any country or economy should be interpreted in the context of local student demographics. In addition, the PISA target population does not include residents of a country who attend school in another country. It does, however, include foreign nationals who attend school in the country of assessment.

[5] In education systems inherently too small (due to demographics for instance), all schools and all eligible students were included in the sample. In PISA 2022, all eligible schools were selected in North Macedonia and Qatar. All students in all schools were selected in Brunei Darussalam, Iceland, Macao (China), and Malta.

[6] Non-response and other standards enforced to achieve consistent, precise, generalisable, and timely data collection in PISA 2022 are available on its Technical Standards (OECD, 2023).

[7] The threshold for an acceptable participation rate after replacement varies between 85 % and 100 %, depending on the participation rate before replacement.

[8] These exclusions refer only to those students with limited proficiency in the language of instruction/assessment. Exclusions related to the unavailability of test material in the language of instruction are not considered in this analysis.

[9] The overall exclusion rate includes those students who were excluded at the school level (Column 6) and those students who were excluded within schools (Column 11); however, only students enrolled in non-excluded schools were affected by within-school exclusions, hence the presence of the term equivalent to 1 minus Column 6 (expressed as a decimal).

[10] If the correlation between the propensity of exclusions and student performance were 0.3, then resulting mean scores would likely have been overestimated by 1 score point if the exclusion rate were 1 %; by 3 score points if the

exclusion rate were 5 %; and by 6 score points if the exclusion rate were 10 %. If the correlation between the propensity of exclusions and student performance were 0.5, then resulting mean scores would likely have been overestimated by 1 score point if the exclusion rate were 1 %; by 5 score points if the exclusion rate were 5 %; and by 10 score points if the exclusion rate were 10 %. For this calculation, a model was used that assumed a bivariate normal distribution for performance and the propensity to participate.

References

OECD (2023), *PISA 2022 Technical Report*, OECD Publishing. [1]

Annex A3. Technical notes on analyses in this volume

Standard errors, confidence intervals, significance test and p-values

The statistics in this report represent estimates based on samples of students, rather than values that could be calculated if every student in every country had answered every question. Consequently, it is important to measure the degree of uncertainty of the estimates. In PISA, each estimate has an associated degree of uncertainty, which is expressed through a standard error. The use of confidence intervals provides a way to make inferences about the population parameters (e.g. means and proportions) in a manner that reflects the uncertainty associated with the sample estimates. If numerous different samples were drawn from the same population, according to the same procedures as the original sample, then in 95 out of 100 samples the calculated confidence interval would encompass the true population parameter. For many parameters, sample estimators follow a normal distribution and the 95% confidence interval can be constructed as the estimated parameter, plus or minus 1.96 times the associated standard error.

In many cases, readers are primarily interested in whether a given value in a particular country is different from a second value in the same or another country, e.g. whether girls in a country perform better than boys in the same country. In the tables and figures used in this report, differences are labelled as statistically significant when a difference of that size or larger, in either direction, would be observed less than 5% of the time in samples, if there were actually no difference in corresponding population values. Throughout the report, significance tests were undertaken to assess the statistical significance of the comparisons made.

Some analyses in this volume explicitly report p-values (e.g. Table I.B1.5.4). P-values represent the probability, under a specified model, that a statistical summary of the data would be equal to or more extreme than its observed value (Wasserstein and Lazar, 2016[1]). For example, in Table I.B1.5.4, the p-value represents the likelihood of observing, in PISA samples, a trend equal to or more extreme (in either direction) than what is reported, when in fact the true trend for the country is flat (equal to 0).

Statistical significance of differences between subgroup means, after accounting for other variables

For many tables, subgroup comparisons were performed both on the observed difference (“before accounting for other variables”) and after accounting for other variables, such as the PISA index of economic, social and cultural status of students. The adjusted differences were estimated using linear regression and tested for significance at the 95% confidence level. Significant differences are marked in bold.

Range of ranks (confidence interval for rankings of countries)

An estimate of the rank of a country mean, across all country means, can be derived from the estimates of the country means from student samples. However, because mean estimates have some degree of uncertainty, this uncertainty should also be reflected in the estimate of the rank. While mean estimates from samples follow a normal distribution, this is not the case of the rank estimates derived from these. Therefore, in order to construct a confidence interval for ranks, simulation methods were used.

Data are simulated assuming that alternative mean estimates for each relevant country follow a normal distribution around the estimated mean, with a standard deviation equal to the standard error of the mean. Some 1 000

simulations are carried out and, based on the alternative mean estimates in each of these simulations, 1 000 possible estimates for each country are produced.

There are two steps to estimating the confidence sets of ranks. For each country, all possible differences in score estimates are considered between the reference country and all other participating countries. Then for every country, confidence sets of ranks are computed with respect to all other participating countries (with respect to all other OECD countries in the case of the OECD country ranking). Using these individual confidence sets, a *simultaneous* confidence set is computed, covering all possible differences of the reference country with all other countries with a confidence level of 95%. Given this, the simultaneous confidence sets that are fully above or fully below zero (i.e. where differences are significantly different from zero) are used to determine confidence sets for the ranking of a country.

The ranking that results from these simultaneous confidence sets is obtained using a stepwise multiple testing procedure. This implies that first, some countries will be ranked higher or lower compared to the reference country as described above. In the following steps, the rank of the remaining countries accounts for the countries that were ranked higher or lower in previous steps, until all countries are ranked with respect to the reference country. These are the ranks reported in Tables I.2.4, I.2.5 and I.2.6, see Chapter 2. For further details on this procedure, see (Mogstad et al., 2023[2]).

The main difference between the range of ranks (e.g. Table I.2.4) and the comparison of countries' mean performance (e.g. Table I.2.1) is that the former takes into account the multiple comparisons involved in ranking countries/economies, while the latter does not. Therefore, sometimes there is a slight difference between the range of ranks and counting the number of countries above a given country, based on pairwise comparisons of the selected countries' performance. For instance, OECD countries Hungary, Portugal and Spain have similar mean performance and the same set of countries whose mean score is not statistically different from theirs, based on Table I.2.1; but the range of ranks amongst OECD countries for Hungary and Portugal can be restricted to be with 97.5% confidence between 16th and 30th for Hungary and between 17th and 30th for Portugal, while the range of ranks for Spain is narrower (between 18th and 29th) (Table I.2.4). When interest lies in examining countries' rankings, this range of ranks should be used.

Statistics based on multilevel models

Statistics based on multilevel models include variance components (between- and within-school variance) and the index of inclusion derived from these components (i.e. by index of inclusion we refer here to the index of academic inclusion [see Tables I.B1.2.12 and I.B1.2.13] and to the index of social inclusion [see Tables I.B1.4.40 and I.B1.4.41]). Multilevel models are generally specified as two-level regression models (student and school levels), with normally distributed residuals, and estimated with maximum likelihood estimation. Where the dependent variable is mathematics performance, the estimation uses 10 plausible values for each student's performance on the mathematics scale. Models were estimated using the Stata (version 17) "mixed" module.

The index of inclusion is defined and estimated as:

$$100 * \frac{\sigma_W^2}{\sigma_W^2 + \sigma_B^2} \qquad \text{Equation I.A3.1}$$

where σ_W^2 and σ_B^2, respectively, represent the within- and between-variance estimates.

For statistics based on multilevel models (such as the estimates of variance components) the standard errors are not estimated with the usual replication method, which accounts for stratification and sampling rates from finite

populations. Instead, standard errors are "model-based": their computation assumes that schools, and students within schools, are sampled at random (with sampling probabilities reflected in school and student weights) from a theoretical, infinite population of schools and students, which complies with the model's parametric assumptions. The standard error for the estimated index of inclusion is calculated by deriving an approximate distribution for it from the (model-based) standard errors for the variance components, using the delta method.

Parity index

The parity index for an indicator is used by the UNESCO Institute of Statistics to report on Target 4.5 of the Sustainable Development Goals. It is defined as the ratio of the indicator value for one group to the value for another group. Typically, the group more likely to be disadvantaged is in the numerator, and the parity index takes values between 0 and 1 (with 1 indicating perfect parity).

However, in some cases the group in the numerator has a higher value on the indicator. To restrict the range of the parity index between 0 and 2, and to make its distribution symmetrical around 1, an adjusted parity index is defined in these cases. For example, the gender parity index for the share of students reaching Level 2 proficiency on the PISA scale is computed from the share of boys (p_b) and the share of girls (p_g) reaching Level 2 proficiency as follows:

$$PI_{b,g} = \begin{cases} \frac{p_b}{p_g} & \text{if } p_b \geq p_g \\ 2 - \frac{p_g}{p_b} & \text{if } p_b < p_g \end{cases}$$ Equation I.A3.2

The "parity index" reported in Table I.B1.3.13 corresponds to the adjusted parity.

Odds ratios

The odds ratio is a measure of the relative likelihood of a particular outcome across two groups. The odds ratio for observing the outcome when an antecedent is present is simply

$$\text{OR} = {(p_{11}/p_{12})}\Big/{(p_{21}/p_{22})}$$ Equation I.A3.3

where p_{11}/p_{12}represents the "odds" of observing the outcome when the antecedent is present, and p_{21}/p_{22} represents the "odds" of observing the outcome when the antecedent is not present.

Logistic regression can be used to estimate the log ratio: the exponentiated logit coefficient for a binary variable is equivalent to the odds ratio. A "generalised" odds ratio, after accounting for other differences across groups, can be estimated by introducing control variables in the logistic regression.

Figures in bold in the data tables presented in Annex B1 of this report indicate that the odds ratio is statistically significantly different from 1 at the 95% confidence level. To construct a 95% confidence interval for the odds ratio, the estimator is assumed to follow a log-normal distribution, rather than a normal distribution.

References

Mogstad, M. et al. (2023), “Inference for Ranks with Applications to Mobility across Neighbourhoods and Academic Achievement across Countries”, *Review of Economic Studies*, https://doi.org/10.1093/restud/rdad006. [2]

Wasserstein, R. and N. Lazar (2016), “The ASA Statement on p-Values: Context, Process, and Purpose”, *The American Statistician*, Vol. 70/2, pp. 129-133, https://doi.org/10.1080/00031305.2016.1154108. [1]

Annex A4. Quality assurance

Quality-assurance procedures were implemented in all parts of PISA 2022, as was done for all previous PISA surveys. The PISA 2022 Technical Standards (available at https://www.oecd.org/pisa/) specify the way in which PISA must be implemented in each country, economy and adjudicated region. The PISA Consortium monitors the implementation in each of these and adjudicates on their adherence to the standards.

The consistent quality and linguistic equivalence of the PISA 2022 assessment instruments were facilitated by assessing the ease with which the original English version could be translated. Two source versions of the assessment instruments, in English and French, were prepared (except for the financial literacy assessment and the operational manuals, which were provided only in English) in order for countries to conduct a double translation, i.e. two independent translations from the source language(s), with reconciliation by a third person. Detailed instructions for the localisation (adaptation, translation and validation) of the instruments for the field trial and for their review for the main survey, and translation/adaptation guidelines were supplied. An independent team of expert verifiers, appointed and trained by the PISA Consortium, verified each national version against the English and/or French source versions. These translators' mother tongue was the language of instruction in the country concerned, and the translators were knowledgeable about education systems. For further information on PISA translation procedures, see the *PISA 2022 Technical Report* (OECD, forthcoming[1]).

The survey was implemented through standardised procedures. The PISA Consortium provided comprehensive manuals that explained the implementation of the survey, including precise instructions for the work of school co-ordinators and scripts for test administrators to use during the assessment sessions. Proposed adaptations to survey procedures, or proposed modifications to the assessment session script, were submitted to the PISA Consortium for approval prior to verification. The PISA Consortium then verified the national translation and adaptation of these manuals.

To establish the credibility of PISA as valid and unbiased and to encourage uniformity in conducting the assessment sessions, test administrators in participating countries were selected using the following criteria: it was required that the test administrator not be the reading, mathematics or science instructor of any student in the sessions he or she would conduct for PISA; and it was considered preferable that the test administrator not be a member of the staff of any school in the PISA sample. Participating countries organised training for test administrators.

Participating countries and economies were required to ensure that test administrators worked with the school co-ordinator to prepare the assessment session, including reviewing and updating the Student Tracking Form; completing the Session Attendance Form, which is designed to record students' attendance and instruments allocation; completing the Session Report Form, which is designed to summarise session times, any disturbance to the session, etc.; ensuring that the number of test booklets and questionnaires collected from students tallied with the number sent to the school (for countries using the paper-based assessment) or ensuring that the number of USB sticks or external laptops used for the assessment were accounted for (for countries using the computer-based assessment); and sending or uploading the school questionnaire, student questionnaires, parent and teacher questionnaires (if applicable), and all test materials (both completed and not completed) to the national centre after the assessment.

The PISA Consortium responsible for overseeing survey operations implemented all phases of the PISA Quality Monitor (PQM) process: interviewing and hiring PQM candidates in each of the countries, organising their training, selecting the schools to visit, and collecting information from the PQM visits. PQMs are independent contractors located in participating countries who are hired by the international survey operations contractor. They visit a sample

of schools to observe test administration and to record the implementation of the documented field-operations procedures in the main survey.

Typically, two or four PQMs were hired for each country, and they visited an average of 15 schools in each country. If there were adjudicated regions in a country, it was usually necessary to hire additional PQMs, as a minimum of five schools were observed in adjudicated regions.

Approximately one-third of test items are open-ended items in mathematics, reading and science assessments in PISA. Reliable human coding is critical for ensuring the validity of assessment results within a country, as well as the comparability of assessment results across countries. Coder reliability in PISA 2022 was evaluated and reported at both within- and across-country levels. The evaluation of coder reliability was made possible by the design of multiple coding: a portion or all of the responses from each human-coded constructed-response item were coded by at least two human coders.

All quality-assurance data were collected by the PISA Consortium from each adjudicated entity (89 adjudication entities including countries, economies and regions) throughout the PISA 2022 assessment. These data were entered and collated in a central data-adjudication database on the quality of field operations, printing, translation, school and student sampling, and coding. This process identifies data issues that are in need of adjudication.

Comprehensive reports were then generated for the PISA Adjudication Group. This group is composed of the Technical Advisory Group and the Sampling Referee. Its role is to review the adjudication database and reports in order to recommend adequate treatment to preserve the quality of PISA data. For further information, see the *PISA 2022 Technical Report* (OECD, forthcoming[1]).

Overall, the Adjudication Group's review suggests good adherence of national implementations of PISA to the technical standards in spite of the challenging circumstances that affected not only PISA operations but schooling more generally during the COVID-19 pandemic. Thanks to the reactivity and flexibility of participating countries and international contractors, to carefully constructed instruments, to a test design that is aligned to the main reporting goals and is supported by adequate sample design, and to the use of appropriate statistical methods for scaling, population estimates are highly reliable and comparable across countries and time, and particularly with 2018 results.

Nevertheless, a number of deviations from standards were noted and their consequences for data quality were reviewed in depth. The following overall patterns of deviations from standards were identified:

- About one in five of all adjudicated entities had exclusion rates exceeding the limits set by the technical standards (Standard 1.7).
- Seven entities failed to meet the required school response rates, with three of them failing to meet the stricter level of 65% before replacement (Standard 1.11). This is in line with earlier cycles of PISA.
- There was a significant increase in the number of entities that failed to meet the required student response rates (Standard 1.12): 10 entities did not meet this standard.
- There were delays in data submission in a significant number of entities (Standard 19.1): 14 entities did not meet this standard, and 13 only partially met it. The Adjudication Group noted that delayed submissions may affect the quality of the international contractors' work; and if shorter reporting timelines are expected, it may no longer be possible to accommodate such delays.
- A large number of entities did not conduct the field trial as intended (Standard 3.1) or did not attend all meetings (Standard 23.1). While this may also be a consequence of the pandemic, the Adjudication Group noted that these violations may be particularly consequential for new participants and for less-experienced teams. The Group underlined the importance of attendance at coder training sessions for ensuring comparability of the data.

At the international level, these frequent deviations should guide future efforts of the PISA Governing Board, the OECD Secretariat and Contractors to review the corresponding standards, prevent future deviations from standards, or mitigate the consequences of such violations.

At the level of individual adjudicated countries, economies and regions, in most cases, these issues did not result in major threats to the validity of reports, and the data could be declared fit for use. Where school or student participation rates fell short of the standard and created a potential threat for non-response/non-participation bias, countries/economies were requested to submit non-response-bias analyses. The evidence produced by countries/economies (and in some cases, by the sampling contractor) was reviewed by the Adjudication Group.

The Adjudication Group reviewed and discussed major adjudication issues in June 2023. The major adjudication issues reviewed by the group are listed below:

- The 13 adjudicated entities listed below did not meet one or more PISA sampling standards. See the Reader's Guide at the beginning of this volume for a detailed account of the sampling issues for each of the 13 entities. The results of these countries/economies are reported with annotations. Two groups can be distinguished among the 13 entities:
  - Entities that submitted technically strong analyses, which indicated that more than minimal bias was most likely introduced in the estimates due to low response rates (falling below PISA standards): Canada, Ireland, New Zealand, the United Kingdom and Scotland.
  - Entities that did not meet one or more PISA sampling standards and it is not possible to exclude the possibility of more than minimal bias based on the information available at the time of data adjudication: Australia, Denmark, Hong Kong (China), Jamaica, Latvia, the Netherlands, Panama and the United States.
- In **Ukraine**, the overall exclusion rate was 36.1%, when computed with respect to the original sampling frame, covering the entire country (See Annex A2). However, most exclusions resulted from the fact that survey operations could not be completed successfully in the regions most affected by war. Results for the remaining regions (18 out of 27) were deemed fit for reporting, but comparisons with previous results should be made only with great caution, and with due consideration of the differences in target populations.
- For **Viet Nam**'s reading scores, a strong linkage to the international PISA scale could not be established as 40% of the items in reading (35 of 87) were assigned unique parameters. Viet Nam's reading results are reported in this volume with an annotation.
- In **Jordan**, and in the context of the country's transition from a paper- to a computer-based assessment, strong comparability of 2022 results in reading and science to the international scale could only be established by assigning new item parameters to most link items, and thus at the expense of trend comparability. For this reason, the Adjudication Group recommended limiting trends comparisons for Jordan to mathematics results.

Nine other countries/economies, listed below, also did not meet one of the sampling standards, but the Adjudication Group did not judge these deviations to be consequential: Sweden (overall exclusion rate: 7.4%); Norway (overall exclusion rate: 7.3%); Lithuania (overall exclusion rate: 6.7%); Estonia (overall exclusion rate: 5.9%); Switzerland (overall exclusion rate: 5.8%); Türkiye (overall exclusion rate: 5.6%); Croatia (overall exclusion rate: 5.4%); Malta (student response rate: 79%); and Chinese Taipei (school response rates: 83% before replacement, 84% after replacement). No annotation is included when reporting data for these countries/economies in the international report.

While this could not be attributed to violations of the technical standards, the Adjudication Group also reviewed additional analyses conducted for Iceland and Norway, which reported that some students who were taking the test on Chromebooks experienced difficulties moving through the cognitive assessment due to overload on the PISA Consortium's server. While the PISA Consortium solved this problem during the testing period, 579 students in Iceland (17.2% of the final student sample, unweighted) and 584 students in Norway (8.8%) were assessed on Chromebooks before the problem was solved. According to Iceland, test administrators reported the issue having affected *at most* 13% of the unweighted final sample (438 students). The Adjudication Group reviewed the results of the additional analyses conducted by the PISA Consortium and confirmed that, overall, the data, including those of students who sat the test in these circumstances, were considered to be fit for reporting as their responses did show good fit with the model, and were not remarkably different from the performance of students in other schools. However the group noted that it is not possible to exclude the possibility that the issue affected students' engagement and

motivation to give their best effort when they sat the test. See *PISA 2022 Technical Report* (OECD, forthcoming[1]) for details.

References

OECD (forthcoming), *PISA 2022 Technical Report*, OECD Publishing, Paris. [1]

Annex A5. How comparable are the PISA 2022 computer- and paper-based tests?

Computer-based administration (CBA) was the primary mode of delivery for PISA 2022. In PISA 2022, 77 out of 81 countries and economies took the CBA version of the PISA test. Four countries (Cambodia, Guatemala, Paraguay, and Viet Nam) used a paper-based version of the assessment (PBA). This annex describes the differences between paper- and computer-based instruments, and what they imply for the interpretation of results.

Differences in test administration

Starting with the 2015 assessment cycle, the PISA test was delivered mainly on computers. Existing tasks were adapted for delivery on screen; new tasks items were developed that made use of the affordances of computer-based testing. The computer-based delivery mode allows PISA to measure new and expanded aspects of the domain constructs. In mathematics, new material for PISA 2022 included items developed to assess mathematical reasoning as a separate process classification, and items that leveraged the use of the digital environment (e.g. spreadsheets, simulators, data generators, drag-and-drop, etc.). A mixed-design that included computer-based multistage adaptive testing was also adopted for the mathematics literacy domain to further improve measurement accuracy and efficiency, especially at the extremes of the proficiency scale (on adaptive testing, see Annex A9 of this report and in *PISA 2022 Technical Report* (OECD, Forthcoming[1])).

Paper-based assessment instruments in each domain comprise a subset of the test-items included in the computer-based version of the tests in prior cycles. In PISA 2022, a paper-based version of the assessment that included only trend units was developed for the four countries that chose not to implement the computer-delivered survey (i.e. “old” PBA). However, only one participant (Viet Nam) used the same paper-based materials as in the 2015 and 2018 cycles (based on items that were first used in PISA 2012 or earlier). The other paper-based participants administered a “new” PBA instrument that was first used in the PISA for Development (PISA-D) assessment. This “new” paper-based instrument contained a substantial amount of material that was first used in the PISA 2015 computer-based tests, or taken from other assessments, including the “Literacy Assessment and Monitoring Programme” (LAMP), the OECD Survey of Adult Skills (PIAAC), and PISA for Schools.

Table I.A5.1 presents differences in the computer- and paper-based assessments in PISA 2022, respectively. All new items for mathematics were developed as computer-based items. No new items were developed for science or reading in PISA 2022.

Table I.A5.1. Differences between computer- and paper-based administration in PISA 2022

	Computer-Based Administration			Paper-based Administration	
Domain	New	Trend	Total CBA items	PBA instrument used by Viet Nam	New instrument used by Cambodia, Guatemala and Paraguay
Mathematics	Adaptive design: 160 items	Adaptive design: 74 items	234	6 clusters: 71 items Same set of items that PBA participants used in 2018 and 2015 These items were all taken from the 2012 cycle	4 clusters: 63 items
Reading	No new item development for 2022	Adaptive design: 197 items	197	6 clusters: 87 items Same set of items that all PBA participants used in 2018 and 2015 Prior to 2015, these items were last used in 2012 and 2009	4 clusters: 66 items
Science	No new item development for 2022	6 clusters: 115 items (76 from the 2015 cycle; 39 used prior to 2015)	115	6 clusters: 85 items Same set of items that all PBA participants used in 2018 and 2015 Prior to 2015, these items were last used in 2012, 2006 and 2003	4 clusters: 66 items

Source: OECD, PISA 2022 Database; PISA 2022 Technical Report (OECD, Forthcoming[1]).

Comparability of computer-based and paper-based tests

In order to ensure comparability of results between the computer-delivered tasks and the paper-based tasks that were used in previous PISA assessments (and are still in use in countries that use paper instruments), for the test items common to the two administration modes, the invariance of item characteristics was investigated using statistical procedures.

Most importantly, these included a randomised mode-effect study in the PISA 2015 field trial that compared students' responses to paper-based and computer-delivered versions of the same test items across equivalent international samples[1]. The goal was to examine whether test items presented in one mode (e.g. paper-based assessment) function differently when presented in another mode (e.g. computer-based assessment). Results of the mode-effect study showed that for the majority of items, the results supported the comparability across the two modes of assessment (i.e. there were very few samples with any significant differences in difficulty and discrimination parameters between CBA and PBA). For some items, however, the computer-delivered version was found to have a different relationship with student proficiency from the corresponding, original paper version. Such tasks had different difficulty parameters (and sometimes different discrimination parameters) in countries that delivered the test on computer. In effect, this partial invariance approach both accounts for and corrects the potential effect of mode differences on test scores.

Table I.A5.2 shows the number of anchor items that support the reporting of results from the computer-based and paper-based assessments on a common scale. The large number of items with common difficulty and discrimination parameters (i.e "scalar invariant") indicates a strong link between the scales. This strong link corroborates the validity of mean comparisons across countries that delivered the test in different modes.

At the same time, Table I.A5.2 also shows that a large number of items used in the PISA 2022 computer-based tests of reading and, to a lesser extent, science, were not delivered on paper. Caution is therefore required when drawing conclusions about the meaning of scale scores from paper-based tests, when the evidence that supports these conclusions is based on the full set of items. For example, the proficiency of students who sat the PISA 2022 paper-based test of mathematics should be described in terms of the PISA 2012 proficiency levels, not the PISA 2022 proficiency levels. This means, for example, that even though PISA 2022 developed a description of the skills of students who scored below Level 1b in mathematics, it remains unclear whether students who scored within the range of Level 1c on the paper-based tests have acquired these basic mathematics skills.

Table I.A5.2. Anchor items across paper- and computer-based scales

Scalar-invariant, metric-invariant and unique items in PISA 2022 paper and computer tests

	Mathematics	Reading	Science
Items with common difficulty and discrimination parameters across modes (scalar invariant)	38	25	29
Items with common discrimination parameters across modes, but distinct difficulty parameters (metric invariant)	23	20	10
Items with mode-specific parameters (distinct difficulty and discrimination parameters across modes)	1	0	0
Items not delivered on computer (paper-based only)	9	4	6
Items not delivered on paper (computer-based only)	172	152	76

Note: The table reports the number of scalar-invariant, metric-invariant and unique items based on international parameters. In any particular country, items that receive country-specific item parameters (see Annex A6) must also be considered.
Source: OECD, PISA 2022 Database; *PISA 2022 Technical Report* (OECD, Forthcoming[1]) .

Notes

[1] For trend items included in the new PISA 2022 PBA instrument, the equivalence across modes was tested in the context of PISA for Development by using CBA item parameters as starting values in scaling.

References

OECD (Forthcoming), *PISA 2022 Technical Report*, PISA, OECD Publishing, Paris. [1]

Annex A6. Are PISA mathematics scores comparable across countries and languages?

The validity and reliability of PISA scores, and their comparability across countries and languages are the key concerns that guide the development of assessment instruments and selection of the statistical model for scaling students' responses. The procedures used by PISA to meet these goals include qualitative reviews conducted by national experts on the final main study items and statistical analyses of model fit in the context of multi-group item-response-theory models, which indicate the measurement equivalence of each item across groups defined by country and language.

Countries' preferred items

National mathematics experts conducted qualitative reviews of the full set of items included in the PISA 2022 assessment at different stages of their development. The ratings and comments submitted by national experts determined the revision of items and coding guides for the main study, and guided the final selection of the item pool. In many cases, these changes mitigated cultural concerns and improved test fairness.

At the end of 2021, the PISA consortium asked national experts to confirm or revise their original ratings with respect to the final instruments. Sixty-eight national centres submitted ratings of the relevance of PISA 2022 mathematics items for measuring students' "preparedness for life" – a key aspect of the validity of PISA (response options were: "not relevant", "somewhat relevant", "highly relevant"). National experts also indicated whether the specific competences addressed by each item were within the scope of official curricula ("not in curriculum", "in some curricula", "standard curriculum material"). While PISA does not intend to measure only what students learn as part of the school curriculum, ratings of curriculum coverage for PISA items provide contextual indicators to understand countries' strengths and weaknesses in the assessment.

On average across countries/economies, 81% of items were rated as "highly relevant for students' preparedness for life" (the highest possible rating); only 2% received a low rating on this dimension (rating equal to 1, i.e. "not relevant").

On the other hand, national experts indicated high overlap between national curricula and the PISA mathematics item set. On average, 86% of items were rated as "standard curriculum material", and only 3% of items were identified as "not in curriculum". National experts from five countries – Kazakhstan, Norway, Peru, the Philippines, and Thailand – indicated that all items used in PISA could be considered standard curriculum material in their country.

Table I.A6.1 provides a summary of the ratings received from national centres about the PISA 2022 set of reading items.

Table I.A6.1. How national experts rated PISA mathematics items

Percentage of test items, by rating

		In curriculum?			Relevant to "preparedness for life"?		
		Not in curriculum	In some curricula	Standard curriculum material	Not at all relevant	Somewhat relevant	Highly relevant
		(%)	(%)	(%)	(%)	(%)	(%)
OECD	Austria	6.4	9.2	84.5	8.0	23.9	68.1
OECD	Belgium	0.4	4.2	95.5	4.2	6.4	89.4
OECD	Canada	5.3	18.6	76.1	4.2	20.5	75.4
OECD	Chile	0.0	1.9	98.1	15.5	15.5	68.9
OECD	Colombia	4.2	24.6	71.2	1.1	13.6	85.2
OECD	Costa Rica	14.0	16.3	69.7	16.3	35.6	48.1
OECD	Czech Republic	1.5	5.3	93.2	0.4	11.4	88.3
OECD	Denmark	1.5	6.8	91.6	0.0	12.2	87.8
OECD	Estonia	0.5	0.0	99.5	0.5	2.7	96.7
OECD	Finland	0.0	9.1	90.9	0.0	6.4	93.6
OECD	Germany	14.6	35.4	50.0	15.7	38.6	45.7
OECD	Greece	2.3	8.7	89.0	0.0	0.4	99.6
OECD	Hungary	0.4	6.4	93.2	12.1	19.3	68.6
OECD	Iceland	0.0	1.9	98.1	0.0	6.1	93.9
OECD	Ireland	0.0	3.0	97.0	1.1	9.1	89.8
OECD	Israel	6.5	4.2	89.4	4.2	22.8	73.0
OECD	Italy	5.3	0.8	93.9	2.7	8.0	89.4
OECD	Korea	0.0	3.2	96.8	3.8	61.3	34.9
OECD	Lithuania	0.0	1.5	98.5	1.1	10.2	88.6
OECD	Mexico	7.2	6.4	86.5	1.6	11.2	87.3
OECD	New Zealand	4.9	4.9	90.2	2.3	37.9	59.8
OECD	Norway	0.0	0.0	100.0	0.4	0.0	99.6
OECD	Poland	12.1	14.8	73.1	0.0	3.8	96.2
OECD	Portugal	0.8	7.2	92.0	0.0	7.2	92.8
OECD	Slovak Republic	2.3	3.4	94.3	3.0	3.4	93.6
OECD	Slovenia	1.1	17.8	81.1	0.0	25.4	74.6
OECD	Spain	1.1	13.3	85.6	3.0	25.4	71.6
OECD	Sweden	0.8	23.1	76.1	0.0	33.3	66.7
OECD	Switzerland	3.0	54.2	42.8	0.0	37.1	62.9
OECD	Türkiye	1.1	0.4	98.5	0.4	1.1	98.5
OECD	United Kingdom (Excl. Scotland)	4.2	12.5	83.3	3.0	22.0	75.0
OECD	United States	3.3	14.3	82.4	3.3	25.8	70.9
Partners	Albania	3.4	12.5	84.1	3.0	4.5	92.4
Partners	Argentina	3.0	17.8	79.2	0.4	19.0	80.6
Partners	Brazil	0.4	0.0	99.6	0.4	7.2	92.4
Partners	Brunei Darussalam	2.0	2.0	96.1	9.8	52.9	37.3
Partners	Bulgaria	4.5	34.8	60.6	2.3	39.4	58.3
Partners	Croatia	0.0	0.4	99.6	0.0	3.0	97.0
Partners	Cyprus	3.8	11.0	85.2	0.0	8.7	91.3
Partners	Dominican Republic	0.0	50.0	50.0	0.4	37.9	61.7
Partners	El Salvador	20.2	0.0	79.8	0.8	9.9	89.3
Partners	Georgia	2.3	4.5	93.2	0.0	15.9	84.1
Partners	Hong Kong (China)	0.0	1.9	98.1	1.9	3.0	95.1
Partners	Indonesia	2.7	5.7	91.7	1.9	10.2	87.9
Partners	Jamaica	5.7	0.8	93.4	0.4	11.5	88.1
Partners	Jordan	0.4	6.4	93.2	0.0	6.1	93.9
Partners	Kazakhstan	0.0	0.0	100.0	0.0	0.0	100.0
Partners	Macao (China)	1.5	62.9	35.6	0.0	42.0	58.0
Partners	Malaysia	3.0	17.5	79.5	0.0	9.1	90.9
Partners	Moldova	1.1	1.9	97.0	0.0	5.7	94.3
Partners	Mongolia	1.5	3.4	95.1	3.0	36.0	61.0
Partners	Montenegro	3.4	6.4	90.2	0.4	6.8	92.8
Partners	Morocco	7.5	33.2	59.3	0.8	30.6	68.7
Partners	Palestinian Authority	4.9	34.1	61.0	2.3	14.8	83.0
Partners	Panama	0.0	1.5	98.5	0.0	10.2	89.8
Partners	Peru	0.0	0.0	100.0	0.0	5.7	94.3
Partners	Philippines	0.0	0.0	100.0	0.0	1.5	98.5
Partners	Qatar	4.9	3.8	91.3	0.8	3.4	95.8
Partners	Romania	10.6	6.8	82.6	1.1	12.1	86.7
Partners	Saudi Arabia	0.0	6.8	93.2	0.0	94.3	5.7
Partners	Serbia	7.6	0.4	92.0	1.1	14.0	84.8
Partners	Singapore	11.8	16.7	71.5	11.8	38.0	50.2
Partners	Chinese Taipei	25.0	14.8	60.2	0.0	5.3	94.7
Partners	Thailand	0.0	0.0	100.0	0.0	3.8	96.2
Partners	Ukraine	0.4	15.5	84.1	0.4	2.7	97.0
Partners	United Arab Emirates	0.4	12.1	87.5	8.7	22.3	68.9
Partners	Uruguay	1.9	14.0	84.1	0.4	9.1	90.5
Partners	Uzbekistan	0.4	6.8	92.8	0.8	2.7	96.6
	Overall average	3.4	10.6	86.0	2.3	16.5	81.2

Note: Percentages may not add to 100% due to rounding. Percentages are reported as a proportion of all test items that received a rating. For countries that delivered the test on paper, only ratings for trend items were considered. Countries and economies that are not included in this table did not submit ratings on the final set of items.

National item deletions, item misfit, and item-by-country interactions

PISA reporting scales in mathematics, reading and science are linked across countries, survey cycles and delivery modes (paper and computer) through common items whose parameters are constrained to the same values and which can therefore serve as "anchors" on the reporting scale. A large number of anchor items support the validity of cross-country comparisons and trend comparisons.

The unidimensional multi-group item-response-theory (IRT) models used in PISA, with groups defined by language within countries and by cycle also result in model-fit indices for each item-group combination. These indices can indicate tensions between model constraints and response data, a situation known as "misfit" or "differential item functioning" (DIF).

In cases where the international parameters for a given item did not fit well for a particular country or language group, or for a subset of countries or language groups, PISA allowed for a "partial invariance" solution in which the equality constraints on the item parameters were released and group-specific item parameters were estimated. This approach was favoured over dropping the group-specific item responses for these items from the analysis in order to retain the information from these responses. While items with DIF treated in this way no longer contribute to the international set of comparable responses, they help reduce measurement uncertainty for the specific country-by-language group.

In rare instances where the partial invariance model was not sufficient to resolve the tension between students' responses and the IRT model, the group-specific response data for that particular item were dropped.

An overview of the number of international/common (invariant) item parameters and group-specific item parameters in mathematics for PISA 2022 is given in Figure I.A6.1 and Figure I.A6.2; the corresponding figures for other domains can be found in the PISA 2022 Technical Report (OECD, Forthcoming[1]). Each set of stacked bars in these figures represents a country or economy; countries and economies with multiple language groups have one bar for each country-by-language group.

The bars represent the items used in the country. A colour code indicates whether international item parameters were used in scaling ("invariant items"), or whether, due to misfit when using international parameters, national item parameters were used. For items where international equality constraints were released, a distinction is made between two groups:

- group-specific new items: items that received unique parameters for the particular group defined by country/language and year (in many cases, equality constraints across a subset of misfit groups defined by country/language and year, e.g. across all language groups in a country, could be implemented)
- group-specific trend items: items for which the "non-invariant" item parameters used in 2022 could be constrained to the same values used in 2018 for the particular country/language group (these items contribute to measurement invariance over time but not across groups).

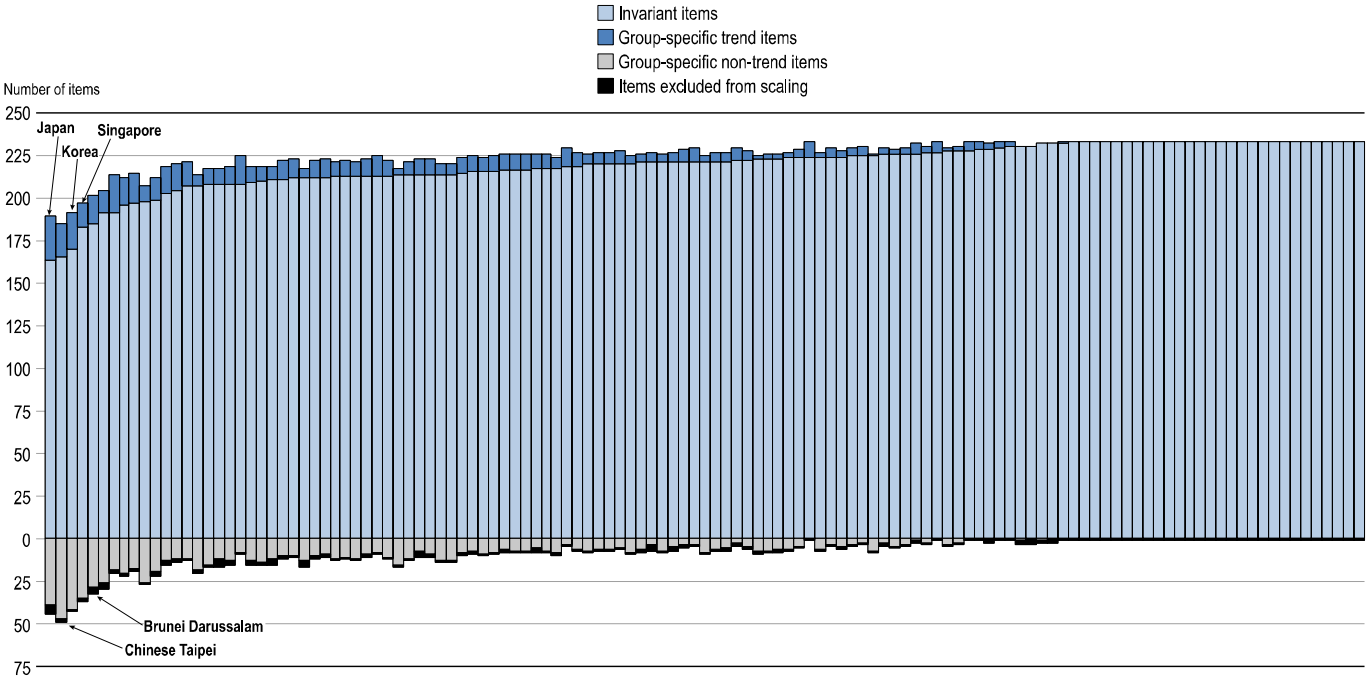
For any pair of countries/economies, the larger the number and share of common ("invariant") item parameters, the more comparable the PISA scores. As the figures show, comparisons between most countries' results are supported by strong links involving many items (in 115 of 125 country-by-language group, over 85% of the items use international, invariant item parameters).

Across every domain, international/common (invariant) item parameters dominate and only a small proportion of the item parameters are group-specific. The *PISA 2022 Technical Report* (OECD, Forthcoming[1]) includes an overview of the number of deviations per item across all country-by-language groups.

The country/language group with the largest amount of misfit across items is Viet Nam in reading (this was not the case in mathematics and science). In reading, almost 40% of items (34 of 87) were assigned unique parameters in Viet Nam. As a result, a strong linkage to the international PISA scale could not be established.

Figure I.A6.1. Invariance of items in the computer-based test of mathematics across countries/economies and over time

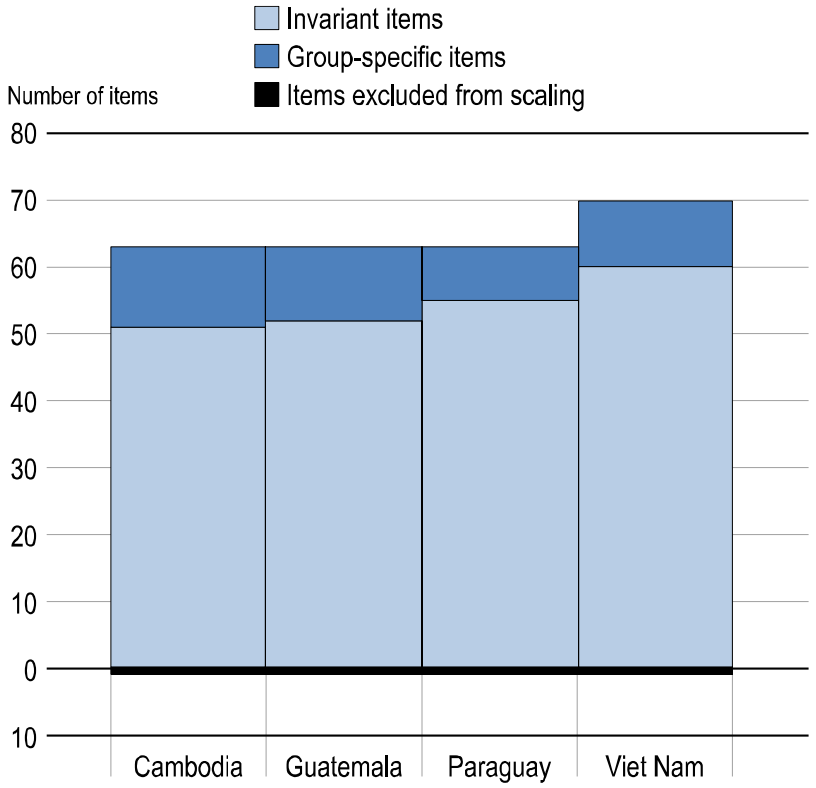
Analyses based on 234 items



Note: Each set of stacked columns corresponds to a distinct country-by-language group.
Source: OECD, PISA 2022 Database; PISA 2022 Technical Report (OECD, Forthcoming[1]).

Figure I.A6.2. Invariance of items in the paper-based test of mathematics across countries and over time

Analyses based on 64 (“new” paper-based assessment) or 71 items (“old” paper-based assessment)



Note: Each set of stacked columns corresponds to a distinct country.
In PISA 2022, a paper-based version of the assessment that included only trend units was implemented in Cambodia, Guatemala and Paraguay (“new” PBA). Viet Nam used the same paper-based materials as in the 2015 and 2018 cycles (based on items that were first used in PISA 2012 or earlier) (“old” PBA). See Annex A5 for more details on paper-based assessments in PISA 2022.
Source: OECD, PISA 2022 Database; PISA 2022 Technical Report (OECD, Forthcoming[1]).

Table I.A6.2. Annex A6 Tables

Table I.A6.1	How national experts rated PISA mathematics items
Figure I.A6.1	Invariance of items in the computer-based test of mathematics across countries/economies and over time
Figure I.A6.2	Invariance of items in the paper-based test of mathematics across countries and over time

StatLink https://stat.link/ozuxna

References

OECD (Forthcoming), *PISA 2022 Technical Report*, PISA, OECD Publishing, Paris. [1]

Annex A7. Comparing mathematics, reading and science performance across PISA assessments

The methodology underpinning the analysis of trends in performance in international studies of education is complex. To ensure the comparability of PISA results across different assessment years, a number of conditions must be met.

In particular, successive assessments of the same subject must include a sufficient number of common assessment items, and these items must retain their measurement properties over time so that results can be reported on a common scale. The set of items included must adequately cover the different aspects of the framework for each domain.

Furthermore, the sample of students in different assessment cycles must be similarly representative of the target population; only results from samples that meet the strict standards set by PISA can be compared over time. Even though some countries and economies took part in successive PISA assessments, some of them cannot compare all their PISA results over time.

Comparisons over time can be affected by changes in assessment conditions or in the methods used to estimate students' performance on the PISA scale. In particular, from 2015 onward, PISA introduced computer-based testing as the main form of assessment. It also adopted a more flexible model for scaling response data, and treated items that were left unanswered at the end of test forms as if they were not part of the test, rather than as incorrectly answered. (Such items were considered incorrect in previous assessments for the purpose of estimating students' position on the PISA scale.) Instead of re-estimating past results based on new methods, PISA incorporates the uncertainty associated with these changes when computing the statistical significance of trend estimates (see the section on "link errors" below).

Changes in enrolment rates do not affect the representative nature of the PISA sample with regards to its target population (15-year-olds enrolled in Grade 7 or above), nevertheless, such changes may affect the interpretation of trends.

Finally, comparisons of assessment results through years that correspond to different assessment frameworks may also reflect the shifting emphasis of the test. For example, differences between PISA 2018 (and earlier) and PISA 2022 results in mathematics reflect not only whether students have become better at mastering the common assessment items used for linking the assessments (which reflect the earlier assessment framework), they also reflect students' relative performance (compared to other students in other countries) on aspects of proficiency that are emphasised in the most recent assessment framework.

Link errors

Link errors are estimates that quantify the uncertainty involved in comparisons that involve different calibrations of the same scale (e.g. the PISA 2012 and the PISA 2022 calibrations of the mathematics scale). Standard errors for estimates of changes in performance and trends across PISA assessments take this uncertainty into account.

Similarly to past assessments, only the uncertainty around the location of scores from past PISA assessments on the 2022 reporting scale is reflected in the link error. Because this uncertainty about the position in the distribution (a change in the intercept) is cancelled out when looking at location-invariant estimates (such as estimates of the

variance, the inter-quartile range, gender gaps, regression coefficients, correlation coefficients, etc.), standard errors for these estimates do not include the linking error.

Link error for scores between two PISA assessments

Link errors for PISA 2022 were estimated based on the comparison of rescaled country/economy means per domain with the corresponding means derived from public use files and produced under the original scaling of each assessment. This approach for estimating the link errors was used for the first time in PISA 2015 (OECD, 2017[1]). The number of observations used for the computation of each link error equals the number of countries with results in both assessments. Because of the sparse nature of the data underlying the computation of the link error, a robust estimate of the standard deviation was used, based on the S_n statistic (Rousseeuw and Croux, 1993[2]).

Table I.A7.1. Robust link error for comparisons of performance between PISA 2022 and previous assessments

Comparison	Reading	Mathematics	Science
PISA 2000 to 2022	6.67		
PISA 2003 to 2022	5.25	5.54	
PISA 2006 to 2022	8.56	4.09	3.68
PISA 2009 to 2022	4.66	4.28	5.92
PISA 2012 to 2022	6.01	3.58	5.20
PISA 2015 to 2022	3.63	2.74	1.38
PISA 2018 to 2022	1.47	2.24	1.61

Note: Comparisons between PISA 2022 scores and previous assessments can only be made to when the subject first became a major domain or later assessment cycles. As a result, comparisons of mathematics and science performance between PISA 2000 and PISA 2022, for example, are not possible.
Source: PISA 2022 Technical Report *(OECD, forthcoming)*

Link error for other types of comparisons of student performance

In PISA, link errors for comparisons across two assessments are considered to be the same across the scale: the link error is the same for a scale score of 400 as for a scale score of 600. However, not all quantities of interest are reported on the PISA scale and some comparisons involve more than two assessments. How is the proportion of students scoring above a particular cut-off value affected by the link error? How are regression-based trends affected by link errors?

Link error for regression-based trends in performance

The link error for regression-based trends in performance and for comparisons based on non-linear transformations of scale scores can be estimated by simulation, based on the link error for comparison of scores between two PISA assessments. In particular, Table I.A7.2 presents the magnitude of the link error associated with the estimation of the average decennial trend (see below for a definition of the average decennial trend).

The estimation of the link errors for regression-based trends uses the assumption that the uncertainty in the link follows a normal distribution with a mean of 0 and a standard deviation equal to the scale link error shown in Table I.A7.1. However, because the interest here lies in trends over more than two assessment years, the covariance between link errors must be considered in addition to the link errors shown in Table I.A7.1.

To simulate data from multiple PISA assessments, 2 000 observations were drawn from a multivariate normal distribution with all means equal to 0 and whose variance/covariance structure is identified by the link error published in Table I.A7.1, and by those between previous PISA reporting scales, published in Table 12.31 of the PISA 2012 Technical Report, in Table 12.8 of the PISA 2015 Technical Report and Table 12.8 of the PISA 2018 Technical Report (OECD, 2014[3]; OECD, 2017[1]; OECD, 2020[4]). These draws represent 2 000 possible scenarios in which

the real trend is 0, and the estimated trend entirely reflects the uncertainty in the comparability of scores across scales. Link errors for comparisons of the average decennial trend between PISA 2022 and previous assessments depend on the number of cycles involved in the estimation but are independent of the shape of the performance distribution within each country.

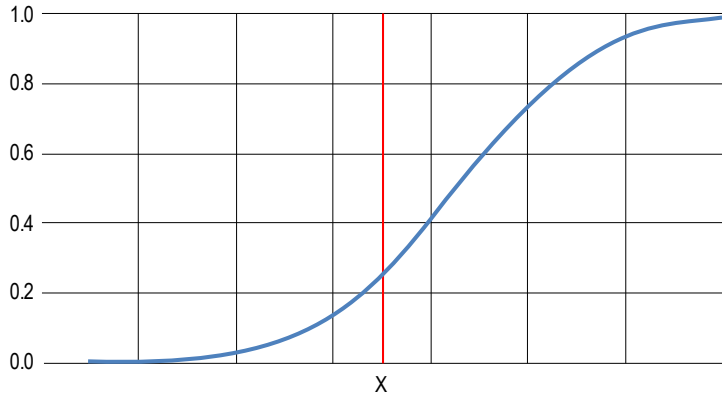
Link error for non-linear transformations of scores

While in previous assessments the link error for comparisons based on non-linear transformations of scores (i.e. proficiency levels) were estimated by simulation of the link error used to compare two PISA assessments, in PISA 2022 the link error is estimated using a parametric approximation of the distribution of student proficiency (the normal distribution), together with the "delta method".

The computation of the link errors using the delta method can be illustrated by taking the percentage of students below proficiency Level 2 as the variable of interest. However, this method applies to any generic non-linear transformation of PISA scores.

In this illustration, the variable of interest is a value in a cumulative normal distribution (Figure I.A7.1). Values on the PISA scale (including the scale link error) are placed on the x-axis; the "proportion below" a particular value on the PISA scale (X) can be read on the y-axis (about .25, or 25%, in this example); and scale errors will be translated to errors on the y-axis as a function of the slope of the curve around the value of X. As the figure makes clear, the link error on the x-axis will affect the error on the y-axis differently, depending where the value of interest (X) is located on the x-axis. In regions where the slope is steeper, an error on the x-axis will translate into a larger error on the y-axis; where the slope flattens out (at the far tails of the distribution), an error on the x-axis will translate to a small error on the y-axis.

Figure I.A7.1. Normal cumulative distribution function



By assuming that the distribution of PISA scores is approximately normal, it is possible to compute the "slope" factor which affects the translation of link errors from PISA scale to percentage scale used for reporting values of the cumulative distribution (e.g. the "percentage of students below proficiency Level 2").

Comparisons of performance: Difference between two assessments and average decennial trend

To evaluate how performance evolved over time, analyses report the change in performance between two assessment cycles and the average decennial trend in performance. When at least five data points are available, curvilinear trend trajectories are also estimated.

Comparisons between two assessments (e.g. a country's/economy's change in performance between PISA 2009 and PISA 2022 or the change in performance of a subgroup) are calculated as:

$$\Delta_{2022-t} = PISA_{2022} - PISA_{t} \qquad \text{Equation I.A7.1}$$

where Δ_{2022-t} is the difference in performance between PISA 2022 and a previous PISA assessment, $PISA_{2022}$ is the mathematics, reading or science score observed in PISA 2022, and $PISA_t$ is the mathematics, reading or science score observed in a previous assessment. (Comparisons are only possible with the year when the subject first became a major domain or later assessments; as a result, comparisons of mathematics performance between PISA 2022 and PISA 2000 are not possible, nor are comparisons of science performance between PISA 2022 and PISA 2000 or PISA 2003).

The standard error of the change in performance $\sigma(\Delta_{2022-t})$ is:

$$\sigma(\Delta_{2022-t}) = \sqrt{\sigma_{2022}^2 + \sigma_t^2 + error_{2022,t}^2} \qquad \text{Equation I.A7.2}$$

where σ_{2022} is the standard error observed for $PISA_{2022}$, σ_t is the standard error observed for $PISA_t$ and $error_{2022,t}^2$ is the link error for comparisons of mathematics, reading or science performance between the PISA 2022 assessment and a previous (t) assessment. The value for $error_{2022,t}^2$ is shown in Table I.A7.1.

A second set of analyses reported in this volume relates to the average decennial trend in performance. The average decennial trend is the average rate of change observed through a country's/economy's participation in PISA per 10-year period. Thus, a positive average decennial trend of x points indicates that the country/economy has improved in performance by x points per 10-year period since its earliest comparable PISA results. The average decennial trend in performance is calculated through a regression of the form:

$$PISA_{i,t} = \beta_0 - \beta_1 time_t + \varepsilon_{i,t} \qquad \text{Equation I.A7.3}$$

where $PISA_{i,t}$ is country *i*'s location on the science, reading or mathematics scale in year *t* (mean score or percentile of the score distribution), $time_t$ is a variable measuring time in 10-year units, and $\varepsilon_{i,t}$ is an error term indicating the sampling and measurement uncertainty around $PISA_{i,t}$. In the estimation, sampling errors and measurement errors are assumed to be independent across time. Under this specification, the estimate for β_1 indicates the average rate of change per 10-year period. Just as a link error is added when drawing comparisons between two PISA assessments, the standard errors for β_1 also include a link error:

$$\sigma(\beta_1) = \sqrt{\sigma_{s,i}^2(\beta_1) + \sigma_l^2(\beta_1)} \qquad \text{Equation I.A7.4}$$

where $\sigma_{s,i}^2(\beta_1)$ is the sampling and imputation error associated with the estimation of β_1 and $\sigma_l^2(\beta_1)$ is the link error associated with the average 10-year trend. It is presented in Table I.A7.2.

The average 10-year trend is a more robust measure of a country's/economy's progress in education outcomes as it is based on information available from all assessments. It is thus less sensitive to abnormal measurements that may alter comparisons based on only two assessments. The average 10-year trend is calculated as the best-fitting line throughout a country's/economy's participation in PISA. PISA scores are regressed on the year the country participated in PISA (measured in 10-year units of time).

Curvilinear trends are estimated in a similar way, by fitting a quadratic regression function to the PISA results for country *i* across assessments indexed by *t*:

$$PISA_{i,t} = \beta_2 + \beta_3 year_t + \beta_4 year_t^2 + \varepsilon_{i,t} \qquad \text{Equation I.A7.5}$$

where $year_t$ is a variable measuring time in years since 2022 and $year_t^2$ is equal to the square of year t. Because year is scaled such that it is equal to zero in 2022, β_3 indicates the estimated annual rate of change in 2022 and β_4 the acceleration/deceleration of the trend. If β_4 is positive, it indicates that the observed trend is U-shaped, and rates of change in performance observed in years closer to 2022 are higher (more positive) than those observed in earlier years. If β_4 is negative, the observed trend has an inverse-U shape, and rates of change in performance observed in years closer to 2022 are lower (more negative) than those observed in earlier years. Just as a link error is added in the estimation of the standard errors for the average 10-year trend, the standard errors for β_3 and β_4 also include a

link error (Table I.A7.3). Curvilinear trends are only estimated for countries/economies that can compare their performance across at least five assessments to avoid over-fitting the data.

Adjusted trends

PISA maintains its technical standards over time. Although this means that trends can be calculated over populations defined in a consistent way, the share of the 15-year-old population that this represents can also be subject to change.

Because trend analyses illustrate the pace of progress of successive cohorts of students, in order to draw reliable conclusions from such results, it is important to examine the extent to which they are driven by changes in the coverage rate of the sample. Two sets of trend results were therefore developed: unadjusted trends and adjusted trends accounting for changes in enrolment.

Adjusted trends accounting for changes in enrolment

To neutralise the impact of changes in enrolment rates on trends in median performance and on performance at higher percentiles (or, more precisely, the impact of changes in the coverage rate of the PISA sample with respect to the total population of 15-year-olds; see Coverage Index 3 in Annex A2), the assumption was made that the 15-year-olds not covered by the assessment would all perform below the percentile of interest across all 15-year-olds. With this assumption, the median score across all 15-year-olds (for countries where the coverage rate of the sample is at least 50%) and higher percentiles could be computed without the need to specify the level of performance of the 15-year-olds who were not covered (note that the assumption made is more demanding for the median than for higher percentiles, such as the 75th percentile).

In practice, the estimation of adjusted trends accounting for changes in enrolment first requires that a single case by country/ economy be added to the database, representing all 15-year-olds not covered by the PISA sample. The final student weight for this case is computed as the difference between the total population of 15-year-olds (see Table I.A2.1) and the sum of final student weights for the observations included in the sample (the weighted number of participating students). Similarly, each replicate weight for this case is computed as the difference between the total population of 15-year-olds and the sum of the corresponding replicate weights. Any negative weights resulting from this procedure are replaced by 0. A value below any of the plausible values in the PISA sample is entered for the performance variables of this case.

In a second step, the median and upper percentiles of the distribution are computed on the augmented sample. In a few cases where the coverage rate is below 50%, the estimate for the adjusted median is reported as missing.

Comparing the OECD average across PISA assessments

Throughout this report, the OECD average is used as a benchmark. It is calculated as the average across OECD countries, weighting each country equally. Some OECD countries did not participate in certain assessments; other OECD countries do not have comparable results for some assessments; still others did not include certain questions in their questionnaires or changed them substantially from assessment to assessment. In trend tables and figures, the OECD average is reported on consistent sets of OECD countries, and multiple averages may be included. For instance, the “OECD average-35” includes only 35 OECD countries that have non-missing observations for all assessments since PISA 2012; other averages include only OECD countries that have non-missing observations for the years for which this average itself is non-missing. This restriction allows for valid comparisons of the OECD average over time and neutralises the effect of changing OECD membership and participation in PISA on the estimated trends.

Table I.A7.4. Tables comparing performance across PISA assessments

	Table I.A7.1.	Link errors for comparisons between PISA 2022 and previous assessments
WEB	Table I.A7.2.	Link errors for the linear trend between previous assessments and PISA 2022
WEB	Table I.A7.3.	Link errors for the curvilinear trend between previous assessments and PISA 2022

StatLink https://stat.link/48f0zo

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Annex A8. How much effort do students put into the PISA test?

Performance on school tests reflects what students know and can do. They also show how quickly students process information and how motivated they are to do well on the test.

To encourage students who sit the PISA test to do their best through to the end of the assessment, schools and students are reminded how important the study is for their country. At the beginning of the test session, the test administrator reads a script that includes the following sentence:

> *"This is an important study because it will tell us about what you have been learning and what school is like for you. Because your answers will help influence future educational policies in <country and/or education system>, we ask you to do the very best you can.*

However, many students view PISA as a low-stakes assessment: they can refuse to participate in the test with no negative consequences and do not receive any feedback on their performance. There is a risk, therefore, that students do not do their best on the test (Wise and DeMars, 2010[1]).

Several studies in the United States have found that student performance on assessments, such as the United States national assessment of educational progress (NAEP), depends on how they are administered. One study shows that students did not perform as well in regular low-stakes conditions as when students received financial rewards tied to their performance or were told their results would count towards their grades (Wise and DeMars, 2005[2]). In contrast, a study in Germany found no difference in effort or performance measures between students who sat a PISA-based mathematics test under the standard PISA test-administration conditions and students who sat the test in alternative high-stakes conditions tied to performance (Baumert and Demmrich, 2001[3]). In the latter study, experimental conditions included promising feedback on performance, providing monetary incentives contingent on performance, and letting students know that the test would count towards their grades. The difference in conclusions reached by these two studies suggests that students' motivation on low-stakes tests such as PISA differs significantly across countries. The only existing multi-country study on the effect of incentives on test performance found that offering students monetary incentives to do well on a test such as PISA – something that is not possible within regular PISA procedures – led to improved performance among students in the United States while students in Shanghai (China) performed equally well with or without incentives (Gneezy et al., 2017[4]).

Differences in student engagement in a given test often reveal important variations in test-administration conditions. For example, in 2018, students predominantly concentrated in a small number of schools in a few regions of Spain exhibited anomalous response patterns, performed below expectations, and reported low levels of engagement with the test. Further investigation revealed that the regions in which these schools were located had conducted their high-stakes exams for 10th-grade students earlier in the year than in the past. This meant that the testing period for these exams coincided with the end of the PISA testing window. Students were more negatively disposed towards PISA in schools where the PISA testing day was closer to that of high-stakes exams (OECD, 2020[5]).

Summing up, differences in countries' and economies' mean scores in PISA, and comparisons between PISA 2022 results and results from prior assessments may reflect differences not only in what students know and can do but how motivated they were to do their best. Put differently, PISA does not measure students' maximum potential but what students actually do in situations where their individual performance is monitored only as part of their group's performance.

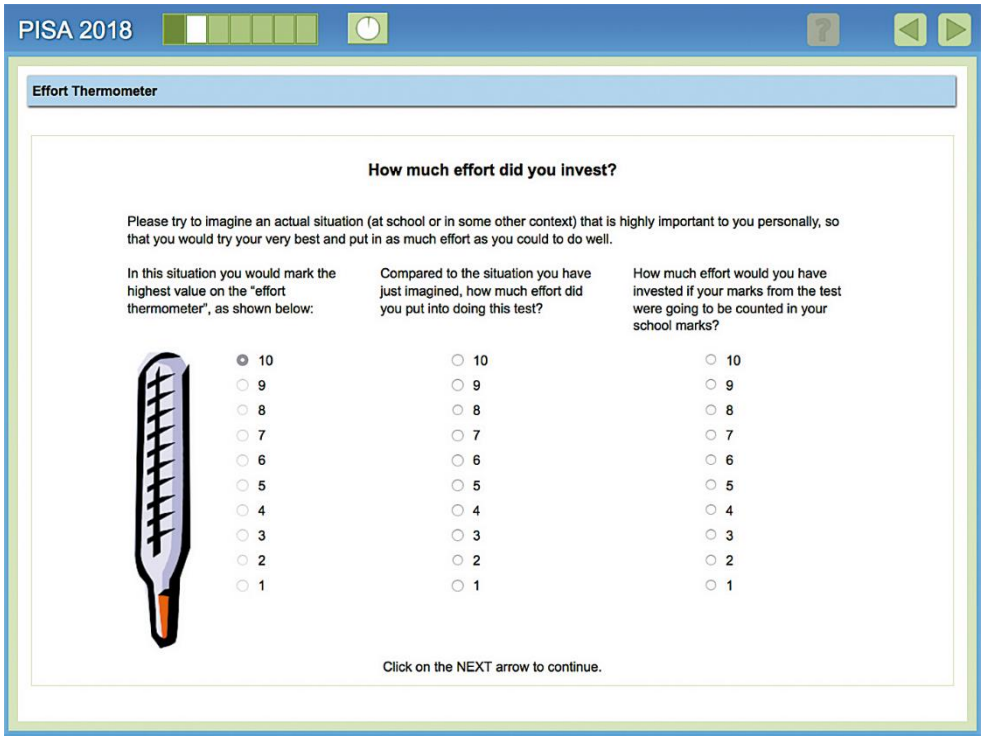
This annex computes several indicators of student engagement using PISA 2022 data to compare between countries/economies and corresponding indicators computed on 2018 data. The intention is not to suggest adjustments to PISA mean scores or performance distributions but to provide richer context for interpreting cross-country differences and trends in performance.

A number of approaches have been developed to assess differences in students' motivation in low-stakes tests (Buchholz, Cignetti and Piacentini, 2022[6]) between individuals or groups (e.g. across countries and economies). These are approaches based on self-reports (which rely on test-takers' own perceptions and reports about their effort and dispositions) and those based on behavioural indicators (which rely on observation of students' behaviour during the test). Among the latter, one can further distinguish between invasive approaches, which require dedicated resources such as human proctors, eye-tracking devices or the administration of bespoke test modules, and non-invasive approaches, which rely only on students' interactions with the test and questionnaire forms. This annex relies on self-reports and non-invasive behavioural indicators.

Self-reported effort

In PISA 2022, students were asked about the effort they invested in the test, and the effort they would have expended in a hypothetical situation if the test results counted towards their grades (see Figure I.A8.1). The same questions were also included in PISA 2018 (Figure I.A8.1).

Figure I.A8.1. The effort thermometer in PISA 2018



It is paradoxical to expect that students who are disengaged and may not even read the instructions in test items would put time and effort into *this* question. Nevertheless, the self-report measure is not only widely used by scholars in this field (Wise and DeMars, 2005[2]; Eklöf, 2007[7]), it has also contributed to making PISA results more reliable. Indicators derived from student self-reporting their engagement level (OECD, 2020[5]) identified anomalies affecting Spain's data in 2018.

Self-reported effort in 2022

In 2022, more than two-thirds of students across OECD countries (71%) reported expending less effort on the PISA test than they would have done in a test that counted towards their grades (Table I.A8.1). On the 1-to-10 scale shown in Figure I.A8.1, students reported an effort of between "7" and "8" for the PISA test they just had completed, on average. They reported that they would have described their effort as "9" had the test counted towards their marks.

Students in the Dominican Republic and Uzbekistan rated their effort highest on average across all participating countries/economies. At least 75% of students completed the effort thermometer, with an average rating close to "9". Only 26% of students in Uzbekistan and 30% of students in the Philippines reported they would have invested more effort had the test counted towards their marks. At the other extreme, more than four out of five PISA students (80%) in Denmark* and Sweden (in descending order), and 71% on average across OECD countries reported they would have invested more effort if their performance on the test had counted towards their marks (Table I.A8.1).

In most countries as well as on average, boys reported investing slightly less effort in the PISA test than girls did. The effort boys reported they would have invested in the test had it counted towards their marks was also less than girls did. When the difference between the "true" and "hypothetical" PISA effort is considered, girls are more likely than boys to report they would have worked harder on the test if it had counted towards their marks (Table I.A8.4).

Changes in self-reported effort between 2018 and 2022

Comparisons of self-reported effort across countries reflect not only actual differences in effort levels but individual and cultural differences in the use of the 1-10 rating scale as well. These differences are less likely to affect comparisons of self-reported effort across different cohorts within the same country/economy.

Students reported making less effort on the test in 2022 than in 2018 in most countries/economies: the difference corresponds to -0.2 points on the 10-point scale on average across OECD countries (Table I.A8.3). Reports about the effort students would have made had the test counted towards their grades were also lower (by 0.1 points on average across OECD countries) but the decline was more marked for reports about the actual effort students made. The proportion of students who rated their actual effort on the PISA test lower than if it had counted towards their grades increased, with only limited exceptions. Among countries where at least 75% of students completed the effort thermometer in both years, the largest increases in this proportion were in Israel (+11 percentage points), Türkiye (+10 percentage points) and Hungary (+8 percentage points). Saudi Arabia, in contrast, stands out for the opposite trend: students' self-reported effort increased by 0.3 points on the 10-point scale and the proportion reporting that their effort would have been higher if the test had counted towards their grades decreased by 12 percentage points between 2018 and 2022. It is noteworthy that there was significant improvement in mathematics performance in Saudi Arabia and students completed the test on computers in 2022 but with paper and pencil in 2018.

Sharp declines in the effort reported by students on the PISA test were observed in two of the countries with strong declines in mathematics performance: Albania (-0.6 points) and Jordan (-0.5 points) (Table I.A8.3). In both cases, the effort students would have made if the test had counted towards their grades was also significantly lower than in 2018. This suggests that lower proficiency in PISA was not just the consequence of students' lower engagement with the PISA test but with learning and school in general. In these two countries, fewer than 75% of students responded to the effort thermometer in either 2022 or 2018. The simple comparisons reported here may be affected by a lack of representativity in the sample of respondents. It is remarkable, however, that there is a strong association between the difference in effort students would have made on a regular school test and the difference in mean performance observed in PISA (Table I.A8.3 and Tables I.B1.5.4, I.B1.5.5 and I.B1.5.6) between 2018 and 2022 across all countries/economies.[1]

Behavioural indicators

There are several disadvantages to self-report measures. It is unclear whether students – especially those who may not have taken the test seriously – respond truthfully when asked how hard they tried on a test they had just taken.

And, it is unclear to what extent answers provided on subjective response scales can be compared across students, let alone across countries. The comparison between the "actual" and the "hypothetical" effort is also problematic. In the German study discussed earlier in this Annex, regardless of the conditions under which they took the test, students said that they would have invested more effort if any of the other three conditions applied; the average difference was particularly marked among boys (Baumert and Demmrich, 2001[3]). One explanation for this finding is that students are under-reporting their true effort and over-reporting their counter-factual effort, regardless of the hypothetical context of the latter: in doing so, students can attribute poor test performance to lack of effort rather than lack of ability.

In response to these criticisms, researchers have developed ways of examining test-taking effort by observing students' behaviour during the test and questionnaire. Two sets of indicators are discussed in this section:

- indicators of endurance based on comparisons of performance on similar (or identical) tasks at different moments in the test (in particular, towards the beginning and the end of the test);
- straight-lining indicators based on the presence (or absence) of logically inconsistent responses among questions presented in close sequence;

Both types of measures are based on the idea that when respondents are disengaged they fall back on satisficing behaviour whereby they do not provide a response that reflects their best judgement or knowledge to the questions asked in the test and questionnaire. Each measure is sensitive to distinct types of satisficing behaviour and has different strengths and weaknesses.

Measures of "endurance" are sensitive to a large range of satisficing behaviours (including random or strategic guessing, skipping questions, and engaging in off-task exploration) but can be used only in cognitive tests (where the "correct" response is known by the examiner). Their interpretation as measures of engagement supposes that engagement is optimal for all students at the beginning of the test. The possibility of measuring endurance in this way also depends critically on test design.

Straight-lining indicators can be computed both for tests and questionnaires, and exploit the presence of pairs of antonyms among the items presented to the student. Antonyms are items where knowledge of a student's answer on one item implies, logically (for semantic or psychometric properties), an opposite answer to the other item in the pair. For example, PISA questionnaire items that measure students' sense of belonging at school ask students to what extent they agree with a number of statements, including "I make friends easily at school" and "I feel lonely at school". Straight-lining behaviour is the use of the same response category (e.g. "strongly agree") for all statements in a set that includes antonyms.

Endurance or the ability to sustain performance

Borgonovi and Biecek (2016[8]) developed a country-level measure of "academic endurance" based on comparisons of performance in the first and third quarter of the PISA 2012 test (the rotating booklets design used in PISA 2012 ensured that test content was perfectly balanced across the first and third quarters at aggregate levels). The reasoning behind this measure is that while effort can vary during the test, what students know and can do remains constant: any difference in performance is therefore due to differences in the amount of effort invested.[2]

The original indicator proposed for PISA 2012 can be adapted to the design used in 2022 in two ways.

A first set of indicators compares the performance of students who were administered a given test (e.g. mathematics) in the first hour to the performance of students who were administered the same test in the second hour of testing. The indicators used can be based on item-response theory (plausible values) or classical test theory (percent-correct scores) although comparisons based on the latter are only valid for students (or domains) whose tests are not adaptive and thus, under all circumstances, of identical difficulty.

A second indicator exploits the test design for mathematics in 2022, which partitions the item pool in three (mutually exclusive) sets, whose position is rotated across students. This means that items in set A were presented for one-third of students at the beginning of the mathematics test; one-third in the middle; and the remaining third at the end

of the mathematics test; and similarly for sets B and C. By comparing the performance of students whose test was not adaptive (25% of all students who took the mathematics test) across different these three positions (beginning, middle, and end), it is possible to see how performance varies (and, typically, declines) over the course of the hour-long mathematics test in each country/economy.

Student performance by hour of testing

The comparison of students' performance by hour of testing shows large declines between the first and the second hour of testing in several countries and economies, in particular for reading results.

- In reading, on average across OECD countries, students who took the test in the second hour (in most cases, after completing an hour-long mathematics test) scored 14 points lower than students who took the test in the first hour – a large difference. Large performance declines during the test of between 20 and 30 score points were observed in Iceland, Israel, Latvia*, Albania, Qatar, Slovenia, Malta, Argentina and Norway (in descending order of the size of this difference) (Table I.A8.17).
- In mathematics, on average across OECD countries, the performance difference between students who took mathematics in the second hour and those who took mathematics in the first hour is only of four points. In most countries, the difference is not statistically significant; however, in Albania and Norway the decline exceeds 10 score points (Table I.A8.14).
- In science, results are between those reported above for mathematics and reading. The average decline between the first and second hour of testing is of eight points. In science, where the test was not adaptive, results based on plausible values closely match those based on percent-correct scores (the linear correlation coefficient between the two sets of estimates, a measure of their association which varies between -1 and 1, is equal to 0.95) (Table I.A8.11 and Table I.A8.20).

Overall, performance declines between the first and second hour of testing for the same country/economy across different subjects correlate only moderately. This suggests that these declines reflect both position effects (the effect of taking a test in the second hour, which is present in all subjects) and order effects (the effect of taking a reading test after a mathematics test, for example). Order effects might play out differently across subjects and depending on the country (Tables I.A8.14, I.A8.17 and I.A8.20).

Nevertheless, a few countries/economies figure consistently among those with low "endurance", meaning their second-hour results are much lower than their first-hour results regardless of the subjects. Countries/economies with low endurance in 2022 include Albania, Malta and Norway (Tables I.A8.14, I.A8.17 and I.A8.20).

The difference between the first and second hour of testing may appear large. However, similarly large declines had already been found in 2018 in most countries. In fact, on average across OECD countries, the difference between the first and second hour of testing even reduced somewhat, meaning that performance in 2022 was lower than in 2018 throughout the test but more so at the beginning of the test. The most significant exceptions to this pattern are Albania in reading, and the Dominican Republic and Greece in science, where the performance difference between the first and second hour of testing widened between 2018 and 2022 (Tables I.A8.16, I.A8.19 and I.A8.22).

Performance decline within the hour-long mathematics test

Performance declines for a given student in the hour-long mathematics test are often larger than those between students who take the mathematics test in the first and second hour of testing because students tend to perform better at the beginning of the second hour of testing (and after a break) than at the end of the first hour of testing.

On average across OECD countries, students who were assigned to a non-adaptive test in mathematics answered 47.6% of the questions correctly if they took the test in the first hour and 46.0% if they took the same test in the second hour of testing (Table I.A8.7). At the very beginning of the mathematics test, the percent-correct rate (averaged across first- and second-hour students) was 48.1% but dropped to 47.3% in the middle section, then to 44.2% in the last section – a drop of almost four percentage points (Table I.A8.23).

The largest drop in the mathematics test was observed in Israel: percent-correct rates started at levels close to the OECD average in 2022 but dropped by about seven percentage points in the third (and last) section. In contrast, performance remained at levels close to the OECD average throughout the test in France, for example. Among high-performing countries and economies, Hong Kong (China)*, Korea, Singapore and Chinese Taipei stand out for small differences (two percentage points or less) in performance between the beginning and the end of the testing hour (Table I.A8.23).

These performance declines between the first and third section of the test can modify country rankings at the margin (for example, Israel would be ranked higher if only performance at the beginning of the mathematics test was considered) but do not affect the main conclusions that can be drawn from comparisons of PISA results across countries. Around the OECD average, a 10-point difference on the PISA mathematics scale approximately corresponds to a difference of four points in the percent-correct metric.[3]

Straight-lining

Straight-lining is the tendency to use an identical response category for all items in a set (Herzog and Bachman, 1981[9]). Measures of straight-lining indicate low effort.

Patterned responses to reading-fluency tasks

The reading-fluency section introduced in the PISA 2018 test offers an opportunity to examine straight-lining behaviour in the test. Students were given a series of 21 or 22 items in rapid sequence with identical response formats (“yes” or “no”). Meaningless sentences (such as “The window sang the song loudly”), calling for a “no” answer, were interspersed among sentences that had meaning (such as “The red car has a flat tyre”), calling for a “yes” answer. It is possible that some students did not read the instructions carefully or that they genuinely considered that the meaningless sentences (which had no grammatical or syntactical flaws) had meaning. However, this response pattern (a series of 21 or 22 “yes” answers) or its opposite (a series of 21 or 22 “no” answers) is unexpected among students who demonstrated medium or strong reading competence in the main part of the reading test.

Table I.A8.25 shows that only 1.2% of all students on average across OECD countries exhibited such patterned responses in reading-fluency tasks. The proportion of patterned responses follows, in general, the proportion of students who scored below Level 2 in reading (the linear correlation coefficient between the two proportions is 0.66). However, in Korea and Türkiye, in spite of a proportion of low-performing students close to, or even below the OECD average (29% and 14%, respectively), the proportion of patterned responses in the reading-fluency test far exceeded the average proportion (5.3% and 3.5%). It is possible that the unusual response format of reading-fluency tasks triggered disengaged response behaviour and that these same students did their best in the latter parts of the test. It is also possible, however, that these students did not do their best throughout the PISA test – not only in this initial, three-minute section of the reading test.

While the content of the reading-fluency section was identical in PISA 2018 and PISA 2022, a minor change in the response format was introduced in PISA 2022: every few sentences, the position of the “yes” and “no” buttons would change slightly. This forced respondents to pay a minimum of attention in order to move forward. Comparisons between 2018 and 2022 must take this into account. Indeed, on average across OECD countries, these comparisons show a slight reduction in the proportion of patterned responses – from 1.4% to 1.2% (Table I.A8.27). It decreased even more (by 3.1 percentage points, from 3.6% to 0.5%) in Spain, where test-administration issues in 2018 limited the extent to which inferences could be drawn from the results (see the introduction to this annex, above). In contrast, the proportion of patterned responses increased significantly in Baku (Azerbaijan), the United Arab Emirates, Hong Kong (China)* and Finland (in descending order of the percentage-point increase).

Identical responses across sense-of-belonging items in the background questionnaire

The PISA questionnaire items that measure students’ sense of belonging can be used to examine effort in the questionnaire and how it changed between 2018 and 2022.[4]

In most countries and economies, fewer than 5% of all students gave identical responses to all items in the sense-of-belonging set (regardless of whether the items indicated a strong sense of belonging or the opposite). Such contradictory responses were more common in Albania, Thailand, and Jordan (8%); Hong Kong (China)*, the Philippines and the United Arab Emirates (7%), the Palestinian Authority, Georgia and Qatar (6%); and in Baku (Azerbaijan) and Bulgaria (5%). These high percentages are often found in countries with large proportions of students with low reading proficiency. This suggests that some of these students did not fully understand the questionnaire items; the high percentages observed in Hong Kong (China)* stand out as anomalous in this context (Table I.A8.28).

When compared to the proportions of straight-lining students in 2018, the proportions in 2022 are, in general, lower. However, rather than reflecting increased engagement, this might reflect position or presentation effects (in 2022, every student saw, at most, five items in this set – and in all similar "matrix" questions). Among countries with large proportions of such students, this proportion increased only in Albania (Table I.A8.30).

Conclusion

Overall, the examination of various indicators of effort and motivation, and comparison with similar indicators for 2018 suggests that the conditions of administration remained similar to those observed in the past, including in terms of students' disposition towards the test. Students reported somewhat lower effort than in the past but it is unclear to what extent this phenomenon is limited to the PISA test and whether it might reflect lower engagement with learning and school more generally (in both cases, this might account for some of the negative trends observed in several countries, particularly in mathematics results).

Throughout the analysis, Albania has repeatedly been mentioned as a negative outlier: students reported spending significantly less effort on PISA and exhibited larger declines between the first and second hour of testing than in the past. There was also a larger proportion of students who used the same response category for antinomic items in the sense-of-belonging set than in 2018. These patterns suggest that the decline in performance in Albania – one of the largest ever registered in PISA – reflects, at least in part, the absence of student engagement.

Notes

[1] The linear correlation coefficient is 0.64 across all 69 countries/economies that can compare PISA 2018 and PISA 2022 results in mathematics. It is 0.55 when considering only the 57 countries/economies where at least 75% of all students completed the effort thermometer.

[2] Speed of information processing and general time management may also influence performance differences between test sections. To limit the influence of this possible confounder, Borgonovi and Biecek (2016[8]) do not use the last quarter of the test but the third (second-to-last) quarter. In the computer-based PISA 2018 and PISA 2022 assessments, the test is divided into two halves, each conducted in an hour-long session. With this design, students' time management and speed of information processing can be expected to have the same impact on both halves.

[3] This "rule of thumb" is based on the comparison of the average percentages of correct responses reported in Table I.A8.7 with the mean scores (in PISA points) reported in Table I.A8.14.

[4] The battery of items comprises six items in total; however, in 2022, only a random subset of five of these were presented to each student in countries that administered PISA on computers. Because the main focus of this analysis is on comparisons across countries and over time, questionnaire straight-lining is defined here as "providing the

same answer to at least five of the sense-of-belonging items, including at least two items loading positively and two loading negatively (i.e. indicating a lack of sense of belonging) on the scale".

Table A8.1. How much effort did students invest in the PISA test? Annex A8 tables

Table I.A8.1	Effort invested in the PISA test (2022)
Table I.A8.2	Effort invested in the PISA test (2018)
Table I.A8.3	Change in effort invested in the PISA test (2022 - 2018)
Table I.A8.4	Effort invested in the PISA test, by gender (2022)
Table I.A8.5	Effort invested in the PISA test, by gender (2018)
Table I.A8.6	Change in effort invested in the PISA test (2022-2018), by gender
Table I.A8.7	Endurance in the PISA test (percent-correct scores in mathematics)
Table I.A8.8	Endurance in the PISA test (percent-correct scores on mathematics trend items, 2022)
Table I.A8.9	Endurance in the PISA test (percent-correct scores on mathematics trend items, 2018)
Table I.A8.10	Change in endurance in the PISA test (percent-correct scores on mathematics trend items, 2022-2018)
Table I.A8.11	Endurance in the PISA test (percent-correct scores in science, 2022)
Table I.A8.12	Endurance in the PISA test (percent-correct scores in science, 2018)
Table I.A8.13	Change in endurance in the PISA test (percent-correct scores in science, 2022-2018)
Table I.A8.14	Endurance in the PISA test (PISA mathematics scores, 2022)
Table I.A8.15	Endurance in the PISA test (PISA mathematics scores, 2018)
Table I.A8.16	Change in endurance in the PISA test (PISA mathematics scores, 2022-2018)
Table I.A8.17	Endurance in the PISA test (PISA reading scores, 2022)
Table I.A8.18	Endurance in the PISA test (PISA reading scores, 2018)
Table I.A8.19	Change in endurance in the PISA test (PISA reading scores, 2022-2018)
Table I.A8.20	Endurance in the PISA test (PISA science scores, 2022)
Table I.A8.21	Endurance in the PISA test (PISA science scores, 2018)
Table I.A8.22	Change in endurance in the PISA test (PISA science scores, 2022-2018)
Table I.A8.23	Endurance within the PISA mathematics test
Table I.A8.24	Endurance within the PISA mathematics test (2)
Table I.A8.25	Response patterns and time in the PISA reading-fluency test (2022)
Table I.A8.26	Response patterns and time in the PISA reading-fluency test (2018)
Table I.A8.27	Change in response patterns and time in the PISA reading-fluency test (2022-2018)
Table I.A8.28	Straight-lining on sense-of-belonging questions (2022)
Table I.A8.29	Straight-lining on sense-of-belonging questions (2018)
Table I.A8.30	Change in straight-lining on sense-of-belonging questions (2022-2018)

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Annex A9. Adaptive testing in PISA 2022

To improve the accuracy of measurements of student ability at the ends of the score distribution (i.e. high- or low-performing groups of students), PISA introduced adaptive testing in its reading assessment in 2018, and expanded its use to mathematics in PISA 2022. Instead of using fixed, predetermined test clusters, and rotating them at random, as was done through PISA 2015, the test items given to each student in an adaptive test are dynamically determined, based on how the student performed in prior stages of the test. Adaptive testing allows for a more accurate measurement of student performance by asking students questions that are better suited to their ability (Yamamoto, Shin and Khorramdel, 2018[1]).

PISA 2022 implemented adaptive testing in mathematics and reading. In mathematics, a new hybrid adaptive testing design was developed and used. In reading, a reduced version of the PISA 2018 adaptive test was used.

Adaptive testing was used in every participating country/economy that took PISA 2022 using computer-based administration (CBA) as the primary mode of delivery of the test. A non-adaptive version of the test was used in countries/economies that took PISA 2022 in paper-based administration (PBA) mode.

A summary of adaptive testing in PISA 2022 is provided in this Annex. For a more detailed description of the adaptive testing design, and a discussion of the considerations that guided its development, see the *PISA 2022 Technical Report* (OECD, Forthcoming[2]).

Adaptive Testing Design for Mathematics in PISA 2022

A hybrid multistage adaptive testing design (MSAT) was used for mathematics in PISA 2022. The design was “hybrid” because it combined an adaptive testing design with non-adaptive random-rotation design (in the latter, item assignment is not conditional on prior performance).

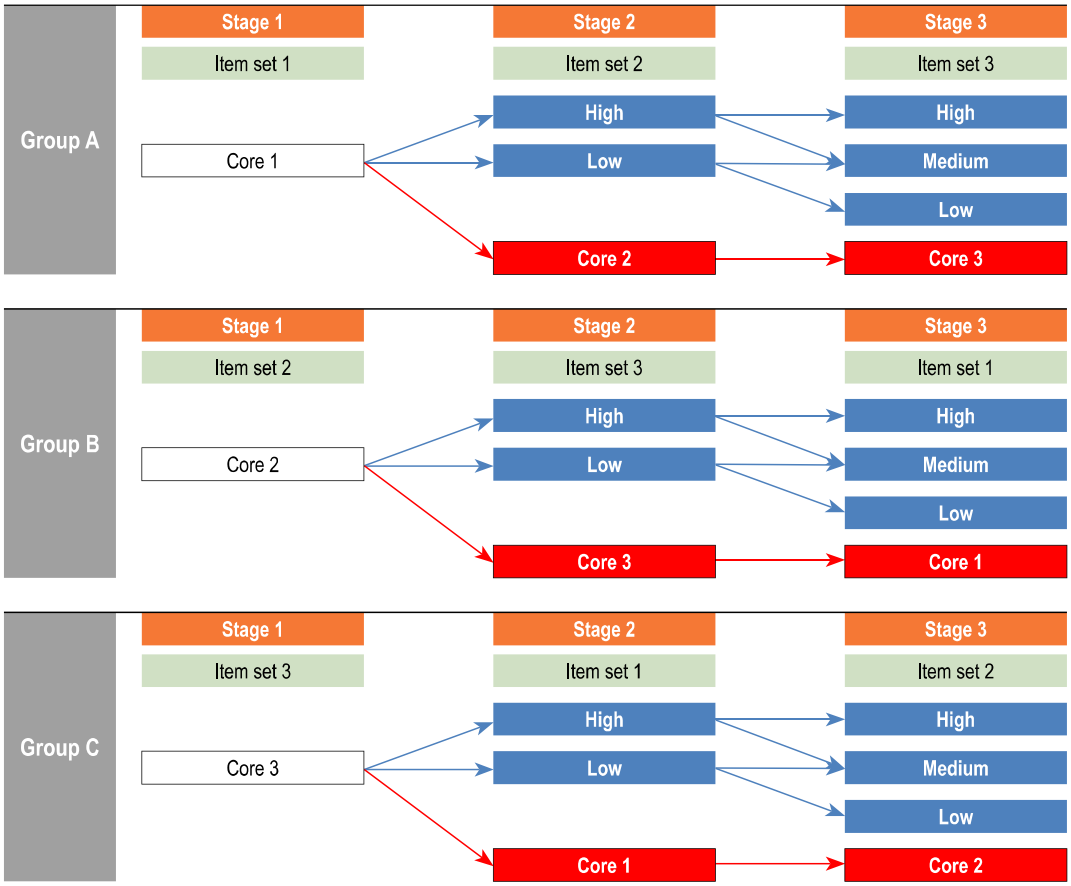
The MSAT design for Mathematics partitioned the item pool of 234 items (99 units) into three mutually exclusive item sets (each with 78 items). For each of the item sets, Stage 1 “core” testlets of medium difficulty, Stage 2 high- or low-difficulty testlets and Stage 3 high-, medium-, or low-difficulty testlets were assembled, each comprising 9 or 10 items. The sequence of the item sets was rotated in the final instruments (each constituting one “core”, one “Stage 1” and one “Stage 2” testlet), in order to constitute three sets of equivalent instruments to be assigned to three groups of randomly selected students (A, B, and C).

As shown in Figure I.A9.1, for the students assigned to the adaptive part of the design, Group A starts with a medium-difficulty core testlet (“Core 1” in the figure) from the first item set, followed by either a high- or low-difficulty testlet from the second item set, followed by either a high-, medium-, or low-difficulty testlet from the third item set. Similarly, group B starts with a core testlet from the second item set (“Core 2” in the figure) and group C starts with a core testlet from the third item set (“Core 3” in the figure). For the students assigned to the non-adaptive part of the design, after the core testlet their path continued in Stage 2 and Stage 3 to core testlets from the other item sets (as highlighted in red in Figure 1).

From each item set, 16 testlets of either 9 or 10 items were created within each stage. Therefore, across the three item sets and three groups, there are a total of 144 testlets (16*3*3). Each student takes one testlet in each stage; the total number of mathematics items administered to each student ranges from 28 to 30.

Simulation studies using the mathematics item pool and the Field Trial item parameters were conducted to refine the design and determine the optimum operational parameters (e.g. routing thresholds, which are the number of correct responses on automatically scored items that determines whether students are routed to a "high", "medium" or "low" testlet in the next stage). These studies led to the decision to assign 75% of the students to the adaptive and 25% to the non-adaptive part of the hybrid design.

Figure I.A9.1. Multistage Adaptive Testing Design for PISA 2022 Mathematics



Source: *PISA 2022 Technical Report* (OECD, forthcoming).

Source: *PISA 2022 Technical Report* (OECD, Forthcoming[2]).

Adaptive Testing Design for Reading in PISA 2022

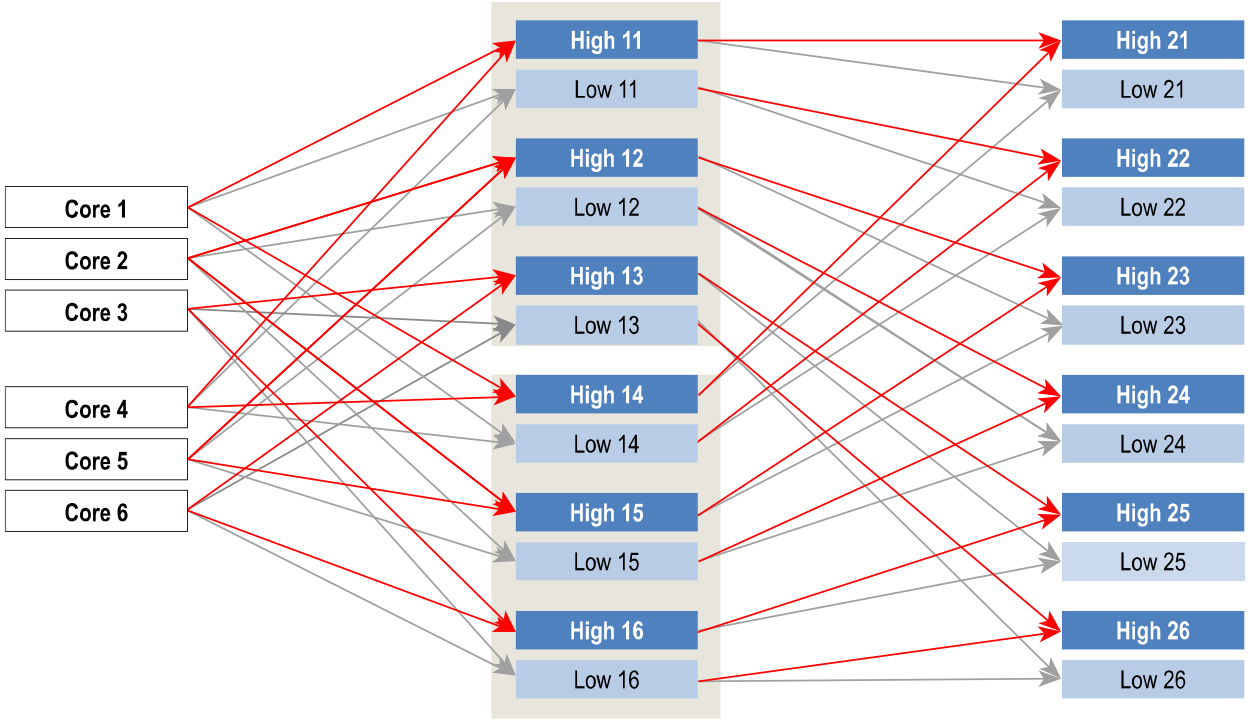
The PISA 2022 Reading MSAT design was a reduced version of the PISA 2018 Main Survey Design. It used the same adaptive structure (e.g. number of stages) as in 2018, but the 2018 Main Survey Reading item pool was reduced by approximately 25%.

In the PISA 2022 reading assessment, there were three stages: Core, Stage 1 and Stage 2. At the Core stage, six testlets were assembled. At Stage 1 and Stage 2, twelve testlets were assembled (the six more-difficult testlets were labeled as “high” and the six easier testlets were labelled as “low”).

As shown in Figure I.A9.2, at the Core stage, students were assigned to a core testlet based on a random number (between 1 and 6). At Stage 1, testlet assignment was based on three criteria: i) the Core testlet assigned, ii) the students’ performance on the Core (i.e. total number correct on automatically scored items on the given testlet), and iii) a random number and a set of rules (probability layer matrix) to overwrite the adaptive assignment for a certain

proportion of students. Similarly, at Stage 2, testlet assignment was based on: i) the testlet taken at Stage 1, ii) the performance at Core and Stage 1 (i.e. total number correct on automatically scored items on previously taken testlets), and iii) a random number and a probability layer matrix.

Figure I.A9.2. Multistage Adaptive Testing Design for PISA 2022 Reading: Standard Design



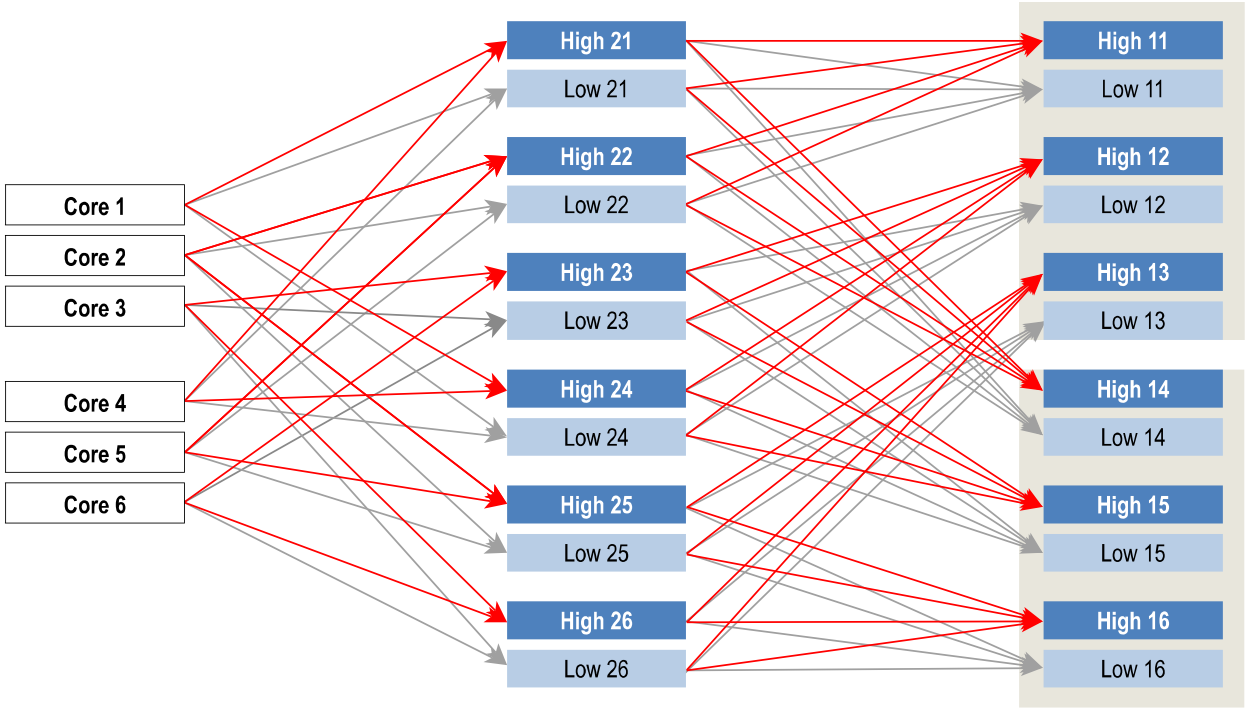
Source: *PISA 2022 Technical Report* (OECD, Forthcoming[2]).

The routing paths shown in Figure I.A9.3 are called the Standard Design, in which students first answered a Core testlet, then a Stage 1 testlet, and finally a Stage 2 testlet. In each country, some 75% of students were expected to follow this Standard Design.

An additional set of routing paths was created and called the Alternate Design, which is shown in Figure 3. In the Alternate Design, students first answered a Core testlet, then a Stage 2 testlet, and finally a Stage 1 testlet. These additional routing paths double the number of paths from 48 in the Standard Design to 96 paths in total, with the Alternate Design.

In each country, 75% of students were expected to follow the Standard Design routing paths shown in Figure 2 (Core>Stage 1>Stage 2, with 48 paths in total) and 25% of students were expected to follow the swapped routing paths of the Alternate Design shown in Figure I.A9. (Core>Stage 2>Stage 1, with 96 paths in total).

Figure I.A9.3. Multistage Adaptive Testing Design for PISA 2022 Reading: Alternate Design



Source: *PISA 2022 Technical Report* (OECD, Forthcoming[2]).

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OECD (Forthcoming), *PISA 2022 Technical Report*, PISA, OECD Publishing, Paris. [2]

Yamamoto, K., H. Shin and L. Khorramdel (2018), "Multistage Adaptive Testing Design in International Large-Scale Assessments", *Educational Measurement: Issues and Practice*, Vol. 37/4, pp. 16-27, https://doi.org/10.1111/emip.12226. [1]

Annex B1. Results for countries and economies

Table I.B1.2.1. Mean score and variation in mathematics performance [1/2]

		Mean score		Standard deviation		Percentiles											
						10th		25th		Median (50th)		75th		90th		Difference (90th - 10th)	
		Mean score	S.E.	S.D.	S.E.	Score	S.E.	Score	S.E.	Score	S.E.	Score	S.E.	Score	S.E.	Score dif.	S.E.
OECD	**Australia***	487	(1.8)	99	(1.0)	358	(2.0)	416	(2.1)	485	(2.0)	556	(2.7)	619	(3.3)	**261**	(3.4)
	Austria	487	(2.3)	94	(1.2)	362	(3.7)	420	(3.6)	489	(2.7)	554	(2.7)	608	(2.7)	**246**	(4.1)
	Belgium	489	(2.2)	96	(1.1)	359	(3.0)	420	(3.0)	492	(3.0)	559	(2.9)	614	(2.7)	**254**	(3.6)
	Canada*	497	(1.6)	94	(0.8)	375	(2.3)	430	(1.7)	496	(1.8)	562	(2.2)	619	(2.2)	**244**	(2.7)
	Chile	412	(2.1)	77	(1.1)	315	(2.9)	358	(2.5)	409	(2.6)	464	(2.4)	514	(2.8)	**198**	(3.3)
	Colombia	383	(3.0)	73	(1.5)	293	(3.1)	332	(3.2)	378	(3.5)	429	(3.7)	481	(4.4)	**187**	(4.2)
	Costa Rica	385	(1.9)	66	(1.4)	302	(2.3)	339	(2.1)	382	(2.2)	427	(2.5)	470	(3.1)	**168**	(3.4)
	Czech Republic	487	(2.1)	93	(1.2)	365	(2.7)	418	(3.0)	486	(2.8)	553	(2.7)	610	(2.9)	**245**	(3.8)
	Denmark*	489	(1.9)	82	(1.1)	383	(2.5)	433	(2.4)	489	(2.5)	545	(2.5)	595	(3.0)	**213**	(3.5)
	Estonia	510	(2.0)	85	(1.1)	401	(2.5)	450	(2.5)	509	(2.4)	569	(2.5)	620	(3.0)	**219**	(3.1)
	Finland	484	(1.9)	89	(0.9)	366	(2.5)	420	(2.2)	486	(2.3)	547	(2.4)	600	(2.7)	**234**	(3.1)
	France	474	(2.5)	91	(1.1)	353	(3.0)	408	(3.3)	475	(2.9)	539	(3.1)	593	(3.1)	**239**	(3.6)
	Germany	475	(3.1)	95	(1.3)	351	(4.2)	407	(3.9)	474	(3.8)	541	(3.4)	599	(3.7)	**248**	(4.5)
	Greece	430	(2.3)	83	(1.3)	326	(3.0)	370	(2.8)	426	(2.7)	487	(2.6)	542	(3.2)	**216**	(3.5)
	Hungary	473	(2.5)	94	(1.7)	348	(3.2)	406	(3.3)	474	(3.3)	538	(3.4)	595	(4.2)	**247**	(5.1)
	Iceland	459	(1.6)	88	(1.2)	344	(2.9)	396	(2.5)	458	(2.2)	520	(2.6)	574	(3.3)	**230**	(4.2)
	Ireland*	492	(2.0)	80	(0.9)	387	(2.8)	437	(2.9)	493	(2.3)	547	(2.1)	594	(2.7)	**207**	(3.2)
	Israel	458	(3.3)	107	(1.9)	317	(4.3)	380	(3.9)	458	(4.1)	534	(3.8)	597	(4.6)	**280**	(5.9)
	Italy	471	(3.1)	89	(1.6)	357	(3.0)	408	(3.0)	469	(3.5)	533	(4.4)	589	(5.1)	**232**	(5.1)
	Japan	536	(2.9)	93	(1.9)	410	(4.9)	473	(4.2)	540	(3.2)	601	(3.3)	652	(4.3)	**243**	(6.1)
	Korea	527	(3.9)	105	(2.6)	388	(6.4)	456	(5.1)	531	(4.3)	600	(4.2)	660	(5.0)	**272**	(7.7)
	Latvia*	483	(2.0)	80	(1.2)	381	(3.4)	428	(2.5)	481	(2.4)	537	(2.6)	587	(3.0)	**207**	(4.0)
	Lithuania	475	(1.8)	87	(1.3)	364	(2.9)	413	(2.4)	473	(2.3)	535	(2.5)	591	(3.0)	**227**	(4.0)
	Mexico	395	(2.3)	69	(1.4)	310	(2.8)	347	(2.3)	391	(2.6)	440	(2.9)	487	(3.8)	**178**	(4.2)
	Netherlands*	493	(3.8)	106	(2.1)	348	(5.7)	411	(6.6)	497	(4.9)	574	(3.4)	630	(2.8)	**282**	(5.8)
	New Zealand*	479	(2.0)	99	(1.4)	350	(3.2)	408	(3.2)	478	(2.7)	547	(2.9)	609	(3.7)	**258**	(5.0)
	Norway	468	(2.1)	93	(0.9)	345	(2.6)	401	(2.5)	469	(2.8)	535	(2.6)	589	(2.6)	**244**	(3.2)
	Poland	489	(2.3)	89	(1.4)	370	(3.1)	426	(3.2)	490	(2.9)	552	(2.6)	604	(3.1)	**234**	(4.2)
	Portugal	472	(2.4)	90	(1.5)	356	(4.1)	408	(3.0)	471	(2.8)	536	(2.7)	589	(2.2)	**233**	(4.3)
	Slovak Republic	464	(2.9)	101	(1.8)	327	(5.2)	392	(4.4)	468	(3.6)	536	(3.0)	591	(3.6)	**263**	(5.9)
	Slovenia	485	(1.2)	89	(1.0)	369	(2.7)	421	(1.9)	482	(1.9)	546	(2.3)	604	(2.6)	**234**	(3.7)
	Spain	473	(1.5)	86	(0.8)	359	(2.2)	414	(1.9)	474	(1.8)	533	(1.6)	584	(1.8)	**225**	(2.5)
	Sweden	482	(2.1)	96	(1.1)	356	(2.9)	413	(2.9)	483	(2.7)	550	(2.8)	607	(2.8)	**251**	(3.6)
	Switzerland	508	(2.1)	96	(1.2)	379	(3.0)	439	(3.1)	509	(2.8)	578	(2.6)	632	(2.7)	**253**	(3.8)
	Türkiye	453	(1.6)	90	(1.0)	341	(2.3)	387	(2.4)	447	(2.4)	515	(2.2)	576	(2.6)	**236**	(3.4)
	United Kingdom*	489	(2.2)	96	(1.3)	363	(3.1)	422	(2.8)	489	(2.7)	555	(2.9)	614	(4.1)	**251**	(4.7)
	United States*	465	(4.0)	95	(1.8)	345	(4.0)	396	(4.2)	462	(4.7)	531	(4.5)	590	(5.9)	**246**	(5.6)
	OECD average	472	(0.4)	90	(0.2)	355	(0.6)	408	(0.5)	472	(0.5)	535	(0.5)	590	(0.6)	**235**	(0.7)

* Caution is required when interpreting estimates because one or more PISA sampling standards were not met (see Reader's Guide, Annexes A2 and A4).
Note: Values that are statistically significant are indicated in bold (see Annex A3).

Table I.B1.2.1. Mean score and variation in mathematics performance [2/2]

		Mean score		Standard deviation		Percentiles											
						10th		25th		Median (50th)		75th		90th		Difference (90th - 10th)	
		Mean score	S.E.	S.D.	S.E.	Score	S.E.	Score	S.E.	Score	S.E.	Score	S.E.	Score	S.E.	Score dif.	S.E.
Partners	Albania	368	(2.1)	85	(1.3)	266	(2.5)	308	(2.2)	361	(2.6)	423	(2.9)	481	(3.5)	**216**	(3.8)
	Argentina	378	(2.3)	74	(1.1)	287	(2.8)	325	(2.3)	372	(2.5)	425	(2.8)	477	(3.3)	**190**	(3.5)
	Baku (Azerbaijan)	397	(2.4)	85	(1.1)	290	(2.5)	336	(2.7)	393	(2.7)	455	(3.0)	511	(3.6)	**221**	(3.4)
	Brazil	379	(1.6)	77	(1.2)	288	(1.6)	325	(1.2)	370	(1.7)	425	(2.4)	482	(3.1)	**194**	(3.2)
	Brunei Darussalam	442	(0.9)	84	(0.7)	337	(2.0)	383	(1.2)	437	(1.5)	499	(1.6)	556	(2.3)	**219**	(3.3)
	Bulgaria	417	(3.3)	97	(2.1)	298	(3.5)	346	(3.2)	411	(3.8)	483	(4.9)	549	(6.5)	**251**	(6.8)
	Cambodia	336	(2.7)	73	(1.6)	244	(3.1)	288	(3.0)	336	(2.7)	383	(3.4)	428	(4.5)	**184**	(4.6)
	Croatia	463	(2.4)	88	(1.4)	352	(3.2)	400	(2.9)	459	(2.9)	524	(3.5)	582	(3.7)	**230**	(4.5)
	Cyprus	418	(1.2)	101	(0.9)	294	(2.0)	343	(1.9)	411	(1.8)	487	(2.1)	556	(2.8)	**262**	(3.3)
	Dominican Republic	339	(1.6)	54	(1.3)	273	(2.1)	302	(1.8)	335	(1.5)	373	(2.3)	410	(2.9)	**137**	(3.3)
	El Salvador	343	(2.0)	59	(1.1)	272	(2.3)	303	(1.9)	338	(2.0)	380	(2.7)	423	(3.9)	**151**	(3.9)
	Georgia	390	(2.4)	85	(2.2)	288	(2.7)	330	(2.1)	383	(2.2)	444	(3.2)	502	(4.9)	**214**	(5.3)
	Guatemala	344	(2.2)	69	(1.7)	256	(3.1)	299	(2.4)	343	(2.1)	389	(2.5)	432	(4.3)	**176**	(5.0)
	Hong Kong (China)*	540	(3.0)	105	(1.7)	398	(5.2)	469	(4.4)	545	(3.2)	614	(3.0)	672	(4.1)	**274**	(5.7)
	Indonesia	366	(2.4)	62	(1.3)	290	(2.4)	323	(2.1)	361	(2.5)	404	(3.3)	448	(3.8)	**158**	(3.6)
	Jamaica*	377	(3.1)	71	(1.4)	291	(2.8)	326	(3.1)	371	(3.6)	423	(4.9)	475	(5.0)	**185**	(4.9)
	Jordan	361	(2.0)	62	(1.0)	284	(2.0)	318	(2.1)	358	(2.2)	402	(2.7)	442	(3.1)	**158**	(3.2)
	Kazakhstan	425	(1.7)	78	(1.0)	329	(1.9)	371	(1.8)	421	(1.9)	477	(2.1)	529	(2.6)	**201**	(2.7)
	Kosovo	355	(1.0)	62	(0.7)	280	(1.7)	311	(1.4)	349	(1.3)	394	(1.8)	438	(2.6)	**159**	(2.8)
	Macao (China)	552	(1.1)	92	(1.0)	429	(2.7)	489	(2.1)	554	(1.8)	616	(1.8)	670	(2.6)	**241**	(3.7)
	Malaysia	409	(2.4)	76	(2.4)	317	(2.3)	355	(2.1)	403	(2.4)	456	(3.0)	509	(5.1)	**193**	(5.4)
	Malta	466	(1.6)	99	(1.4)	333	(3.4)	395	(2.9)	469	(2.2)	537	(2.5)	592	(3.7)	**259**	(5.3)
	Moldova	414	(2.3)	80	(1.3)	317	(2.5)	359	(1.9)	408	(2.4)	465	(3.4)	521	(4.3)	**205**	(4.1)
	Mongolia	425	(2.6)	83	(1.6)	323	(2.9)	366	(2.2)	418	(2.5)	479	(3.3)	537	(4.5)	**214**	(4.6)
	Montenegro	406	(1.1)	82	(0.9)	306	(1.7)	346	(1.7)	399	(1.8)	460	(2.1)	517	(2.4)	**211**	(3.1)
	Morocco	365	(3.4)	63	(2.1)	289	(2.6)	321	(2.6)	359	(3.3)	404	(4.2)	449	(6.3)	**160**	(5.9)
	North Macedonia	389	(0.9)	83	(0.9)	287	(1.9)	329	(1.4)	382	(1.7)	444	(1.8)	500	(2.2)	**213**	(3.0)
	Palestinian Authority	366	(1.8)	66	(1.1)	285	(2.2)	319	(1.9)	361	(2.0)	408	(2.5)	452	(3.1)	**167**	(3.1)
	Panama*	357	(2.8)	65	(2.1)	278	(2.5)	311	(2.4)	351	(2.8)	396	(3.8)	443	(6.7)	**165**	(6.6)
	Paraguay	338	(2.2)	77	(1.1)	241	(2.9)	283	(2.6)	335	(2.8)	389	(2.8)	439	(3.4)	**199**	(3.9)
	Peru	391	(2.3)	78	(1.2)	295	(2.6)	335	(2.3)	386	(2.6)	442	(2.9)	497	(3.6)	**201**	(3.6)
	Philippines	355	(2.6)	65	(1.8)	279	(2.2)	308	(2.1)	347	(2.7)	395	(3.5)	443	(4.8)	**164**	(4.8)
	Qatar	414	(1.1)	89	(1.0)	307	(2.0)	350	(1.6)	405	(1.7)	469	(2.0)	536	(2.7)	**229**	(3.5)
	Romania	428	(4.0)	99	(2.0)	303	(3.8)	356	(4.1)	424	(4.9)	495	(5.6)	559	(6.1)	**257**	(6.3)
	Saudi Arabia	389	(1.8)	66	(1.0)	308	(2.1)	343	(2.0)	385	(1.9)	431	(2.3)	474	(2.8)	**166**	(3.0)
	Serbia	440	(3.0)	90	(2.7)	329	(3.6)	377	(2.7)	436	(2.9)	499	(3.6)	558	(5.8)	**229**	(6.4)
	Singapore	575	(1.2)	103	(0.9)	433	(2.8)	505	(2.3)	582	(1.7)	649	(2.0)	702	(2.3)	**268**	(3.6)
	Chinese Taipei	547	(3.8)	112	(2.3)	393	(5.1)	470	(4.6)	554	(4.5)	628	(4.5)	687	(5.5)	**294**	(6.8)
	Thailand	394	(2.7)	76	(2.0)	306	(2.3)	342	(2.2)	385	(2.4)	437	(3.9)	495	(6.5)	**189**	(6.2)
	Ukrainian regions (18 of 27)	441	(4.1)	88	(2.1)	329	(5.4)	378	(5.2)	438	(4.8)	501	(4.7)	557	(5.3)	**228**	(6.4)
	United Arab Emirates	431	(0.9)	101	(0.6)	306	(1.5)	356	(1.4)	423	(1.3)	500	(1.6)	570	(1.4)	**264**	(1.7)
	Uruguay	409	(2.0)	83	(1.3)	303	(2.6)	349	(2.7)	405	(2.7)	466	(2.7)	520	(3.2)	**217**	(3.8)
	Uzbekistan	364	(2.0)	67	(1.0)	283	(2.2)	318	(1.9)	360	(2.1)	406	(2.8)	453	(3.6)	**170**	(3.3)
	Viet Nam	469	(3.9)	86	(2.3)	360	(5.5)	412	(4.3)	469	(4.0)	527	(4.6)	580	(4.8)	**220**	(6.2)

* Caution is required when interpreting estimates because one or more PISA sampling standards were not met (see Reader's Guide, Annexes A2 and A4).
Note: Values that are statistically significant are indicated in bold (see Annex A3).

Table I.B1.2.2. Mean score and variation in reading performance [1/2]

		Mean score		Standard deviation		Percentiles											
						10th		25th		Median (50th)		75th		90th		Difference (90th - 10th)	
		Mean score	S.E.	S.D.	S.E.	Score	S.E.	Score	S.E.	Score	S.E.	Score	S.E.	Score	S.E.	Score dif.	S.E.
OECD	Australia*	498	(2.0)	111	(1.2)	351	(2.7)	422	(2.2)	502	(2.2)	576	(2.7)	638	(3.1)	**288**	(3.6)
	Austria	480	(2.7)	104	(1.4)	340	(4.3)	406	(4.0)	485	(3.4)	557	(2.7)	613	(3.4)	**273**	(4.9)
	Belgium	479	(2.5)	105	(1.4)	337	(3.9)	407	(3.4)	484	(3.2)	555	(2.7)	610	(3.2)	**274**	(4.6)
	Canada*	507	(2.0)	109	(1.4)	365	(2.7)	434	(2.5)	511	(2.4)	583	(2.7)	643	(2.9)	**278**	(3.8)
	Chile	448	(2.6)	93	(1.4)	329	(3.7)	384	(3.2)	448	(3.2)	513	(3.3)	568	(3.4)	**239**	(4.2)
	Colombia	409	(3.8)	93	(1.5)	291	(3.8)	342	(3.7)	404	(4.5)	473	(4.9)	534	(4.6)	**243**	(4.2)
	Costa Rica	415	(2.7)	86	(1.2)	305	(3.1)	354	(3.0)	414	(3.4)	474	(3.5)	528	(4.2)	**222**	(4.3)
	Czech Republic	489	(2.2)	98	(1.4)	359	(3.5)	420	(3.1)	490	(2.7)	558	(2.7)	615	(3.0)	**256**	(4.4)
	Denmark*	489	(2.6)	92	(1.3)	368	(3.5)	427	(3.4)	491	(3.1)	554	(3.0)	605	(3.6)	**238**	(4.5)
	Estonia	511	(2.4)	92	(1.1)	388	(4.0)	449	(3.3)	514	(2.6)	576	(2.4)	628	(3.0)	**240**	(3.7)
	Finland	490	(2.3)	104	(1.1)	350	(3.9)	421	(3.0)	497	(2.7)	565	(2.4)	619	(3.0)	**270**	(4.1)
	France	474	(3.1)	106	(1.4)	331	(4.5)	400	(4.5)	479	(3.4)	549	(3.1)	608	(3.6)	**277**	(4.3)
	Germany	480	(3.6)	106	(1.5)	340	(5.1)	406	(4.5)	482	(4.5)	556	(3.7)	616	(3.8)	**276**	(5.0)
	Greece	438	(2.8)	94	(1.3)	315	(4.4)	372	(3.5)	439	(3.3)	505	(3.1)	561	(3.3)	**245**	(4.3)
	Hungary	473	(2.8)	101	(1.9)	336	(4.3)	404	(4.2)	479	(3.9)	546	(3.3)	599	(3.5)	**264**	(5.1)
	Iceland	436	(2.1)	103	(1.3)	298	(4.3)	362	(2.9)	437	(3.4)	511	(3.0)	569	(3.8)	**271**	(5.4)
	Ireland*	516	(2.3)	88	(1.2)	400	(3.8)	458	(3.2)	521	(2.6)	578	(2.8)	627	(2.6)	**227**	(3.9)
	Israel	474	(3.5)	122	(1.6)	306	(4.6)	388	(5.0)	481	(4.3)	564	(3.4)	628	(3.7)	**323**	(5.1)
	Italy	482	(2.7)	92	(1.3)	357	(3.8)	420	(3.6)	487	(3.1)	547	(3.1)	597	(3.5)	**240**	(4.3)
	Japan	516	(3.2)	96	(1.9)	387	(5.5)	451	(4.2)	522	(3.7)	585	(3.3)	636	(3.4)	**249**	(5.7)
	Korea	515	(3.6)	103	(2.5)	379	(6.3)	451	(4.8)	523	(4.0)	587	(3.6)	641	(4.2)	**262**	(6.4)
	Latvia*	475	(2.5)	90	(1.5)	358	(3.9)	414	(3.4)	476	(2.7)	537	(3.0)	590	(3.5)	**233**	(4.4)
	Lithuania	472	(2.2)	94	(1.5)	348	(4.3)	408	(2.7)	474	(2.8)	538	(2.8)	592	(3.5)	**244**	(5.3)
	Mexico	415	(2.9)	84	(1.8)	308	(3.7)	357	(3.1)	414	(3.2)	473	(3.9)	526	(4.8)	**218**	(5.4)
	Netherlands*	459	(4.3)	115	(2.1)	304	(6.6)	371	(7.3)	462	(5.7)	548	(4.5)	608	(3.8)	**303**	(6.7)
	New Zealand*	501	(2.1)	109	(1.4)	354	(3.8)	424	(3.3)	504	(2.8)	580	(3.1)	641	(3.3)	**287**	(4.8)
	Norway	477	(2.5)	112	(1.3)	323	(3.7)	398	(3.7)	482	(3.2)	558	(3.1)	618	(3.0)	**295**	(4.2)
	Poland	489	(2.7)	104	(1.9)	347	(5.2)	418	(4.5)	495	(3.2)	563	(3.4)	619	(3.7)	**272**	(6.2)
	Portugal	477	(2.7)	94	(1.7)	352	(4.9)	413	(3.5)	480	(3.0)	543	(2.6)	594	(2.8)	**243**	(4.9)
	Slovak Republic	447	(3.1)	105	(1.7)	306	(5.0)	372	(4.4)	451	(3.9)	524	(3.3)	580	(3.3)	**275**	(5.4)
	Slovenia	469	(1.6)	97	(1.2)	340	(3.6)	404	(2.3)	473	(2.0)	536	(2.5)	591	(3.2)	**252**	(4.2)
	Spain	474	(1.7)	97	(1.0)	346	(2.7)	409	(2.4)	478	(1.9)	542	(1.7)	597	(2.0)	**250**	(2.9)
	Sweden	487	(2.5)	111	(1.5)	337	(4.2)	410	(3.5)	493	(3.1)	568	(2.9)	627	(3.2)	**290**	(4.7)
	Switzerland	483	(2.3)	105	(1.5)	345	(3.7)	409	(3.2)	486	(3.2)	560	(3.2)	618	(3.0)	**273**	(4.6)
	Türkiye	456	(1.9)	87	(1.1)	341	(2.9)	396	(3.1)	458	(2.6)	518	(2.3)	568	(2.6)	**227**	(3.7)
	United Kingdom*	494	(2.4)	105	(1.6)	357	(3.6)	425	(3.0)	496	(2.8)	567	(2.7)	626	(3.5)	**269**	(4.2)
	United States*	504	(4.3)	111	(1.9)	356	(6.1)	428	(5.6)	506	(4.5)	583	(5.0)	648	(5.5)	**292**	(6.8)
	OECD average	476	(0.5)	101	(0.3)	342	(0.7)	406	(0.6)	479	(0.5)	547	(0.5)	603	(0.6)	**262**	(0.8)

* Caution is required when interpreting estimates because one or more PISA sampling standards were not met (see Reader's Guide, Annexes A2 and A4).

** Caution is required when comparing estimates based on PISA 2022 with other countries/economies as a strong linkage to the international PISA reading scale could not be established (see Reader's Guide and Annex A4).

Note: Values that are statistically significant are indicated in bold (see Annex A3).

Table I.B1.2.2. Mean score and variation in reading performance [2/2]

		Mean score		Standard deviation		Percentiles											
						10th		25th		Median (50th)		75th		90th		Difference (90th - 10th)	
		Mean score	S.E.	S.D.	S.E.	Score	S.E.	Score	S.E.	Score	S.E.	Score	S.E.	Score	S.E.	Score dif.	S.E.
Partners	Albania	358	(1.9)	80	(1.3)	260	(2.3)	302	(2.1)	354	(2.4)	411	(2.8)	465	(3.3)	**205**	(3.4)
	Argentina	401	(2.6)	92	(1.2)	285	(2.9)	334	(2.9)	397	(3.0)	462	(3.4)	523	(4.2)	**239**	(4.1)
	Baku (Azerbaijan)	365	(2.5)	85	(1.2)	257	(2.7)	304	(2.8)	363	(2.8)	423	(2.8)	478	(3.4)	**221**	(3.4)
	Brazil	410	(2.1)	100	(1.4)	284	(2.8)	339	(2.4)	407	(2.4)	478	(3.0)	544	(3.5)	**260**	(4.3)
	Brunei Darussalam	429	(1.2)	99	(1.1)	300	(2.3)	358	(2.0)	429	(1.5)	500	(2.1)	561	(3.0)	**261**	(3.8)
	Bulgaria	404	(3.4)	107	(2.3)	268	(3.5)	326	(3.6)	399	(4.3)	479	(5.2)	550	(5.8)	**282**	(6.5)
	Cambodia	329	(2.1)	57	(1.0)	256	(2.6)	292	(2.4)	330	(2.3)	367	(2.5)	400	(3.3)	**144**	(3.3)
	Croatia	475	(2.4)	89	(1.6)	358	(4.2)	415	(3.0)	477	(2.8)	539	(3.1)	590	(3.8)	**232**	(5.2)
	Cyprus	381	(1.2)	108	(1.0)	245	(2.2)	300	(1.8)	374	(2.3)	456	(2.3)	527	(2.7)	**281**	(3.0)
	Dominican Republic	351	(2.4)	84	(1.6)	249	(2.5)	291	(2.6)	345	(3.0)	406	(3.3)	464	(4.1)	**215**	(4.3)
	El Salvador	365	(2.8)	79	(1.7)	268	(3.0)	309	(2.8)	358	(3.0)	416	(3.7)	473	(4.9)	**204**	(5.3)
	Georgia	374	(2.3)	83	(1.6)	270	(2.7)	314	(2.7)	370	(2.2)	429	(3.3)	486	(4.4)	**216**	(4.7)
	Guatemala	374	(2.4)	73	(1.6)	283	(2.9)	323	(2.6)	372	(2.7)	422	(3.2)	469	(4.3)	**186**	(4.9)
	Hong Kong (China)*	500	(2.8)	99	(1.5)	366	(5.1)	437	(4.0)	507	(2.9)	569	(2.8)	621	(3.3)	**255**	(5.2)
	Indonesia	359	(2.9)	76	(1.4)	264	(3.1)	306	(2.9)	355	(3.1)	409	(3.9)	459	(4.1)	**195**	(4.0)
	Jamaica*	410	(4.2)	98	(1.8)	284	(5.0)	340	(4.7)	407	(5.1)	480	(5.3)	540	(5.0)	**255**	(5.5)
	Jordan	342	(2.4)	77	(1.4)	245	(2.6)	287	(2.5)	339	(2.6)	395	(3.1)	443	(4.2)	**198**	(4.5)
	Kazakhstan	386	(1.7)	82	(1.1)	288	(2.0)	330	(1.6)	380	(1.8)	435	(2.1)	495	(3.2)	**207**	(3.2)
	Kosovo	342	(1.1)	67	(0.8)	259	(2.0)	295	(1.5)	338	(1.5)	386	(1.7)	432	(2.7)	**173**	(3.2)
	Macao (China)	510	(1.3)	90	(1.0)	393	(2.9)	453	(2.4)	515	(1.5)	574	(1.9)	621	(2.6)	**228**	(3.8)
	Malaysia	388	(2.7)	86	(1.6)	275	(3.0)	326	(3.0)	389	(3.3)	449	(3.2)	499	(3.8)	**224**	(4.2)
	Malta	445	(1.9)	111	(1.5)	293	(4.0)	366	(3.4)	450	(2.8)	526	(2.4)	588	(3.5)	**295**	(5.7)
	Moldova	411	(2.5)	87	(1.6)	297	(3.2)	349	(2.8)	410	(3.1)	472	(3.2)	525	(4.3)	**228**	(5.0)
	Mongolia	378	(2.3)	77	(1.2)	279	(3.4)	327	(2.5)	379	(2.4)	431	(2.7)	477	(3.0)	**199**	(3.7)
	Montenegro	405	(1.3)	89	(1.0)	293	(2.2)	341	(2.1)	401	(2.1)	467	(2.0)	525	(2.8)	**232**	(3.4)
	Morocco	339	(4.0)	76	(1.9)	245	(3.5)	285	(3.4)	336	(4.4)	391	(5.0)	440	(6.3)	**195**	(5.8)
	North Macedonia	359	(0.8)	76	(0.8)	263	(1.6)	304	(1.6)	355	(1.2)	411	(1.8)	460	(2.0)	**196**	(2.7)
	Palestinian Authority	349	(2.0)	77	(1.1)	251	(2.6)	295	(2.3)	349	(2.5)	402	(2.4)	449	(2.8)	**198**	(3.4)
	Panama*	392	(3.4)	94	(1.9)	274	(3.8)	325	(3.8)	388	(4.6)	455	(4.5)	516	(5.4)	**243**	(5.6)
	Paraguay	373	(2.4)	83	(1.2)	268	(3.1)	315	(2.8)	370	(2.9)	430	(3.0)	484	(3.7)	**216**	(4.1)
	Peru	408	(2.7)	91	(1.7)	291	(3.7)	343	(3.1)	406	(3.1)	472	(3.2)	529	(4.0)	**238**	(5.2)
	Philippines	347	(3.4)	85	(2.2)	246	(2.1)	283	(2.4)	335	(3.5)	403	(5.5)	466	(6.3)	**220**	(5.9)
	Qatar	419	(1.4)	106	(1.3)	284	(2.6)	342	(2.2)	415	(2.2)	492	(2.7)	561	(3.7)	**277**	(4.4)
	Romania	428	(4.0)	100	(1.7)	297	(4.2)	357	(4.3)	430	(5.0)	500	(5.1)	559	(5.1)	**262**	(5.7)
	Saudi Arabia	383	(2.0)	79	(1.1)	281	(3.1)	328	(2.7)	381	(2.5)	437	(2.3)	485	(2.8)	**204**	(3.8)
	Serbia	440	(2.8)	91	(2.0)	323	(3.6)	377	(3.0)	440	(3.2)	504	(2.9)	558	(4.5)	**236**	(5.2)
	Singapore	543	(1.9)	106	(1.2)	400	(3.7)	474	(3.1)	551	(2.2)	619	(2.1)	671	(2.2)	**271**	(3.7)
	Chinese Taipei	515	(3.3)	105	(2.2)	374	(5.3)	447	(4.4)	523	(3.6)	589	(3.7)	643	(4.5)	**269**	(6.3)
	Thailand	379	(2.8)	80	(2.0)	279	(3.0)	322	(3.0)	374	(3.1)	431	(3.8)	486	(5.2)	**206**	(5.5)
	Ukrainian regions (18 of 27)	428	(3.9)	93	(2.0)	304	(6.6)	363	(5.8)	429	(4.4)	492	(3.8)	546	(4.1)	**242**	(6.5)
	United Arab Emirates	417	(1.3)	125	(0.7)	256	(1.7)	324	(1.8)	414	(2.0)	508	(1.9)	584	(1.8)	**328**	(2.0)
	Uruguay	430	(2.4)	99	(1.7)	299	(3.5)	359	(3.2)	432	(3.2)	502	(3.1)	559	(3.4)	**260**	(5.0)
	Uzbekistan	336	(2.0)	66	(1.0)	252	(2.1)	290	(2.1)	333	(2.4)	379	(2.3)	422	(3.1)	**170**	(3.0)
	Viet Nam**	462	(3.9)	77	(2.2)	361	(6.2)	413	(4.6)	465	(3.9)	515	(3.9)	558	(4.7)	**197**	(6.6)

* Caution is required when interpreting estimates because one or more PISA sampling standards were not met (see Reader's Guide, Annexes A2 and A4).

** Caution is required when comparing estimates based on PISA 2022 with other countries/economies as a strong linkage to the international PISA reading scale could not be established (see Reader's Guide and Annex A4).

Note: Values that are statistically significant are indicated in bold (see Annex A3).

Table I.B1.2.3. Mean score and variation in science performance [1/2]

		Mean score		Standard deviation		Percentiles											
						10th		25th		Median (50th)		75th		90th		Difference (90th - 10th)	
		Mean score	S.E.	S.D.	S.E.	Score	S.E.	Score	S.E.	Score	S.E.	Score	S.E.	Score	S.E.	Score dif.	S.E.
OECD	**Australia***	507	(1.9)	109	(1.4)	364	(2.7)	430	(2.4)	508	(2.2)	583	(2.5)	647	(3.1)	**283**	(3.9)
	Austria	491	(2.7)	101	(1.4)	356	(3.6)	418	(3.8)	495	(3.3)	565	(3.4)	622	(3.1)	**266**	(4.1)
	Belgium	491	(2.5)	101	(1.3)	352	(3.7)	419	(3.5)	496	(2.8)	564	(2.8)	618	(3.2)	**266**	(4.4)
	Canada*	515	(1.9)	101	(1.1)	383	(2.6)	446	(2.2)	516	(2.3)	584	(2.4)	643	(2.9)	**260**	(3.4)
	Chile	444	(2.5)	92	(1.4)	326	(3.5)	379	(3.4)	443	(3.0)	508	(3.0)	564	(3.1)	**238**	(4.3)
	Colombia	411	(3.3)	87	(1.7)	303	(3.6)	349	(3.3)	406	(3.7)	469	(4.4)	528	(4.7)	**225**	(5.0)
	Costa Rica	411	(2.4)	80	(1.3)	309	(3.0)	355	(2.8)	408	(2.8)	464	(3.0)	515	(3.5)	**206**	(3.8)
	Czech Republic	498	(2.3)	99	(1.4)	368	(3.4)	427	(3.3)	498	(2.9)	568	(3.0)	628	(3.4)	**260**	(4.0)
	Denmark*	494	(2.5)	95	(1.6)	370	(3.8)	427	(3.6)	495	(3.0)	560	(3.1)	615	(3.5)	**246**	(4.3)
	Estonia	526	(2.1)	89	(1.3)	409	(3.2)	465	(2.8)	527	(2.4)	588	(3.0)	641	(3.2)	**232**	(4.3)
	Finland	511	(2.5)	106	(1.1)	370	(3.2)	437	(3.1)	514	(3.2)	586	(2.9)	647	(3.3)	**278**	(3.8)
	France	487	(2.7)	103	(1.5)	350	(4.0)	414	(4.0)	490	(3.4)	561	(3.1)	620	(3.4)	**270**	(4.4)
	Germany	492	(3.5)	106	(1.5)	352	(5.0)	417	(4.6)	493	(4.5)	567	(3.8)	631	(4.2)	**279**	(5.6)
	Greece	441	(2.8)	91	(1.6)	323	(4.0)	376	(3.3)	441	(3.0)	505	(3.0)	560	(3.5)	**236**	(4.7)
	Hungary	486	(2.7)	96	(1.6)	357	(3.3)	417	(3.8)	487	(3.7)	555	(3.6)	611	(3.9)	**254**	(5.1)
	Iceland	447	(1.8)	95	(1.4)	324	(3.7)	378	(2.5)	446	(2.4)	514	(3.0)	571	(3.3)	**248**	(4.9)
	Ireland*	504	(2.3)	91	(1.1)	384	(3.9)	441	(3.1)	506	(2.7)	569	(2.5)	621	(2.8)	**237**	(4.6)
	Israel	465	(3.4)	109	(1.7)	320	(4.3)	385	(4.1)	466	(4.1)	544	(3.9)	605	(4.6)	**285**	(5.3)
	Italy	477	(3.2)	93	(1.7)	356	(3.9)	413	(3.8)	480	(3.8)	543	(4.3)	597	(4.3)	**241**	(4.7)
	Japan	547	(2.8)	93	(1.7)	421	(4.6)	484	(4.3)	552	(3.2)	614	(3.1)	663	(3.4)	**241**	(5.4)
	Korea	528	(3.6)	105	(2.7)	387	(6.4)	459	(4.9)	535	(4.1)	603	(4.1)	657	(5.0)	**270**	(7.5)
	Latvia*	494	(2.3)	85	(1.2)	385	(3.3)	434	(2.8)	493	(2.7)	553	(2.9)	604	(3.2)	**219**	(4.2)
	Lithuania	484	(2.3)	92	(1.3)	364	(3.3)	419	(3.0)	484	(2.7)	548	(2.8)	605	(3.4)	**241**	(4.2)
	Mexico	410	(2.4)	75	(1.7)	315	(3.3)	357	(2.7)	408	(2.9)	461	(3.0)	508	(3.8)	**193**	(4.8)
	Netherlands*	488	(4.1)	112	(2.2)	340	(5.4)	401	(6.4)	489	(5.1)	574	(4.3)	636	(3.7)	**296**	(6.0)
	New Zealand*	504	(2.2)	107	(1.5)	362	(4.1)	428	(3.6)	506	(2.7)	581	(3.0)	643	(3.1)	**281**	(5.1)
	Norway	478	(2.4)	106	(1.2)	338	(3.2)	401	(3.2)	480	(3.0)	555	(3.2)	614	(3.1)	**276**	(3.7)
	Poland	499	(2.5)	96	(1.5)	370	(4.0)	432	(3.9)	502	(3.2)	568	(3.0)	623	(3.4)	**253**	(4.7)
	Portugal	484	(2.6)	92	(1.4)	364	(4.2)	419	(3.5)	485	(3.3)	550	(3.0)	603	(2.7)	**239**	(4.5)
	Slovak Republic	462	(3.0)	103	(1.9)	324	(5.1)	391	(4.1)	465	(3.6)	536	(3.6)	593	(3.6)	**269**	(5.8)
	Slovenia	500	(1.4)	94	(1.6)	376	(2.9)	434	(2.3)	500	(2.1)	566	(2.3)	622	(3.3)	**246**	(4.9)
	Spain	485	(1.6)	92	(0.8)	363	(2.3)	422	(2.0)	486	(2.0)	548	(1.8)	601	(1.9)	**238**	(2.3)
	Sweden	494	(2.4)	108	(1.7)	350	(4.0)	414	(3.7)	497	(3.0)	572	(2.7)	633	(3.3)	**284**	(5.5)
	Switzerland	503	(2.2)	99	(1.3)	370	(3.5)	429	(3.0)	504	(2.9)	575	(2.7)	631	(2.8)	**261**	(4.4)
	Türkiye	476	(1.9)	89	(1.1)	361	(2.7)	411	(2.8)	474	(2.7)	540	(2.3)	595	(3.1)	**234**	(3.8)
	United Kingdom*	500	(2.4)	104	(1.4)	363	(3.0)	427	(2.9)	500	(2.9)	572	(3.1)	634	(3.8)	**271**	(4.5)
	United States*	499	(4.3)	108	(1.8)	357	(5.1)	421	(5.0)	502	(5.3)	577	(4.8)	639	(5.2)	**282**	(5.8)
	OECD average	485	(0.4)	97	(0.3)	356	(0.6)	416	(0.6)	486	(0.5)	554	(0.5)	611	(0.6)	**254**	(0.8)

* Caution is required when interpreting estimates because one or more PISA sampling standards were not met (see Reader's Guide, Annexes A2 and A4).
Note: Values that are statistically significant are indicated in bold (see Annex A3).

Table I.B1.2.3. Mean score and variation in science performance [2/2]

		Mean score		Standard deviation		Percentiles											
						10th		25th		Median (50th)		75th		90th		Difference (90th - 10th)	
		Mean score	S.E.	S.D.	S.E.	Score	S.E.	Score	S.E.	Score	S.E.	Score	S.E.	Score	S.E.	Score dif.	S.E.
Partners	Albania	376	(2.2)	83	(1.4)	275	(2.5)	318	(2.5)	371	(2.5)	429	(3.0)	485	(3.8)	**210**	(4.4)
	Argentina	406	(2.5)	86	(1.2)	301	(3.0)	345	(2.7)	401	(3.1)	463	(3.3)	521	(3.6)	**221**	(3.7)
	Baku (Azerbaijan)	380	(2.2)	78	(1.3)	283	(2.8)	324	(2.5)	376	(2.5)	432	(2.7)	484	(3.4)	**201**	(3.8)
	Brazil	403	(1.9)	94	(1.3)	288	(2.2)	337	(1.9)	396	(2.1)	463	(2.6)	529	(3.5)	**241**	(3.6)
	Brunei Darussalam	446	(1.3)	94	(1.0)	327	(2.7)	378	(2.0)	442	(1.7)	512	(2.2)	571	(2.6)	**245**	(3.9)
	Bulgaria	421	(3.2)	95	(1.9)	302	(3.1)	351	(3.3)	415	(4.0)	487	(4.7)	549	(5.0)	**247**	(5.5)
	Cambodia	347	(2.1)	51	(1.2)	283	(2.5)	314	(2.1)	347	(2.2)	381	(2.5)	411	(3.2)	**128**	(3.1)
	Croatia	483	(2.4)	93	(1.6)	362	(3.9)	417	(3.2)	482	(3.0)	548	(2.8)	605	(3.0)	**243**	(4.8)
	Cyprus	411	(1.5)	105	(1.5)	280	(2.9)	332	(2.4)	404	(2.4)	485	(2.6)	553	(3.0)	**272**	(4.4)
	Dominican Republic	360	(2.0)	69	(1.1)	275	(2.3)	312	(1.9)	356	(2.3)	405	(3.0)	452	(2.8)	**177**	(3.0)
	El Salvador	373	(2.6)	74	(1.3)	284	(3.3)	322	(2.7)	367	(2.6)	419	(3.4)	472	(4.5)	**188**	(4.1)
	Georgia	384	(2.3)	81	(1.9)	285	(2.4)	328	(2.3)	379	(2.3)	436	(2.8)	491	(5.1)	**207**	(5.2)
	Guatemala	373	(2.2)	65	(1.7)	294	(2.6)	329	(2.3)	369	(2.3)	414	(2.7)	458	(4.4)	**163**	(4.5)
	Hong Kong (China)*	520	(2.8)	93	(1.7)	394	(4.8)	458	(4.3)	526	(3.4)	586	(3.0)	636	(3.2)	**242**	(5.5)
	Indonesia	383	(2.6)	71	(1.3)	296	(2.7)	336	(2.7)	381	(2.7)	429	(3.1)	474	(3.5)	**178**	(3.6)
	Jamaica*	403	(3.9)	94	(1.8)	286	(4.1)	334	(4.1)	397	(4.8)	466	(5.1)	531	(5.8)	**245**	(5.9)
	Jordan	375	(2.4)	74	(1.4)	282	(2.5)	322	(2.3)	371	(2.5)	424	(2.9)	473	(3.7)	**191**	(3.7)
	Kazakhstan	423	(1.7)	78	(1.3)	329	(2.2)	371	(1.9)	419	(1.8)	471	(2.1)	524	(3.1)	**195**	(3.5)
	Kosovo	357	(1.3)	66	(1.0)	278	(1.6)	311	(1.5)	351	(1.5)	399	(1.9)	446	(3.2)	**168**	(3.5)
	Macao (China)	543	(1.1)	88	(1.5)	426	(2.8)	487	(2.1)	549	(1.9)	604	(1.9)	651	(2.5)	**225**	(4.3)
	Malaysia	416	(2.3)	79	(2.2)	317	(2.9)	360	(2.7)	414	(2.6)	469	(3.0)	519	(4.5)	**202**	(5.6)
	Malta	466	(1.7)	102	(1.4)	328	(3.6)	391	(3.1)	469	(2.8)	540	(2.7)	597	(4.1)	**269**	(5.7)
	Moldova	417	(2.4)	83	(1.5)	314	(2.7)	358	(2.5)	412	(2.7)	473	(3.3)	528	(3.8)	**214**	(4.2)
	Mongolia	412	(2.4)	76	(1.3)	316	(3.2)	359	(2.5)	410	(2.7)	464	(3.2)	513	(3.5)	**197**	(4.2)
	Montenegro	403	(1.2)	84	(1.1)	298	(2.5)	343	(1.9)	399	(1.9)	461	(2.3)	515	(2.3)	**217**	(3.7)
	Morocco	365	(3.4)	67	(1.7)	283	(2.8)	318	(2.9)	360	(3.5)	408	(4.6)	456	(5.3)	**173**	(5.0)
	North Macedonia	380	(0.9)	82	(0.9)	279	(1.8)	321	(1.4)	374	(1.5)	435	(1.9)	490	(2.4)	**211**	(2.8)
	Palestinian Authority	369	(2.1)	72	(1.3)	280	(2.4)	319	(2.2)	365	(2.1)	416	(2.7)	464	(3.6)	**184**	(3.7)
	Panama*	388	(3.5)	88	(2.2)	281	(3.7)	327	(3.0)	382	(3.6)	444	(5.2)	504	(6.6)	**224**	(6.9)
	Paraguay	368	(2.1)	77	(1.2)	273	(2.9)	314	(2.6)	364	(2.4)	419	(2.6)	469	(3.3)	**196**	(3.9)
	Peru	408	(2.6)	86	(1.3)	300	(3.4)	347	(3.0)	404	(3.0)	466	(3.1)	522	(3.9)	**222**	(4.4)
	Philippines	356	(3.1)	78	(2.1)	266	(2.4)	302	(2.4)	346	(2.7)	403	(4.6)	464	(6.4)	**197**	(6.2)
	Qatar	432	(1.5)	97	(1.3)	313	(2.4)	361	(2.1)	425	(2.1)	496	(2.2)	564	(2.9)	**250**	(3.8)
	Romania	428	(3.9)	96	(1.7)	303	(3.9)	356	(4.0)	426	(5.2)	496	(4.7)	556	(4.8)	**252**	(5.2)
	Saudi Arabia	390	(2.0)	70	(1.4)	304	(3.1)	342	(2.2)	387	(2.3)	436	(2.6)	482	(3.1)	**179**	(4.4)
	Serbia	447	(2.9)	91	(2.2)	332	(3.3)	383	(3.0)	445	(3.1)	510	(3.6)	567	(4.9)	**235**	(5.4)
	Singapore	561	(1.3)	99	(1.1)	425	(3.1)	497	(2.7)	569	(2.0)	632	(1.6)	684	(2.2)	**258**	(3.9)
	Chinese Taipei	537	(3.3)	103	(2.0)	397	(4.8)	469	(4.0)	544	(3.5)	611	(3.9)	664	(5.0)	**267**	(6.3)
	Thailand	409	(2.8)	82	(1.9)	309	(3.3)	352	(2.9)	403	(3.0)	462	(3.8)	518	(4.9)	**209**	(5.4)
	Ukrainian regions (18 of 27)	450	(3.8)	90	(2.0)	334	(5.4)	386	(5.0)	449	(5.0)	513	(4.2)	567	(4.4)	**234**	(5.7)
	United Arab Emirates	432	(1.3)	110	(1.3)	296	(2.5)	350	(2.1)	424	(1.8)	510	(1.9)	582	(2.7)	**287**	(4.3)
	Uruguay	435	(2.5)	92	(1.4)	318	(3.4)	369	(3.1)	433	(2.8)	500	(2.9)	557	(3.9)	**239**	(4.7)
	Uzbekistan	355	(2.0)	63	(1.0)	276	(2.3)	312	(1.9)	353	(2.2)	396	(2.8)	437	(3.0)	**160**	(2.8)
	Viet Nam	472	(3.6)	78	(1.8)	372	(4.8)	420	(3.9)	473	(3.6)	525	(3.8)	572	(4.5)	**199**	(5.3)

* Caution is required when interpreting estimates because one or more PISA sampling standards were not met (see Reader's Guide, Annexes A2 and A4).
Note: Values that are statistically significant are indicated in bold (see Annex A3).

Table I.B1.3.1. Percentage of students at each proficiency level in mathematics [1/2]

		All students																	
		Below Level 1c (below 233.17 score points)		Level 1c (from 233.17 to less than 295.47 score points)		Level 1b (from 295.47 to less than 357.77 score points)		Level 1a (from 357.77 to less than 420.07 score points)		Level 2 (from 420.07 to less than 482.38 score points)		Level 3 (from 482.38 to less than 544.68 score points)		Level 4 (from 544.68 to less than 606.99 score points)		Level 5 (from 606.99 to less than 669.30 score points)		Level 6 (above 669.30 score points)	
		%	S.E.	%	S.E.	%	S.E.	%	S.E.	%	S.E.	%	S.E.	%	S.E.	%	S.E.	%	S.E.
OECD	Australia*	0.2	(0.1)	1.7	(0.2)	7.9	(0.4)	16.5	(0.5)	22.8	(0.6)	22.3	(0.7)	16.2	(0.5)	8.8	(0.4)	3.5	(0.3)
	Austria	0.1	(0.1)	1.5	(0.3)	7.5	(0.5)	15.7	(0.7)	22.5	(0.7)	24.2	(0.7)	18.1	(0.7)	8.1	(0.5)	2.2	(0.2)
	Belgium	0.1	(0.1)	1.7	(0.2)	7.8	(0.5)	15.3	(0.6)	21.5	(0.7)	23.5	(0.8)	18.6	(0.7)	8.9	(0.5)	2.6	(0.2)
	Canada*	0.1	(0.0)	1.0	(0.1)	5.7	(0.3)	14.7	(0.4)	22.7	(0.5)	24.8	(0.5)	18.5	(0.5)	9.1	(0.4)	3.3	(0.2)
	Chile	0.5	(0.2)	5.2	(0.6)	19.3	(0.9)	30.7	(0.8)	26.0	(0.8)	13.5	(0.6)	4.1	(0.4)	0.6	(0.1)	0.0	(0.0)
	Colombia	1.1	(0.3)	9.6	(0.8)	28.4	(1.4)	32.3	(1.0)	19.1	(1.0)	7.7	(0.6)	1.7	(0.3)	0.3	(0.1)	0.0	(0.0)
	Costa Rica	0.5	(0.1)	7.6	(0.6)	27.3	(1.0)	36.5	(1.1)	20.9	(0.9)	6.0	(0.5)	1.1	(0.2)	0.2	(0.1)	0.0	(0.0)
	Czech Republic	0.1	(0.1)	1.2	(0.2)	7.1	(0.5)	17.1	(0.7)	23.2	(0.7)	23.4	(0.8)	17.3	(0.7)	8.1	(0.5)	2.5	(0.3)
	Denmark*	0.0	(0.0)	0.6	(0.2)	4.7	(0.4)	15.1	(0.7)	26.3	(0.9)	28.1	(0.8)	17.5	(0.8)	6.5	(0.5)	1.3	(0.2)
	Estonia	0.0	(0.0)	0.3	(0.1)	3.0	(0.3)	11.6	(0.6)	23.3	(0.8)	27.3	(1.0)	21.3	(0.9)	9.9	(0.6)	3.2	(0.3)
	Finland	0.1	(0.0)	1.2	(0.2)	7.1	(0.4)	16.4	(0.6)	23.7	(0.7)	25.5	(0.7)	17.4	(0.6)	7.0	(0.5)	1.5	(0.2)
	France	0.2	(0.1)	1.9	(0.2)	8.9	(0.6)	17.8	(0.7)	24.2	(0.7)	23.9	(0.7)	15.7	(0.7)	6.2	(0.5)	1.1	(0.2)
	Germany	0.2	(0.1)	2.2	(0.4)	9.2	(0.7)	18.0	(0.8)	23.6	(0.9)	23.0	(0.9)	15.3	(0.8)	6.7	(0.5)	1.9	(0.2)
	Greece	0.5	(0.2)	3.8	(0.4)	16.2	(0.8)	26.8	(0.8)	26.0	(0.8)	17.3	(0.7)	7.5	(0.5)	1.8	(0.3)	0.1	(0.1)
	Hungary	0.2	(0.1)	2.4	(0.3)	9.6	(0.6)	17.3	(0.9)	23.8	(0.9)	23.8	(0.9)	15.1	(0.7)	6.3	(0.5)	1.6	(0.3)
	Iceland	0.2	(0.1)	2.4	(0.4)	10.5	(0.7)	21.0	(0.8)	26.2	(0.8)	22.4	(0.8)	12.4	(0.8)	4.2	(0.5)	0.7	(0.2)
	Ireland*	0.0	(0.0)	0.5	(0.1)	4.2	(0.4)	14.2	(0.7)	25.9	(0.8)	29.0	(0.9)	18.8	(0.7)	6.2	(0.5)	1.0	(0.2)
	Israel	1.2	(0.2)	5.2	(0.5)	12.4	(0.7)	18.4	(0.8)	21.1	(0.8)	19.7	(0.8)	13.6	(0.8)	6.2	(0.5)	2.2	(0.4)
	Italy	0.2	(0.1)	1.6	(0.3)	8.3	(0.6)	19.5	(0.9)	26.0	(0.9)	23.2	(0.8)	14.2	(0.9)	5.7	(0.6)	1.2	(0.2)
	Japan	0.0	(0.0)	0.4	(0.1)	2.7	(0.4)	8.8	(0.7)	16.0	(0.8)	24.0	(0.9)	25.1	(1.0)	16.2	(0.8)	6.8	(0.7)
	Korea	0.3	(0.1)	1.2	(0.3)	4.5	(0.6)	10.2	(0.8)	16.7	(0.8)	22.0	(0.9)	22.2	(1.0)	14.4	(0.9)	8.5	(0.8)
	Latvia*	0.0	(0.0)	0.6	(0.1)	4.8	(0.5)	16.7	(0.7)	28.4	(0.9)	27.2	(0.9)	15.8	(0.8)	5.2	(0.4)	1.2	(0.2)
	Lithuania	0.1	(0.1)	1.1	(0.2)	7.5	(0.6)	19.1	(0.8)	26.5	(0.7)	24.0	(0.8)	14.5	(0.6)	5.8	(0.5)	1.4	(0.2)
	Mexico	0.6	(0.2)	5.8	(0.6)	24.3	(1.0)	35.1	(1.1)	23.0	(0.9)	9.0	(0.7)	2.0	(0.3)	0.2	(0.1)	0.0	(0.0)
	Netherlands*	0.2	(0.1)	2.2	(0.4)	9.8	(1.0)	15.2	(0.9)	18.2	(0.8)	19.8	(1.0)	19.2	(0.9)	11.7	(0.7)	3.7	(0.4)
	New Zealand*	0.2	(0.1)	2.1	(0.3)	9.3	(0.6)	17.2	(0.8)	22.9	(0.7)	22.6	(0.8)	15.4	(0.7)	7.4	(0.6)	2.9	(0.3)
	Norway	0.3	(0.1)	2.4	(0.3)	10.1	(0.5)	18.7	(0.7)	23.8	(0.7)	23.0	(0.8)	14.9	(0.6)	5.5	(0.4)	1.4	(0.2)
	Poland	0.1	(0.1)	1.1	(0.2)	6.4	(0.5)	15.4	(0.8)	23.8	(0.9)	25.6	(0.9)	18.2	(0.7)	7.5	(0.5)	1.9	(0.3)
	Portugal	0.2	(0.1)	1.9	(0.4)	8.3	(0.6)	19.3	(0.7)	25.0	(0.8)	23.0	(0.8)	15.6	(0.7)	5.5	(0.4)	1.1	(0.2)
	Slovak Republic	0.9	(0.2)	4.4	(0.5)	10.9	(0.8)	17.1	(0.9)	22.0	(1.0)	22.6	(0.8)	14.9	(0.7)	5.7	(0.4)	1.6	(0.2)
	Slovenia	0.1	(0.0)	1.0	(0.2)	6.7	(0.6)	16.9	(0.7)	25.7	(0.9)	24.2	(0.9)	16.1	(0.7)	7.5	(0.4)	1.9	(0.3)
	Spain	0.2	(0.1)	1.7	(0.2)	7.8	(0.4)	17.6	(0.5)	26.2	(0.5)	25.4	(0.5)	15.2	(0.4)	5.0	(0.3)	0.9	(0.1)
	Sweden	0.2	(0.1)	1.9	(0.2)	8.3	(0.5)	16.8	(0.6)	22.6	(0.7)	23.5	(0.8)	16.7	(0.8)	7.8	(0.5)	2.1	(0.3)
	Switzerland	0.0	(0.0)	0.8	(0.1)	5.4	(0.4)	13.2	(0.7)	20.5	(0.7)	23.5	(0.8)	20.4	(0.8)	11.9	(0.7)	4.2	(0.4)
	Türkiye	0.1	(0.1)	2.3	(0.2)	12.3	(0.6)	23.9	(0.7)	25.3	(0.7)	19.2	(0.7)	11.3	(0.6)	4.6	(0.4)	0.9	(0.2)
	United Kingdom*	0.2	(0.1)	1.7	(0.3)	7.2	(0.5)	15.3	(0.7)	23.1	(0.7)	24.2	(0.8)	17.1	(0.7)	8.2	(0.6)	3.1	(0.4)
	United States*	0.2	(0.1)	2.5	(0.4)	10.4	(0.8)	20.8	(1.0)	23.9	(0.8)	21.5	(0.9)	13.3	(0.8)	5.7	(0.7)	1.6	(0.3)
	OECD average	0.3	(0.0)	2.3	(0.1)	9.8	(0.1)	18.7	(0.1)	23.3	(0.1)	22.0	(0.1)	14.9	(0.1)	6.7	(0.1)	2.0	(0.0)

* Caution is required when interpreting estimates because one or more PISA sampling standards were not met (see Reader's Guide, Annexes A2 and A4).

Table I.B1.3.1. Percentage of students at each proficiency level in mathematics [2/2]

		All students																	
		Below Level 1c (below 233.17 score points)		Level 1c (from 233.17 to less than 295.47 score points)		Level 1b (from 295.47 to less than 357.77 score points)		Level 1a (from 357.77 to less than 420.07 score points)		Level 2 (from 420.07 to less than 482.38 score points)		Level 3 (from 482.38 to less than 544.68 score points)		Level 4 (from 544.68 to less than 606.99 score points)		Level 5 (from 606.99 to less than 669.30 score points)		Level 6 (above 669.30 score points)	
		%	S.E.	%	S.E.	%	S.E.	%	S.E.	%	S.E.	%	S.E.	%	S.E.	%	S.E.	%	S.E.
Partners	Albania	4.0	(0.4)	15.7	(0.7)	28.8	(0.9)	25.4	(0.7)	16.2	(0.7)	7.1	(0.4)	2.1	(0.3)	0.6	(0.2)	0.1	(0.1)
	Argentina	1.4	(0.3)	11.3	(0.8)	29.4	(1.0)	30.8	(0.8)	18.1	(0.8)	6.9	(0.5)	1.7	(0.2)	0.3	(0.1)	0.0	(0.0)
	Baku (Azerbaijan)	1.8	(0.2)	9.7	(0.6)	22.9	(0.7)	27.6	(0.8)	21.7	(0.8)	11.7	(0.6)	3.9	(0.4)	0.7	(0.2)	0.1	(0.0)
	Brazil	1.2	(0.2)	11.2	(0.5)	30.7	(0.8)	30.3	(0.7)	16.7	(0.6)	7.0	(0.4)	2.4	(0.3)	0.5	(0.1)	0.1	(0.0)
	Brunei Darussalam	0.2	(0.1)	2.8	(0.3)	12.9	(0.5)	26.0	(0.7)	27.3	(0.6)	18.6	(0.6)	9.2	(0.5)	2.8	(0.3)	0.3	(0.1)
	Bulgaria	1.6	(0.3)	7.9	(0.6)	20.0	(0.9)	24.2	(0.9)	21.2	(0.9)	14.5	(0.8)	7.5	(0.7)	2.5	(0.4)	0.6	(0.2)
	Cambodia	7.6	(0.6)	20.6	(1.0)	33.7	(1.0)	26.1	(1.1)	9.5	(0.9)	2.2	(0.5)	0.3	(0.2)	0.0	(0.0)	0.0	(0.0)
	Croatia	0.2	(0.1)	1.9	(0.3)	9.3	(0.6)	21.5	(0.8)	26.8	(0.8)	21.7	(0.9)	12.7	(0.7)	4.9	(0.5)	1.0	(0.2)
	Cyprus	1.7	(0.3)	8.6	(0.4)	20.2	(0.6)	22.7	(0.7)	20.5	(0.7)	14.5	(0.5)	8.0	(0.5)	3.1	(0.3)	0.8	(0.1)
	Dominican Republic	1.5	(0.3)	19.5	(1.0)	45.1	(1.4)	26.4	(1.0)	6.7	(0.6)	0.8	(0.2)	0.1	(0.1)	0.0	c	0.0	c
	El Salvador	1.9	(0.3)	19.0	(0.9)	42.0	(1.1)	26.5	(1.0)	8.8	(0.7)	1.7	(0.3)	0.2	(0.1)	0.0	c	0.0	c
	Georgia	1.8	(0.2)	10.3	(0.7)	25.9	(0.9)	28.4	(0.8)	19.6	(0.7)	9.4	(0.5)	3.4	(0.4)	1.0	(0.3)	0.2	(0.1)
	Guatemala	5.1	(0.6)	18.3	(1.0)	35.2	(1.2)	28.2	(1.0)	10.5	(0.8)	2.3	(0.5)	0.3	(0.2)	0.0	(0.0)	0.0	(0.0)
	Hong Kong (China)*	0.1	(0.0)	0.9	(0.2)	3.8	(0.4)	9.1	(0.6)	14.8	(0.8)	21.0	(0.8)	23.1	(0.9)	16.7	(0.7)	10.6	(0.8)
	Indonesia	1.0	(0.2)	10.9	(0.8)	36.0	(1.2)	33.8	(1.2)	14.1	(0.9)	3.8	(0.5)	0.5	(0.1)	0.0	(0.0)	0.0	(0.0)
	Jamaica*	0.9	(0.2)	10.7	(0.9)	30.9	(1.5)	31.3	(1.3)	17.5	(1.2)	7.1	(0.7)	1.4	(0.3)	0.1	(0.1)	0.0	c
	Jordan	1.2	(0.2)	13.0	(0.8)	35.4	(1.1)	33.2	(1.0)	13.9	(0.9)	3.0	(0.4)	0.3	(0.1)	0.0	(0.0)	0.0	c
	Kazakhstan	0.4	(0.1)	3.4	(0.3)	15.7	(0.5)	30.1	(0.6)	27.5	(0.7)	15.6	(0.5)	5.7	(0.3)	1.4	(0.2)	0.2	(0.1)
	Kosovo	1.4	(0.3)	15.1	(0.7)	38.9	(0.9)	29.6	(0.9)	11.7	(0.6)	2.9	(0.3)	0.3	(0.1)	0.0	(0.0)	0.0	c
	Macao (China)	0.0	(0.0)	0.2	(0.1)	1.7	(0.3)	6.5	(0.5)	14.4	(0.7)	23.2	(0.8)	25.4	(1.1)	18.4	(0.8)	10.2	(0.5)
	Malaysia	0.2	(0.1)	4.7	(0.4)	21.6	(0.9)	32.5	(0.9)	24.8	(0.9)	11.4	(0.6)	3.7	(0.4)	0.9	(0.3)	0.2	(0.2)
	Malta	0.5	(0.2)	3.6	(0.4)	11.4	(0.7)	17.0	(0.8)	22.3	(1.1)	22.7	(0.9)	15.2	(1.0)	5.7	(0.6)	1.5	(0.2)
	Moldova	0.5	(0.2)	5.0	(0.4)	19.1	(0.8)	31.1	(0.9)	24.8	(0.7)	13.3	(0.8)	4.9	(0.5)	1.1	(0.2)	0.1	(0.1)
	Mongolia	0.4	(0.1)	4.2	(0.4)	17.0	(0.7)	29.5	(0.8)	25.1	(0.7)	15.1	(0.7)	6.4	(0.5)	1.9	(0.4)	0.3	(0.1)
	Montenegro	0.7	(0.1)	6.9	(0.4)	22.6	(0.8)	29.3	(0.8)	22.4	(0.8)	12.5	(0.5)	4.7	(0.3)	0.9	(0.1)	0.1	(0.1)
	Morocco	0.7	(0.2)	11.7	(0.9)	36.7	(1.6)	32.5	(1.2)	14.0	(1.1)	3.9	(0.7)	0.6	(0.3)	0.0	(0.0)	0.0	c
	North Macedonia	1.7	(0.3)	10.6	(0.5)	26.2	(0.8)	27.7	(0.8)	19.9	(0.6)	10.1	(0.4)	3.1	(0.3)	0.6	(0.1)	0.1	(0.0)
	Palestinian Authority	1.3	(0.2)	12.4	(0.7)	34.1	(0.9)	32.1	(0.9)	15.2	(0.7)	4.1	(0.4)	0.7	(0.2)	0.1	(0.0)	0.0	(0.0)
	Panama*	1.6	(0.3)	15.4	(0.9)	37.1	(1.3)	29.7	(1.3)	12.1	(1.0)	3.3	(0.7)	0.7	(0.3)	0.0	(0.0)	0.0	c
	Paraguay	8.3	(0.7)	22.2	(0.9)	30.7	(1.0)	24.3	(1.0)	11.0	(0.7)	3.0	(0.4)	0.6	(0.2)	0.0	(0.0)	0.0	c
	Peru	1.1	(0.3)	9.0	(0.6)	25.6	(0.9)	30.5	(0.7)	20.8	(0.8)	9.7	(0.6)	2.8	(0.3)	0.5	(0.1)	0.0	(0.0)
	Philippines	1.1	(0.2)	16.7	(1.0)	38.6	(1.3)	27.7	(0.9)	12.2	(0.9)	3.2	(0.4)	0.5	(0.2)	0.1	(0.1)	0.0	c
	Qatar	0.6	(0.2)	6.6	(0.5)	21.2	(0.6)	28.0	(1.0)	22.3	(0.7)	12.5	(0.6)	6.0	(0.4)	2.1	(0.2)	0.6	(0.1)
	Romania	1.5	(0.3)	7.0	(0.6)	17.1	(1.0)	22.9	(1.0)	22.3	(0.9)	16.4	(0.9)	8.7	(0.7)	3.2	(0.5)	0.8	(0.2)
	Saudi Arabia	0.4	(0.1)	6.1	(0.4)	26.9	(0.8)	36.6	(0.9)	21.7	(0.8)	6.7	(0.5)	1.3	(0.2)	0.2	(0.1)	0.0	(0.0)
	Serbia	0.7	(0.2)	3.6	(0.5)	13.8	(0.8)	25.0	(0.8)	26.3	(0.9)	18.1	(0.8)	8.8	(0.5)	3.0	(0.5)	0.8	(0.4)
	Singapore	0.0	(0.0)	0.3	(0.1)	1.9	(0.2)	5.9	(0.4)	11.2	(0.6)	17.6	(0.6)	22.6	(0.7)	22.0	(0.7)	18.6	(0.5)
	Chinese Taipei	0.2	(0.1)	0.9	(0.2)	4.3	(0.4)	9.2	(0.6)	13.5	(0.8)	18.7	(0.9)	21.5	(0.8)	18.0	(0.9)	13.7	(1.2)
	Thailand	0.5	(0.1)	6.6	(0.6)	27.0	(1.0)	34.2	(1.0)	19.4	(0.8)	8.1	(0.7)	3.2	(0.4)	0.8	(0.2)	0.2	(0.1)
	Ukrainian regions (18 of 27)	0.4	(0.2)	3.6	(0.6)	14.2	(1.3)	24.3	(1.3)	25.9	(1.2)	19.2	(1.2)	9.3	(0.8)	2.7	(0.4)	0.6	(0.2)
	United Arab Emirates	1.0	(0.1)	6.6	(0.3)	18.0	(0.4)	23.3	(0.4)	21.1	(0.4)	15.3	(0.4)	9.2	(0.3)	4.0	(0.2)	1.3	(0.1)
	Uruguay	1.0	(0.2)	7.3	(0.5)	20.4	(0.8)	27.9	(0.8)	24.1	(0.7)	13.6	(0.6)	4.9	(0.4)	0.9	(0.2)	0.1	(0.0)
	Uzbekistan	1.7	(0.3)	12.8	(0.7)	34.4	(0.9)	31.8	(0.8)	14.4	(0.8)	4.2	(0.5)	0.7	(0.2)	0.0	(0.0)	0.0	(0.0)
	Viet Nam	0.3	(0.1)	1.9	(0.4)	7.3	(0.8)	18.6	(1.1)	28.1	(1.2)	24.7	(1.0)	13.6	(0.9)	4.5	(0.6)	0.9	(0.3)

* Caution is required when interpreting estimates because one or more PISA sampling standards were not met (see Reader's Guide, Annexes A2 and A4).

Table I.B1.3.2. Percentage of students at each proficiency level in reading [1/2]

		All students																	
		Below Level 1c (less than 189.33 score points)		Level 1c (from 189.33 to less than 262.04 score points)		Level 1b (from 262.04 to less than 334.75 score points)		Level 1a (from 334.75 to less than 407.47 score points)		Level 2 (from 407.47 to less than 480.18 score points)		Level 3 (from 480.18 to less than 552.89 score points)		Level 4 (from 552.89 to less than 625.61 score points)		Level 5 (from 625.61 to less than 698.32 score points)		Level 6 (above 698.32 score points)	
		%	S.E.	%	S.E.	%	S.E.	%	S.E.	%	S.E.	%	S.E.	%	S.E.	%	S.E.	%	S.E.
OECD	Australia*	0.3	(0.1)	1.5	(0.2)	6.0	(0.4)	13.4	(0.4)	21.4	(0.5)	25.0	(0.7)	20.1	(0.5)	9.5	(0.4)	2.9	(0.3)
	Austria	0.1	(0.1)	1.7	(0.2)	7.4	(0.6)	16.1	(0.8)	23.1	(0.8)	25.5	(0.8)	18.5	(0.8)	6.7	(0.5)	1.0	(0.2)
	Belgium	0.2	(0.1)	2.0	(0.3)	7.5	(0.5)	15.5	(0.7)	23.2	(0.8)	25.9	(0.9)	18.2	(0.7)	6.3	(0.4)	1.0	(0.2)
	Canada*	0.2	(0.1)	1.2	(0.1)	4.7	(0.2)	12.0	(0.4)	21.2	(0.5)	25.6	(0.7)	21.4	(0.5)	10.3	(0.4)	3.3	(0.3)
	Chile	0.4	(0.1)	1.8	(0.3)	8.8	(0.6)	22.6	(0.8)	29.1	(0.9)	23.9	(0.9)	10.9	(0.7)	2.3	(0.3)	0.2	(0.1)
	Colombia	0.4	(0.2)	4.6	(0.5)	17.3	(1.0)	29.1	(1.1)	25.9	(1.0)	15.8	(1.0)	5.9	(0.6)	1.0	(0.2)	0.1	(0.0)
	Costa Rica	0.3	(0.1)	3.1	(0.3)	14.7	(0.8)	29.0	(0.9)	30.0	(0.8)	17.3	(1.0)	4.9	(0.5)	0.7	(0.2)	0.1	(0.0)
	Czech Republic	0.1	(0.1)	0.8	(0.2)	5.0	(0.4)	15.4	(0.6)	24.8	(0.8)	27.0	(0.8)	18.8	(0.8)	6.9	(0.4)	1.1	(0.2)
	Denmark*	0.1	(0.0)	0.8	(0.2)	4.4	(0.4)	13.8	(0.7)	26.3	(0.9)	29.3	(0.9)	19.1	(0.8)	5.6	(0.5)	0.7	(0.2)
	Estonia	0.0	(0.0)	0.4	(0.1)	3.0	(0.4)	10.4	(0.7)	22.4	(0.8)	30.0	(0.8)	23.2	(0.7)	9.1	(0.5)	1.5	(0.3)
	Finland	0.2	(0.1)	1.7	(0.2)	6.1	(0.4)	13.5	(0.6)	22.6	(0.7)	26.8	(0.7)	20.4	(0.9)	7.5	(0.5)	1.2	(0.2)
	France	0.2	(0.1)	2.4	(0.3)	8.1	(0.6)	16.2	(0.7)	23.6	(0.8)	25.5	(0.9)	16.9	(0.8)	6.1	(0.5)	1.0	(0.2)
	Germany	0.2	(0.1)	1.9	(0.3)	7.2	(0.6)	16.2	(0.8)	23.8	(0.9)	24.7	(0.8)	17.8	(0.9)	6.7	(0.5)	1.4	(0.2)
	Greece	0.3	(0.1)	2.7	(0.4)	11.2	(0.8)	23.4	(0.9)	28.3	(0.8)	22.4	(0.9)	9.7	(0.6)	1.9	(0.2)	0.1	(0.1)
	Hungary	0.3	(0.1)	2.0	(0.3)	7.5	(0.6)	16.0	(0.9)	24.4	(0.9)	27.0	(1.1)	17.3	(0.8)	4.9	(0.5)	0.5	(0.1)
	Iceland	0.5	(0.1)	4.1	(0.5)	13.1	(0.7)	22.1	(0.9)	24.9	(1.0)	22.0	(0.8)	10.7	(0.8)	2.4	(0.4)	0.3	(0.1)
	Ireland*	0.0	(0.0)	0.3	(0.1)	2.3	(0.3)	8.7	(0.6)	21.4	(0.7)	31.8	(0.9)	25.2	(0.8)	9.1	(0.6)	1.1	(0.2)
	Israel	0.9	(0.2)	4.0	(0.4)	9.5	(0.6)	15.3	(0.7)	20.2	(0.7)	22.1	(0.8)	17.5	(0.7)	8.3	(0.6)	2.2	(0.3)
	Italy	0.1	(0.0)	1.0	(0.2)	5.5	(0.5)	14.8	(0.7)	26.0	(0.9)	29.8	(0.8)	17.8	(0.8)	4.6	(0.5)	0.4	(0.1)
	Japan	0.1	(0.0)	0.5	(0.1)	3.2	(0.4)	10.0	(0.7)	20.7	(0.9)	27.9	(1.1)	25.2	(1.0)	10.6	(0.7)	1.8	(0.3)
	Korea	0.3	(0.2)	1.0	(0.3)	3.6	(0.4)	9.7	(0.8)	19.4	(1.0)	28.0	(1.0)	24.7	(1.1)	10.8	(0.8)	2.5	(0.4)
	Latvia*	0.1	(0.0)	0.9	(0.2)	5.3	(0.5)	16.6	(0.8)	29.1	(0.9)	28.6	(0.8)	15.3	(0.8)	3.8	(0.5)	0.4	(0.1)
	Lithuania	0.1	(0.1)	1.2	(0.2)	6.6	(0.5)	16.9	(0.7)	27.8	(0.9)	27.1	(0.9)	15.5	(0.7)	4.2	(0.4)	0.5	(0.1)
	Mexico	0.2	(0.1)	2.8	(0.4)	14.2	(0.9)	29.8	(1.1)	30.8	(1.0)	16.7	(0.9)	5.0	(0.6)	0.6	(0.2)	0.0	(0.0)
	Netherlands*	0.3	(0.1)	3.4	(0.5)	12.5	(1.1)	18.3	(0.9)	20.4	(1.0)	21.5	(1.1)	16.6	(0.9)	6.0	(0.5)	1.0	(0.2)
	New Zealand*	0.1	(0.1)	1.1	(0.2)	6.0	(0.5)	13.5	(0.7)	21.1	(0.8)	24.8	(0.9)	20.3	(0.7)	10.4	(0.7)	2.7	(0.3)
	Norway	0.3	(0.1)	2.7	(0.3)	8.8	(0.5)	15.6	(0.7)	21.9	(0.8)	24.2	(0.7)	17.7	(0.8)	7.1	(0.4)	1.6	(0.2)
	Poland	0.2	(0.1)	1.6	(0.3)	6.5	(0.6)	14.0	(0.7)	22.4	(0.9)	26.9	(1.1)	19.7	(0.9)	7.5	(0.6)	1.3	(0.2)
	Portugal	0.1	(0.1)	1.2	(0.3)	6.0	(0.5)	15.8	(0.7)	26.8	(0.8)	28.5	(0.9)	16.8	(0.8)	4.3	(0.4)	0.4	(0.1)
	Slovak Republic	0.5	(0.2)	3.7	(0.5)	11.3	(0.8)	19.9	(0.8)	25.0	(0.9)	23.0	(0.8)	13.2	(0.7)	3.1	(0.3)	0.3	(0.1)
	Slovenia	0.2	(0.1)	1.8	(0.2)	7.3	(0.5)	16.8	(0.6)	26.9	(1.0)	27.3	(0.9)	15.3	(0.7)	4.0	(0.4)	0.4	(0.2)
	Spain	0.2	(0.1)	1.5	(0.2)	6.5	(0.3)	16.2	(0.5)	26.6	(0.5)	27.5	(0.5)	16.1	(0.5)	4.7	(0.3)	0.6	(0.1)
	Sweden	0.2	(0.1)	2.1	(0.3)	7.4	(0.5)	14.6	(0.6)	21.5	(0.8)	24.7	(1.0)	19.3	(0.9)	8.4	(0.6)	1.8	(0.3)
	Switzerland	0.1	(0.1)	1.5	(0.2)	6.8	(0.5)	16.2	(0.7)	23.5	(0.8)	24.7	(0.9)	18.6	(0.8)	7.2	(0.5)	1.4	(0.2)
	Türkiye	0.1	(0.0)	1.1	(0.2)	7.5	(0.5)	20.6	(0.8)	30.5	(0.9)	26.4	(0.8)	12.0	(0.6)	1.8	(0.2)	0.0	(0.0)
	United Kingdom*	0.2	(0.1)	1.3	(0.3)	5.3	(0.5)	13.3	(0.6)	23.9	(0.7)	26.4	(0.8)	19.5	(0.7)	7.9	(0.5)	2.2	(0.3)
	United States*	0.1	(0.1)	1.3	(0.3)	5.7	(0.7)	13.0	(0.8)	20.9	(0.9)	25.0	(0.9)	19.8	(1.0)	10.6	(0.8)	3.6	(0.5)
	OECD average	0.2	(0.0)	1.9	(0.0)	7.6	(0.1)	16.6	(0.1)	24.4	(0.1)	25.3	(0.1)	16.9	(0.1)	6.0	(0.1)	1.2	(0.0)

* Caution is required when interpreting estimates because one or more PISA sampling standards were not met (see Reader's Guide, Annexes A2 and A4).

** Caution is required when comparing estimates based on PISA 2022 with other countries/economies as a strong linkage to the international PISA reading scale could not be established (see Reader's Guide and Annex A4).

Table I.B1.3.2. Percentage of students at each proficiency level in reading [2/2]

		All students																	
		Below Level 1c (less than 189.33 score points)		Level 1c (from 189.33 to less than 262.04 score points)		Level 1b (from 262.04 to less than 334.75 score points)		Level 1a (from 334.75 to less than 407.47 score points)		Level 2 (from 407.47 to less than 480.18 score points)		Level 3 (from 480.18 to less than 552.89 score points)		Level 4 (from 552.89 to less than 625.61 score points)		Level 5 (from 625.61 to less than 698.32 score points)		Level 6 (above 698.32 score points)	
		%	S.E.	%	S.E.	%	S.E.	%	S.E.	%	S.E.	%	S.E.	%	S.E.	%	S.E.	%	S.E.
Partners	Albania	0.9	(0.2)	9.7	(0.6)	30.3	(0.9)	32.8	(1.0)	19.0	(0.8)	6.2	(0.5)	1.0	(0.2)	0.1	(0.1)	0.0	(0.0)
	Argentina	0.5	(0.1)	5.2	(0.4)	19.4	(0.8)	29.4	(0.8)	25.8	(0.8)	14.0	(0.7)	4.8	(0.4)	0.9	(0.2)	0.1	(0.0)
	Baku (Azerbaijan)	1.2	(0.3)	10.0	(0.6)	26.4	(0.8)	31.6	(0.7)	21.3	(0.9)	8.1	(0.5)	1.3	(0.2)	0.1	(0.0)	0.0	(0.0)
	Brazil	0.8	(0.1)	5.4	(0.4)	17.3	(0.6)	26.8	(0.7)	25.3	(0.6)	15.8	(0.6)	6.7	(0.5)	1.6	(0.2)	0.2	(0.1)
	Brunei Darussalam	0.4	(0.1)	4.1	(0.3)	13.8	(0.6)	23.9	(0.6)	26.2	(0.6)	20.2	(0.7)	9.4	(0.5)	1.9	(0.2)	0.2	(0.1)
	Bulgaria	1.3	(0.2)	7.6	(0.6)	19.0	(1.0)	25.0	(1.1)	22.5	(1.0)	15.1	(0.9)	7.3	(0.7)	1.9	(0.4)	0.2	(0.1)
	Cambodia	0.9	(0.2)	11.0	(0.8)	41.6	(1.3)	38.6	(1.4)	7.6	(0.8)	0.3	(0.2)	0.0	c	0.0	c	0.0	c
	Croatia	0.0	(0.0)	0.8	(0.2)	5.4	(0.5)	16.5	(0.8)	28.8	(0.9)	28.4	(1.0)	16.0	(0.8)	3.9	(0.5)	0.3	(0.1)
	Cyprus	2.3	(0.2)	11.4	(0.4)	22.6	(0.7)	24.3	(0.7)	20.2	(0.7)	12.8	(0.6)	5.0	(0.4)	1.3	(0.2)	0.1	(0.1)
	Dominican Republic	1.5	(0.2)	12.5	(0.7)	31.2	(1.0)	30.3	(1.3)	17.2	(0.7)	6.1	(0.5)	1.2	(0.3)	0.1	(0.0)	0.0	(0.0)
	El Salvador	0.5	(0.2)	7.9	(0.6)	29.5	(1.2)	34.2	(1.1)	19.4	(0.8)	7.1	(0.7)	1.4	(0.3)	0.1	(0.1)	0.0	(0.0)
	Georgia	0.7	(0.2)	7.3	(0.6)	25.7	(0.9)	33.1	(1.1)	22.1	(0.8)	8.9	(0.6)	1.9	(0.3)	0.1	(0.1)	0.0	(0.0)
	Guatemala	0.4	(0.1)	5.3	(0.6)	24.6	(1.0)	38.2	(1.1)	23.7	(0.9)	6.9	(0.7)	0.9	(0.3)	0.1	(0.0)	0.0	c
	Hong Kong (China)*	0.2	(0.1)	1.2	(0.2)	4.6	(0.5)	11.4	(0.7)	21.8	(0.9)	29.7	(0.9)	22.1	(0.8)	7.8	(0.6)	1.2	(0.2)
	Indonesia	0.9	(0.2)	8.6	(0.7)	29.6	(1.2)	35.4	(1.0)	19.3	(1.1)	5.4	(0.5)	0.7	(0.2)	0.0	(0.0)	0.0	(0.0)
	Jamaica*	0.9	(0.2)	5.3	(0.7)	17.1	(1.2)	26.9	(1.1)	25.1	(1.1)	17.0	(1.1)	6.9	(0.8)	1.0	(0.3)	0.0	(0.1)
	Jordan	1.3	(0.3)	14.0	(0.7)	32.6	(1.0)	31.6	(0.9)	16.4	(0.8)	3.6	(0.5)	0.4	(0.1)	0.0	(0.0)	0.0	c
	Kazakhstan	0.4	(0.1)	4.4	(0.3)	22.3	(0.7)	36.6	(0.7)	23.6	(0.6)	9.1	(0.4)	3.0	(0.2)	0.5	(0.1)	0.0	(0.0)
	Kosovo	0.4	(0.1)	10.4	(0.6)	37.2	(1.0)	35.0	(0.8)	14.4	(0.7)	2.4	(0.3)	0.1	(0.1)	0.0	(0.0)	0.0	c
	Macao (China)	0.1	(0.0)	0.6	(0.2)	2.7	(0.3)	9.2	(0.6)	22.4	(0.8)	31.6	(0.8)	24.4	(0.8)	8.0	(0.5)	0.9	(0.2)
	Malaysia	0.6	(0.1)	6.7	(0.5)	20.7	(0.9)	30.1	(0.9)	27.2	(1.0)	12.2	(0.7)	2.3	(0.4)	0.2	(0.1)	0.0	(0.0)
	Malta	0.8	(0.2)	4.9	(0.5)	12.1	(0.7)	18.5	(0.9)	23.8	(0.8)	22.2	(0.9)	13.3	(0.7)	4.0	(0.4)	0.5	(0.2)
	Moldova	0.3	(0.1)	3.9	(0.4)	15.9	(0.9)	28.8	(0.9)	29.2	(1.2)	16.8	(0.8)	4.8	(0.5)	0.5	(0.2)	0.0	(0.0)
	Mongolia	0.7	(0.2)	6.2	(0.5)	21.6	(0.8)	35.7	(0.8)	26.7	(0.8)	8.3	(0.6)	0.9	(0.2)	0.0	(0.0)	0.0	c
	Montenegro	0.3	(0.1)	4.2	(0.4)	18.3	(0.7)	30.0	(1.0)	26.1	(0.9)	15.6	(0.6)	4.9	(0.4)	0.6	(0.1)	0.0	(0.0)
	Morocco	1.5	(0.3)	13.8	(1.0)	34.2	(1.4)	31.6	(1.1)	15.1	(1.2)	3.5	(0.7)	0.3	(0.1)	0.0	(0.0)	0.0	c
	North Macedonia	0.6	(0.1)	8.9	(0.4)	30.4	(0.7)	33.7	(0.7)	20.3	(0.7)	5.5	(0.4)	0.5	(0.1)	0.0	(0.0)	0.0	c
	Palestinian Authority	1.5	(0.2)	11.7	(0.7)	30.0	(1.0)	34.0	(0.8)	18.5	(0.8)	4.0	(0.4)	0.3	(0.1)	0.0	(0.0)	0.0	c
	Panama*	0.8	(0.2)	6.9	(0.6)	20.9	(1.2)	29.1	(1.2)	24.4	(1.2)	12.8	(0.9)	4.2	(0.6)	0.7	(0.2)	0.1	(0.1)
	Paraguay	1.0	(0.2)	7.7	(0.6)	24.9	(1.0)	32.6	(0.9)	22.9	(0.9)	9.1	(0.7)	1.7	(0.2)	0.1	(0.0)	0.0	c
	Peru	0.5	(0.2)	4.6	(0.6)	16.8	(0.8)	28.5	(0.8)	27.2	(0.8)	16.6	(0.8)	5.2	(0.5)	0.7	(0.1)	0.0	(0.0)
	Philippines	1.0	(0.2)	15.0	(0.9)	33.7	(1.2)	26.6	(1.0)	15.9	(0.9)	6.4	(0.7)	1.3	(0.3)	0.1	(0.1)	0.0	c
	Qatar	0.6	(0.1)	5.5	(0.5)	16.6	(0.6)	24.6	(0.7)	24.3	(0.8)	17.1	(0.7)	8.4	(0.5)	2.5	(0.3)	0.4	(0.1)
	Romania	0.7	(0.2)	4.3	(0.4)	13.6	(0.9)	23.2	(1.2)	26.6	(1.0)	20.6	(1.1)	9.1	(0.8)	1.9	(0.4)	0.1	(0.0)
	Saudi Arabia	0.4	(0.1)	5.7	(0.5)	22.0	(0.8)	34.5	(0.8)	26.2	(0.9)	9.6	(0.6)	1.5	(0.2)	0.1	(0.1)	0.0	(0.0)
	Serbia	0.3	(0.2)	2.0	(0.3)	10.3	(0.7)	23.8	(0.8)	29.7	(0.9)	22.7	(0.9)	9.3	(0.6)	1.7	(0.4)	0.1	(0.1)
	Singapore	0.2	(0.1)	0.6	(0.1)	2.7	(0.3)	7.7	(0.5)	15.6	(0.6)	23.8	(0.7)	26.9	(0.7)	17.2	(0.6)	5.4	(0.4)
	Chinese Taipei	0.2	(0.1)	0.9	(0.2)	4.0	(0.4)	10.7	(0.7)	19.0	(0.8)	26.9	(1.1)	24.3	(1.1)	11.4	(0.9)	2.6	(0.4)
	Thailand	0.4	(0.1)	5.8	(0.5)	24.6	(1.0)	34.6	(1.2)	23.5	(1.0)	8.9	(0.7)	2.0	(0.4)	0.2	(0.1)	0.0	(0.0)
	Ukrainian regions (18 of 27)	0.4	(0.2)	3.5	(0.6)	12.7	(1.2)	24.3	(1.3)	29.7	(1.3)	20.6	(1.1)	7.1	(0.6)	1.4	(0.3)	0.1	(0.1)
	United Arab Emirates	2.3	(0.2)	8.8	(0.3)	16.8	(0.4)	20.1	(0.4)	20.2	(0.5)	16.5	(0.4)	10.3	(0.3)	4.0	(0.2)	1.0	(0.1)
	Uruguay	0.4	(0.1)	3.9	(0.4)	13.7	(0.6)	23.1	(0.8)	26.8	(0.9)	20.9	(0.7)	9.2	(0.5)	2.0	(0.3)	0.1	(0.1)
	Uzbekistan	0.9	(0.2)	12.3	(0.8)	37.7	(1.0)	35.0	(1.1)	12.2	(0.8)	1.8	(0.3)	0.1	(0.1)	0.0	(0.0)	0.0	c
	Viet Nam**	0.0	(0.0)	0.7	(0.2)	5.0	(0.7)	17.2	(1.1)	35.3	(1.2)	30.5	(1.4)	10.0	(1.0)	1.2	(0.3)	0.0	(0.0)

* Caution is required when interpreting estimates because one or more PISA sampling standards were not met (see Reader's Guide, Annexes A2 and A4).

** Caution is required when comparing estimates based on PISA 2022 with other countries/economies as a strong linkage to the international PISA reading scale could not be established (see Reader's Guide and Annex A4).

Table I.B1.3.3. Percentage of students at each proficiency level in science [1/2]

		All students															
		Below Level 1b (below 260.54 score points)		Level 1b (from 260.54 to less than 334.94 score points)		Level 1a (from 334.94 to less than 409.54 score points)		Level 2 (from 409.54 to less than 484.14 score points)		Level 3 (from 484.14 to less than 558.73 score points)		Level 4 (from 558.73 to less than 633.33 score points)		Level 5 (from 633.33 to less than 707.93 score points)		Level 6 (above 707.93 score points)	
		%	S.E.	%	S.E.	%	S.E.	%	S.E.	%	S.E.	%	S.E.	%	S.E.	%	S.E.
OECD	Australia*	1.0	(0.1)	4.8	(0.3)	13.7	(0.5)	22.2	(0.6)	25.3	(0.7)	20.3	(0.5)	9.6	(0.4)	3.0	(0.4)
	Austria	0.8	(0.2)	5.8	(0.6)	16.0	(0.7)	23.6	(0.7)	26.7	(0.9)	19.2	(0.8)	6.9	(0.4)	1.0	(0.2)
	Belgium	1.0	(0.2)	6.3	(0.6)	15.2	(0.7)	23.3	(0.7)	27.4	(0.7)	19.8	(0.7)	6.4	(0.5)	0.7	(0.1)
	Canada*	0.5	(0.1)	3.3	(0.2)	11.5	(0.5)	22.3	(0.6)	28.5	(0.7)	22.0	(0.7)	9.4	(0.4)	2.5	(0.2)
	Chile	2.1	(0.3)	9.9	(0.7)	24.4	(0.8)	30.3	(0.9)	22.3	(0.8)	9.2	(0.5)	1.7	(0.2)	0.1	(0.0)
	Colombia	3.1	(0.4)	16.5	(1.0)	31.9	(1.0)	28.3	(1.0)	15.0	(1.0)	4.6	(0.5)	0.7	(0.1)	0.0	(0.0)
	Costa Rica	2.4	(0.4)	15.0	(0.8)	33.4	(1.2)	31.2	(0.9)	14.2	(0.9)	3.4	(0.4)	0.4	(0.1)	0.0	(0.0)
	Czech Republic	0.6	(0.1)	4.2	(0.4)	15.1	(0.7)	24.9	(0.8)	27.4	(1.0)	18.9	(0.8)	7.5	(0.5)	1.5	(0.3)
	Denmark*	0.5	(0.1)	4.1	(0.5)	14.9	(0.8)	26.4	(1.1)	28.7	(0.9)	18.5	(0.9)	6.0	(0.6)	1.0	(0.3)
	Estonia	0.1	(0.1)	1.5	(0.3)	8.5	(0.6)	21.9	(0.8)	31.7	(0.9)	24.7	(0.8)	9.8	(0.6)	1.8	(0.2)
	Finland	0.8	(0.1)	4.4	(0.3)	12.8	(0.6)	21.6	(0.7)	26.6	(0.8)	21.2	(0.7)	9.9	(0.5)	2.8	(0.3)
	France	1.2	(0.2)	6.5	(0.6)	16.2	(0.9)	23.8	(0.8)	26.8	(0.9)	17.9	(0.8)	6.7	(0.4)	1.1	(0.2)
	Germany	1.0	(0.2)	6.4	(0.6)	15.5	(0.9)	24.0	(0.8)	25.4	(0.8)	18.0	(0.8)	7.8	(0.6)	1.9	(0.3)
	Greece	2.0	(0.4)	10.8	(0.8)	24.6	(0.9)	30.1	(0.9)	22.4	(0.8)	8.7	(0.7)	1.4	(0.3)	0.1	(0.0)
	Hungary	0.6	(0.2)	5.5	(0.5)	16.8	(0.9)	25.9	(1.0)	27.3	(1.0)	17.7	(0.9)	5.5	(0.5)	0.6	(0.1)
	Iceland	1.9	(0.3)	10.5	(0.8)	23.4	(1.1)	28.6	(1.1)	22.9	(1.0)	10.4	(0.8)	2.1	(0.4)	0.1	(0.1)
	Ireland*	0.4	(0.1)	3.1	(0.3)	12.1	(0.7)	25.4	(0.9)	30.4	(0.8)	21.0	(0.7)	6.8	(0.4)	0.8	(0.2)
	Israel	2.6	(0.4)	10.2	(0.7)	19.3	(0.8)	24.0	(0.9)	23.2	(0.9)	15.0	(0.8)	4.9	(0.5)	0.9	(0.2)
	Italy	0.9	(0.2)	5.6	(0.5)	17.4	(0.9)	27.9	(1.0)	28.3	(0.8)	15.6	(0.9)	3.9	(0.4)	0.4	(0.1)
	Japan	0.1	(0.1)	1.4	(0.2)	6.5	(0.6)	17.0	(0.9)	27.7	(0.9)	29.3	(1.0)	15.0	(0.9)	3.0	(0.4)
	Korea	1.0	(0.3)	3.2	(0.4)	9.5	(0.8)	18.4	(0.8)	27.0	(0.8)	25.2	(1.1)	12.7	(0.9)	3.0	(0.5)
	Latvia*	0.2	(0.1)	2.5	(0.4)	13.8	(0.7)	29.8	(0.9)	30.9	(0.9)	17.7	(0.8)	4.6	(0.5)	0.6	(0.1)
	Lithuania	0.5	(0.1)	4.6	(0.5)	16.7	(0.8)	28.4	(0.9)	28.1	(0.8)	16.3	(0.7)	4.8	(0.5)	0.7	(0.1)
	Mexico	2.0	(0.4)	13.9	(0.8)	35.0	(1.3)	32.7	(1.1)	13.9	(0.8)	2.5	(0.4)	0.1	(0.1)	0.0	(0.0)
	Netherlands*	1.2	(0.2)	7.8	(0.9)	18.3	(1.0)	21.3	(1.0)	22.0	(1.1)	18.8	(1.0)	8.9	(0.6)	1.6	(0.2)
	New Zealand*	0.9	(0.2)	5.1	(0.5)	14.3	(0.7)	21.8	(0.6)	25.9	(0.8)	20.0	(0.8)	9.8	(0.6)	2.2	(0.3)
	Norway	1.5	(0.2)	8.0	(0.5)	18.2	(0.7)	23.8	(0.7)	24.5	(0.8)	17.0	(0.8)	5.8	(0.4)	1.2	(0.2)
	Poland	0.4	(0.1)	4.4	(0.5)	13.8	(0.9)	24.3	(1.0)	28.9	(1.0)	20.1	(0.8)	7.0	(0.5)	1.0	(0.2)
	Portugal	0.6	(0.2)	4.7	(0.4)	16.5	(0.8)	27.8	(0.9)	28.2	(0.9)	17.3	(0.8)	4.4	(0.4)	0.5	(0.1)
	Slovak Republic	2.6	(0.4)	9.3	(0.7)	18.7	(0.8)	26.3	(1.1)	24.7	(1.1)	14.0	(0.8)	3.8	(0.4)	0.5	(0.1)
	Slovenia	0.3	(0.1)	3.5	(0.4)	13.9	(0.5)	25.7	(0.9)	29.0	(0.9)	19.5	(0.7)	6.9	(0.4)	1.1	(0.2)
	Spain	0.7	(0.1)	4.7	(0.3)	15.9	(0.5)	27.8	(0.6)	29.5	(0.7)	16.5	(0.5)	4.4	(0.3)	0.5	(0.1)
	Sweden	1.2	(0.2)	6.3	(0.5)	16.2	(0.8)	22.1	(0.8)	25.0	(0.9)	19.2	(0.7)	8.2	(0.5)	1.8	(0.2)
	Switzerland	0.4	(0.1)	4.1	(0.5)	14.8	(0.6)	23.7	(0.8)	26.6	(0.8)	21.0	(0.8)	8.1	(0.5)	1.5	(0.2)
	Türkiye	0.4	(0.1)	4.8	(0.4)	19.5	(0.7)	29.4	(0.7)	26.7	(0.8)	15.2	(0.6)	3.7	(0.3)	0.2	(0.1)
	United Kingdom*	0.7	(0.1)	5.0	(0.5)	14.4	(0.6)	24.3	(0.7)	26.4	(0.7)	19.2	(0.7)	8.1	(0.5)	2.0	(0.3)
	United States*	1.1	(0.2)	5.6	(0.6)	15.3	(1.0)	22.4	(0.8)	24.8	(0.9)	19.9	(1.0)	8.8	(0.8)	2.2	(0.4)
	OECD average	1.1	(0.0)	6.3	(0.1)	17.1	(0.1)	25.2	(0.1)	25.7	(0.1)	17.2	(0.1)	6.3	(0.1)	1.2	(0.0)

* Caution is required when interpreting estimates because one or more PISA sampling standards were not met (see Reader's Guide, Annexes A2 and A4).

Table I.B1.3.3. Percentage of students at each proficiency level in science [2/2]

		All students															
		Below Level 1b (below 260.54 score points)		Level 1b (from 260.54 to less than 334.94 score points)		Level 1a (from 334.94 to less than 409.54 score points)		Level 2 (from 409.54 to less than 484.14 score points)		Level 3 (from 484.14 to less than 558.73 score points)		Level 4 (from 558.73 to less than 633.33 score points)		Level 5 (from 633.33 to less than 707.93 score points)		Level 6 (above 707.93 score points)	
		%	S.E.	%	S.E.	%	S.E.	%	S.E.	%	S.E.	%	S.E.	%	S.E.	%	S.E.
Partners	Albania	6.9	(0.5)	25.6	(1.2)	34.8	(1.0)	22.5	(0.8)	8.1	(0.6)	1.8	(0.3)	0.2	(0.1)	0.0	(0.0)
	Argentina	3.4	(0.4)	17.5	(0.9)	33.0	(0.9)	27.5	(0.9)	13.8	(0.7)	4.1	(0.4)	0.5	(0.1)	0.0	(0.0)
	Baku (Azerbaijan)	5.2	(0.5)	24.5	(0.9)	36.1	(0.8)	24.2	(0.9)	8.4	(0.5)	1.4	(0.3)	0.1	(0.1)	0.0	(0.0)
	Brazil	5.1	(0.3)	19.1	(0.6)	31.2	(0.7)	25.4	(0.6)	13.2	(0.6)	4.8	(0.4)	1.0	(0.2)	0.2	(0.1)
	Brunei Darussalam	1.5	(0.2)	10.5	(0.5)	25.1	(0.7)	28.6	(0.8)	21.7	(0.7)	10.2	(0.6)	2.2	(0.3)	0.2	(0.1)
	Bulgaria	3.1	(0.4)	16.3	(0.9)	28.6	(1.0)	26.2	(0.9)	17.4	(0.9)	6.9	(0.6)	1.4	(0.3)	0.1	(0.1)
	Cambodia	4.5	(0.6)	35.6	(1.5)	49.5	(1.2)	9.9	(1.0)	0.5	(0.2)	0.0	(0.0)	0.0	c	0.0	c
	Croatia	0.6	(0.1)	5.0	(0.5)	16.9	(0.7)	28.5	(0.8)	27.4	(0.9)	16.2	(0.7)	4.9	(0.4)	0.5	(0.1)
	Cyprus	6.3	(0.4)	19.7	(0.6)	25.8	(0.7)	23.0	(0.9)	16.2	(0.6)	7.0	(0.4)	1.8	(0.3)	0.2	(0.1)
	Dominican Republic	6.2	(0.5)	31.4	(1.0)	39.0	(1.0)	18.7	(0.9)	4.2	(0.4)	0.4	(0.1)	0.0	(0.0)	0.0	c
	El Salvador	5.0	(0.6)	26.5	(1.2)	39.4	(1.0)	21.2	(1.0)	6.8	(0.6)	1.0	(0.2)	0.1	(0.1)	0.0	c
	Georgia	5.1	(0.4)	23.2	(0.8)	36.3	(0.9)	24.0	(0.8)	9.0	(0.6)	2.2	(0.4)	0.2	(0.1)	0.0	(0.0)
	Guatemala	3.1	(0.5)	25.5	(1.1)	44.4	(1.1)	21.7	(0.9)	4.7	(0.7)	0.5	(0.2)	0.0	(0.0)	0.0	c
	HongKong (China)*	0.2	(0.1)	2.6	(0.4)	10.0	(0.7)	20.8	(0.9)	30.2	(1.1)	25.4	(0.9)	9.3	(0.6)	1.4	(0.2)
	Indonesia	3.6	(0.4)	21.2	(1.1)	41.1	(1.1)	26.3	(1.1)	7.0	(0.6)	0.8	(0.2)	0.0	(0.0)	0.0	c
	Jamaica*	5.2	(0.7)	20.1	(1.3)	29.4	(1.2)	25.5	(1.1)	13.8	(1.1)	5.2	(0.7)	0.9	(0.2)	0.0	(0.0)
	Jordan	5.3	(0.5)	25.9	(1.0)	37.7	(0.8)	23.3	(0.9)	6.8	(0.6)	0.9	(0.2)	0.0	(0.0)	0.0	(0.0)
	Kazakhstan	1.3	(0.2)	10.3	(0.6)	33.6	(0.7)	34.6	(0.7)	15.2	(0.6)	4.2	(0.3)	0.8	(0.1)	0.1	(0.0)
	Kosovo	5.2	(0.5)	34.7	(1.1)	39.3	(1.1)	16.7	(0.7)	3.7	(0.4)	0.3	(0.1)	0.0	(0.0)	0.0	c
	Macao (China)	0.2	(0.1)	1.2	(0.2)	6.1	(0.5)	16.6	(0.8)	30.5	(0.9)	30.7	(0.9)	12.7	(0.6)	2.0	(0.3)
	Malaysia	1.5	(0.3)	14.0	(0.9)	32.4	(1.0)	32.6	(1.0)	15.7	(0.8)	3.3	(0.5)	0.4	(0.2)	0.1	(0.1)
	Malta	1.8	(0.3)	9.5	(0.7)	19.0	(0.9)	25.3	(0.9)	25.1	(0.9)	14.8	(0.7)	4.1	(0.5)	0.5	(0.2)
	Moldova	2.1	(0.3)	14.2	(0.8)	32.3	(0.9)	30.1	(0.9)	16.0	(0.8)	4.8	(0.5)	0.5	(0.1)	0.0	(0.0)
	Mongolia	1.8	(0.3)	13.6	(0.7)	34.3	(1.1)	32.5	(0.9)	14.7	(0.8)	2.9	(0.4)	0.2	(0.1)	0.0	c
	Montenegro	3.4	(0.5)	18.5	(0.7)	33.0	(1.2)	27.4	(0.7)	14.1	(0.7)	3.3	(0.3)	0.3	(0.1)	0.0	(0.0)
	Morocco	4.3	(0.5)	30.6	(1.5)	40.6	(1.1)	19.5	(1.3)	4.6	(0.7)	0.4	(0.1)	0.0	(0.0)	0.0	c
	NorthMacedonia	5.9	(0.4)	25.7	(0.8)	33.8	(0.8)	23.3	(0.6)	9.4	(0.5)	1.8	(0.2)	0.1	(0.1)	0.0	(0.0)
	Palestinian Authority	5.5	(0.4)	27.8	(0.9)	39.1	(0.9)	21.3	(0.9)	5.6	(0.5)	0.7	(0.2)	0.0	(0.0)	0.0	c
	Panama*	6.1	(0.8)	22.5	(1.1)	33.6	(1.3)	23.7	(1.0)	10.8	(1.0)	2.8	(0.6)	0.5	(0.2)	0.0	(0.0)
	Paraguay	6.9	(0.6)	28.2	(1.1)	36.0	(1.1)	21.5	(0.9)	6.3	(0.5)	1.0	(0.2)	0.0	(0.0)	0.0	c
	Peru	3.4	(0.4)	17.0	(0.8)	32.2	(0.9)	28.2	(0.8)	14.8	(0.7)	4.0	(0.4)	0.5	(0.1)	0.0	(0.0)
	Philippines	8.3	(0.7)	35.8	(1.1)	33.1	(0.9)	16.0	(0.9)	5.6	(0.7)	1.0	(0.2)	0.1	(0.1)	0.0	(0.0)
	Qatar	2.2	(0.2)	13.9	(0.6)	27.6	(0.6)	27.7	(0.7)	17.8	(0.7)	8.0	(0.4)	2.4	(0.3)	0.4	(0.1)
	Romania	3.2	(0.4)	14.9	(1.0)	25.9	(1.1)	27.0	(0.9)	19.6	(1.1)	8.0	(0.7)	1.3	(0.2)	0.1	(0.1)
	Saudi Arabia	2.3	(0.4)	19.3	(0.9)	40.6	(1.1)	28.2	(1.1)	8.4	(0.6)	1.1	(0.2)	0.0	(0.0)	0.0	(0.0)
	Serbia	1.6	(0.3)	9.1	(0.7)	24.5	(0.9)	30.7	(0.9)	22.5	(0.9)	9.5	(0.6)	2.0	(0.5)	0.2	(0.1)
	Singapore	0.2	(0.1)	1.5	(0.2)	6.2	(0.5)	13.9	(0.6)	24.2	(0.6)	29.7	(0.7)	18.9	(0.6)	5.6	(0.4)
	Chinese Taipei	0.4	(0.1)	2.6	(0.4)	9.1	(0.6)	17.2	(0.8)	26.4	(1.0)	26.6	(1.1)	14.2	(1.0)	3.6	(0.6)
	Thailand	2.3	(0.3)	15.6	(1.0)	35.2	(1.1)	28.8	(1.0)	13.8	(0.8)	3.8	(0.5)	0.6	(0.2)	0.0	(0.0)
	Ukrainian regions (18 of 27)	1.3	(0.3)	9.0	(1.0)	23.8	(1.2)	30.3	(1.1)	23.9	(1.2)	9.7	(0.7)	2.0	(0.4)	0.1	(0.1)
	United Arab Emirates	4.4	(0.3)	15.8	(0.6)	24.8	(0.6)	23.2	(0.5)	17.7	(0.4)	10.2	(0.3)	3.3	(0.2)	0.6	(0.1)
	Uruguay	2.2	(0.3)	11.9	(0.8)	26.4	(0.8)	29.3	(0.9)	20.6	(0.7)	8.1	(0.5)	1.5	(0.2)	0.1	(0.1)
	Uzbekistan	6.0	(0.6)	32.5	(1.1)	42.6	(0.9)	16.5	(0.9)	2.2	(0.3)	0.1	(0.1)	0.0	(0.0)	0.0	c
	Viet Nam	0.5	(0.2)	3.6	(0.6)	16.9	(1.1)	34.4	(1.1)	31.2	(1.2)	11.5	(0.9)	1.7	(0.3)	0.1	(0.1)

* Caution is required when interpreting estimates because one or more PISA sampling standards were not met (see Reader's Guide, Annexes A2 and A4).

Table I.B1.4.2. Students' socio-economic status [1/2]

		Students' socio-economic status measured by the PISA index of economic, social and cultural status (ESCS)																			
		All students		Variability in the index		Bottom quarter		Second quarter		Third quarter		Fourth quarter		Top - Bottom quarter		10th percentile		90th percentile		90th - 10th percentile	
		Mean index	S.E.	S.D.	S.E.	Mean index	S.E.	Mean index	S.E.	Mean index	S.E.	Mean index	S.E.	Dif.	S.E.	Value	S.E.	Value	S.E.	Dif.	S.E.
OECD	Australia*	0.38	(0.01)	0.84	(0.01)	-0.80	(0.02)	0.21	(0.02)	0.80	(0.01)	1.31	(0.01)	**2.10**	(0.02)	-0.80	(0.02)	1.31	(0.01)	**2.11**	(0.01)
	Austria	0.07	(0.02)	0.94	(0.01)	-1.18	(0.03)	-0.21	(0.02)	0.47	(0.03)	1.20	(0.02)	**2.37**	(0.03)	-1.15	(0.03)	1.23	(0.02)	**2.38**	(0.03)
	Belgium	0.08	(0.02)	0.93	(0.01)	-1.19	(0.03)	-0.15	(0.03)	0.53	(0.02)	1.14	(0.02)	**2.33**	(0.03)	-1.17	(0.03)	1.16	(0.01)	**2.34**	(0.03)
	Canada*	0.38	(0.01)	0.76	(0.01)	-0.66	(0.02)	0.19	(0.02)	0.74	(0.01)	1.25	(0.01)	**1.91**	(0.02)	-0.68	(0.02)	1.26	(0.01)	**1.94**	(0.02)
	Chile	-0.51	(0.03)	0.94	(0.01)	-1.71	(0.03)	-0.85	(0.03)	-0.18	(0.04)	0.70	(0.03)	**2.41**	(0.03)	-1.72	(0.03)	0.77	(0.03)	**2.49**	(0.04)
	Colombia	-1.07	(0.04)	1.20	(0.02)	-2.62	(0.04)	-1.47	(0.04)	-0.66	(0.05)	0.49	(0.05)	**3.10**	(0.06)	-2.68	(0.05)	0.58	(0.06)	**3.26**	(0.07)
	Costa Rica	m	m	m	m	m	m	m	m	m	m	m	m	m	m	m	m	m	m	m	m
	Czech Republic	-0.10	(0.02)	0.87	(0.01)	-1.19	(0.02)	-0.48	(0.02)	0.21	(0.02)	1.04	(0.01)	**2.23**	(0.02)	-1.20	(0.01)	1.09	(0.01)	**2.29**	(0.02)
	Denmark*	0.48	(0.02)	0.75	(0.01)	-0.58	(0.03)	0.38	(0.02)	0.84	(0.01)	1.26	(0.01)	**1.84**	(0.02)	-0.58	(0.02)	1.27	(0.01)	**1.85**	(0.02)
	Estonia	0.15	(0.02)	0.79	(0.01)	-0.93	(0.02)	-0.10	(0.03)	0.54	(0.02)	1.09	(0.01)	**2.02**	(0.02)	-0.95	(0.03)	1.11	(0.02)	**2.06**	(0.03)
	Finland	0.26	(0.01)	0.81	(0.01)	-0.85	(0.02)	0.03	(0.02)	0.66	(0.02)	1.19	(0.01)	**2.04**	(0.01)	-0.86	(0.02)	1.21	(0.01)	**2.07**	(0.02)
	France	0.00	(0.02)	0.92	(0.01)	-1.23	(0.02)	-0.26	(0.03)	0.42	(0.03)	1.08	(0.02)	**2.32**	(0.02)	-1.21	(0.02)	1.11	(0.02)	**2.32**	(0.03)
	Germany	-0.14	(0.03)	1.04	(0.01)	-1.53	(0.04)	-0.44	(0.03)	0.30	(0.03)	1.13	(0.02)	**2.66**	(0.03)	-1.54	(0.03)	1.17	(0.02)	**2.71**	(0.03)
	Greece	-0.15	(0.02)	0.92	(0.01)	-1.40	(0.03)	-0.45	(0.03)	0.26	(0.03)	0.96	(0.02)	**2.36**	(0.03)	-1.38	(0.03)	0.99	(0.02)	**2.37**	(0.03)
	Hungary	0.00	(0.02)	0.96	(0.01)	-1.28	(0.03)	-0.32	(0.03)	0.46	(0.03)	1.16	(0.01)	**2.43**	(0.03)	-1.29	(0.02)	1.18	(0.02)	**2.47**	(0.03)
	Iceland	0.38	(0.01)	0.78	(0.01)	-0.71	(0.03)	0.23	(0.02)	0.76	(0.01)	1.23	(0.01)	**1.95**	(0.03)	-0.73	(0.03)	1.24	(0.01)	**1.97**	(0.03)
	Ireland*	0.33	(0.03)	0.80	(0.01)	-0.79	(0.04)	0.15	(0.04)	0.74	(0.03)	1.24	(0.01)	**2.03**	(0.03)	-0.83	(0.04)	1.25	(0.01)	**2.09**	(0.03)
	Israel	0.28	(0.02)	0.92	(0.01)	-1.01	(0.03)	0.12	(0.03)	0.73	(0.02)	1.28	(0.02)	**2.30**	(0.03)	-1.03	(0.03)	1.29	(0.02)	**2.32**	(0.03)
	Italy	-0.10	(0.02)	0.93	(0.01)	-1.33	(0.03)	-0.40	(0.02)	0.27	(0.03)	1.06	(0.02)	**2.39**	(0.03)	-1.36	(0.04)	1.11	(0.01)	**2.47**	(0.04)
	Japan	-0.01	(0.01)	0.71	(0.01)	-0.96	(0.02)	-0.22	(0.02)	0.29	(0.02)	0.86	(0.02)	**1.82**	(0.02)	-0.99	(0.03)	0.88	(0.02)	**1.87**	(0.03)
	Korea	0.22	(0.03)	0.82	(0.01)	-0.87	(0.03)	-0.02	(0.03)	0.58	(0.03)	1.21	(0.02)	**2.09**	(0.03)	-0.92	(0.02)	1.22	(0.03)	**2.14**	(0.03)
	Latvia*	-0.01	(0.02)	0.83	(0.01)	-1.12	(0.02)	-0.28	(0.02)	0.36	(0.02)	1.00	(0.01)	**2.12**	(0.02)	-1.12	(0.02)	1.02	(0.02)	**2.15**	(0.02)
	Lithuania	0.05	(0.02)	0.89	(0.01)	-1.17	(0.02)	-0.22	(0.02)	0.50	(0.02)	1.10	(0.01)	**2.27**	(0.02)	-1.18	(0.02)	1.10	(0.01)	**2.29**	(0.02)
	Mexico	-0.95	(0.03)	1.16	(0.02)	-2.42	(0.03)	-1.44	(0.04)	-0.54	(0.05)	0.59	(0.04)	**3.01**	(0.04)	-2.43	(0.03)	0.66	(0.04)	**3.09**	(0.04)
	Netherlands*	0.25	(0.02)	0.87	(0.01)	-0.94	(0.03)	0.08	(0.03)	0.67	(0.02)	1.20	(0.02)	**2.15**	(0.03)	-0.91	(0.03)	1.22	(0.01)	**2.13**	(0.03)
	New Zealand*	0.22	(0.02)	0.92	(0.01)	-1.06	(0.04)	0.02	(0.03)	0.66	(0.02)	1.25	(0.02)	**2.31**	(0.04)	-1.10	(0.04)	1.26	(0.02)	**2.36**	(0.04)
	Norway	0.52	(0.02)	0.83	(0.01)	-0.62	(0.03)	0.39	(0.03)	0.92	(0.02)	1.40	(0.01)	**2.02**	(0.03)	-0.58	(0.04)	1.39	(0.01)	**1.97**	(0.03)
	Poland	-0.11	(0.02)	0.89	(0.01)	-1.21	(0.01)	-0.52	(0.02)	0.26	(0.03)	1.04	(0.02)	**2.25**	(0.02)	-1.19	(0.01)	1.07	(0.02)	**2.26**	(0.02)
	Portugal	-0.23	(0.03)	1.14	(0.01)	-1.77	(0.03)	-0.60	(0.04)	0.31	(0.04)	1.16	(0.02)	**2.93**	(0.03)	-1.83	(0.04)	1.20	(0.01)	**3.03**	(0.03)
	Slovak Republic	-0.30	(0.02)	0.96	(0.01)	-1.51	(0.03)	-0.68	(0.03)	0.05	(0.03)	0.93	(0.02)	**2.44**	(0.04)	-1.46	(0.04)	0.97	(0.02)	**2.43**	(0.04)
	Slovenia	0.23	(0.01)	0.84	(0.01)	-0.93	(0.02)	-0.01	(0.02)	0.65	(0.01)	1.20	(0.01)	**2.13**	(0.02)	-0.96	(0.03)	1.20	(0.01)	**2.16**	(0.03)
	Spain	-0.03	(0.02)	1.01	(0.01)	-1.43	(0.03)	-0.26	(0.02)	0.45	(0.02)	1.10	(0.01)	**2.53**	(0.03)	-1.50	(0.03)	1.13	(0.01)	**2.62**	(0.03)
	Sweden	0.33	(0.02)	0.85	(0.01)	-0.85	(0.03)	0.16	(0.02)	0.75	(0.02)	1.25	(0.01)	**2.10**	(0.03)	-0.84	(0.02)	1.25	(0.02)	**2.09**	(0.02)
	Switzerland	0.17	(0.02)	0.93	(0.01)	-1.10	(0.03)	-0.05	(0.03)	0.61	(0.02)	1.22	(0.01)	**2.32**	(0.03)	-1.06	(0.03)	1.24	(0.01)	**2.30**	(0.03)
	Türkiye	-1.19	(0.04)	1.17	(0.02)	-2.62	(0.03)	-1.67	(0.04)	-0.87	(0.05)	0.42	(0.06)	**3.04**	(0.05)	-2.64	(0.03)	0.56	(0.05)	**3.20**	(0.05)
	United Kingdom*	0.14	(0.02)	0.89	(0.01)	-1.06	(0.03)	-0.14	(0.03)	0.54	(0.02)	1.20	(0.02)	**2.26**	(0.03)	-1.06	(0.02)	1.22	(0.02)	**2.28**	(0.02)
	United States*	0.06	(0.04)	0.98	(0.02)	-1.27	(0.05)	-0.22	(0.06)	0.53	(0.05)	1.19	(0.03)	**2.47**	(0.04)	-1.24	(0.05)	1.21	(0.03)	**2.45**	(0.04)
	OECD average	0.00	(0.00)	0.91	(0.00)	-1.22	(0.00)	-0.26	(0.00)	0.41	(0.00)	1.09	(0.00)	**2.31**	(0.00)	-1.23	(0.00)	1.12	(0.00)	**2.34**	(0.01)

* Caution is required when interpreting estimates because one or more PISA sampling standards were not met (see Reader's Guide, Annexes A2 and A4).Note: Values that are statistically significant are indicated in bold (see Annex A3).

Table I.B1.4.2. Students' socio-economic status [2/2]

		Students' socio-economic status measured by the PISA index of economic, social and cultural status (ESCS)																			
		All students		Variability in the index		Bottom quarter		Second quarter		Third quarter		Fourth quarter		Top - Bottom quarter		10th percentile		90th percentile		90th - 10th percentile	
		Mean index	S.E.	S.D.	S.E.	Mean index	S.E.	Mean index	S.E.	Mean index	S.E.	Mean index	S.E.	Dif.	S.E.	Value	S.E.	Value	S.E.	Dif.	S.E.
Partners	Albania	-0.75	(0.02)	1.09	(0.01)	-2.15	(0.02)	-1.17	(0.03)	-0.34	(0.03)	0.65	(0.03)	**2.81**	(0.04)	-2.20	(0.03)	0.69	(0.03)	**2.89**	(0.04)
	Argentina	-0.80	(0.04)	1.15	(0.01)	-2.28	(0.04)	-1.19	(0.04)	-0.39	(0.05)	0.67	(0.04)	**2.95**	(0.04)	-2.32	(0.05)	0.75	(0.04)	**3.06**	(0.05)
	Baku (Azerbaijan)	-0.51	(0.03)	0.93	(0.01)	-1.68	(0.02)	-0.86	(0.03)	-0.19	(0.03)	0.70	(0.03)	**2.38**	(0.03)	-1.69	(0.03)	0.73	(0.03)	**2.42**	(0.04)
	Brazil	-0.99	(0.02)	1.13	(0.01)	-2.49	(0.03)	-1.32	(0.02)	-0.58	(0.02)	0.43	(0.03)	**2.91**	(0.04)	-2.52	(0.04)	0.47	(0.03)	**3.00**	(0.04)
	Brunei Darussalam	-0.26	(0.01)	0.94	(0.01)	-1.47	(0.02)	-0.62	(0.02)	0.10	(0.02)	0.95	(0.01)	**2.42**	(0.02)	-1.48	(0.02)	0.98	(0.01)	**2.47**	(0.02)
	Bulgaria	-0.27	(0.03)	1.05	(0.02)	-1.65	(0.05)	-0.61	(0.04)	0.21	(0.03)	0.96	(0.02)	**2.61**	(0.05)	-1.57	(0.05)	0.97	(0.01)	**2.54**	(0.04)
	Cambodia	-2.01	(0.03)	1.24	(0.02)	-3.55	(0.03)	-2.47	(0.04)	-1.66	(0.04)	-0.36	(0.06)	**3.19**	(0.06)	-3.61	(0.04)	-0.27	(0.06)	**3.34**	(0.07)
	Croatia	-0.15	(0.02)	0.83	(0.01)	-1.20	(0.02)	-0.53	(0.02)	0.19	(0.03)	0.92	(0.02)	**2.12**	(0.02)	-1.20	(0.01)	0.96	(0.01)	**2.16**	(0.02)
	Cyprus	0.16	(0.01)	0.91	(0.01)	-1.09	(0.02)	-0.05	(0.02)	0.58	(0.01)	1.21	(0.01)	**2.30**	(0.02)	-1.10	(0.02)	1.22	(0.01)	**2.31**	(0.02)
	Dominican Republic	-0.71	(0.02)	1.01	(0.01)	-2.04	(0.03)	-1.03	(0.03)	-0.31	(0.03)	0.54	(0.03)	**2.57**	(0.03)	-2.02	(0.03)	0.58	(0.03)	**2.60**	(0.04)
	El Salvador	-1.39	(0.03)	1.23	(0.02)	-2.92	(0.03)	-1.85	(0.03)	-1.03	(0.04)	0.24	(0.05)	**3.16**	(0.05)	-2.95	(0.03)	0.36	(0.06)	**3.31**	(0.06)
	Georgia	-0.47	(0.02)	0.94	(0.01)	-1.67	(0.02)	-0.81	(0.03)	-0.11	(0.03)	0.73	(0.02)	**2.39**	(0.03)	-1.68	(0.02)	0.76	(0.02)	**2.44**	(0.03)
	Guatemala	-1.51	(0.05)	1.38	(0.02)	-3.24	(0.04)	-2.08	(0.05)	-1.04	(0.06)	0.32	(0.07)	**3.56**	(0.06)	-3.27	(0.04)	0.39	(0.07)	**3.66**	(0.06)
	Hong Kong (China)*	-0.46	(0.04)	1.01	(0.01)	-1.73	(0.03)	-0.87	(0.03)	-0.12	(0.05)	0.86	(0.04)	**2.59**	(0.04)	-1.72	(0.03)	0.93	(0.04)	**2.65**	(0.04)
	Indonesia	-1.56	(0.04)	1.06	(0.02)	-2.86	(0.03)	-1.95	(0.04)	-1.29	(0.04)	-0.13	(0.05)	**2.73**	(0.05)	-2.89	(0.04)	-0.04	(0.07)	**2.85**	(0.07)
	Jamaica*	-0.55	(0.03)	0.95	(0.01)	-1.76	(0.03)	-0.85	(0.02)	-0.22	(0.03)	0.63	(0.03)	**2.39**	(0.03)	-1.73	(0.04)	0.70	(0.04)	**2.43**	(0.04)
	Jordan	-0.82	(0.02)	1.10	(0.01)	-2.23	(0.03)	-1.20	(0.03)	-0.38	(0.03)	0.55	(0.02)	**2.78**	(0.03)	-2.21	(0.03)	0.58	(0.02)	**2.79**	(0.03)
	Kazakhstan	-0.37	(0.02)	0.83	(0.01)	-1.49	(0.02)	-0.64	(0.02)	0.00	(0.02)	0.64	(0.01)	**2.13**	(0.02)	-1.52	(0.02)	0.67	(0.02)	**2.19**	(0.02)
	Kosovo	-0.34	(0.01)	0.89	(0.01)	-1.51	(0.02)	-0.61	(0.02)	0.00	(0.02)	0.75	(0.02)	**2.26**	(0.02)	-1.53	(0.03)	0.78	(0.02)	**2.31**	(0.03)
	Macao (China)	-0.45	(0.01)	0.91	(0.01)	-1.58	(0.02)	-0.80	(0.01)	-0.16	(0.01)	0.75	(0.02)	**2.33**	(0.02)	-1.58	(0.01)	0.81	(0.02)	**2.39**	(0.02)
	Malaysia	-0.68	(0.03)	1.04	(0.02)	-1.98	(0.03)	-1.10	(0.03)	-0.33	(0.04)	0.67	(0.03)	**2.66**	(0.04)	-1.93	(0.02)	0.74	(0.04)	**2.67**	(0.04)
	Malta	0.02	(0.02)	0.98	(0.01)	-1.30	(0.02)	-0.29	(0.02)	0.48	(0.02)	1.19	(0.02)	**2.49**	(0.03)	-1.37	(0.02)	1.20	(0.02)	**2.57**	(0.03)
	Moldova	-0.52	(0.02)	0.96	(0.01)	-1.76	(0.02)	-0.89	(0.03)	-0.15	(0.03)	0.70	(0.02)	**2.46**	(0.03)	-1.77	(0.02)	0.74	(0.03)	**2.51**	(0.03)
	Mongolia	-0.73	(0.03)	1.07	(0.01)	-2.14	(0.03)	-1.09	(0.04)	-0.28	(0.04)	0.59	(0.03)	**2.72**	(0.03)	-2.15	(0.04)	0.63	(0.02)	**2.78**	(0.04)
	Montenegro	-0.21	(0.01)	0.86	(0.01)	-1.31	(0.02)	-0.50	(0.02)	0.12	(0.02)	0.87	(0.01)	**2.18**	(0.02)	-1.28	(0.02)	0.89	(0.01)	**2.17**	(0.02)
	Morocco	-1.78	(0.06)	1.35	(0.03)	-3.49	(0.04)	-2.27	(0.05)	-1.39	(0.06)	0.01	(0.11)	**3.50**	(0.10)	-3.55	(0.04)	0.15	(0.12)	**3.71**	(0.11)
	North Macedonia	-0.28	(0.01)	0.93	(0.01)	-1.51	(0.02)	-0.59	(0.01)	0.11	(0.01)	0.87	(0.01)	**2.37**	(0.02)	-1.51	(0.03)	0.90	(0.01)	**2.41**	(0.03)
	Palestinian Authority	-0.91	(0.02)	1.06	(0.01)	-2.27	(0.03)	-1.29	(0.02)	-0.51	(0.03)	0.42	(0.02)	**2.68**	(0.03)	-2.25	(0.03)	0.44	(0.02)	**2.69**	(0.03)
	Panama*	-0.95	(0.05)	1.30	(0.03)	-2.71	(0.05)	-1.33	(0.05)	-0.38	(0.07)	0.63	(0.06)	**3.34**	(0.06)	-2.74	(0.06)	0.67	(0.06)	**3.41**	(0.07)
	Paraguay	-1.24	(0.03)	1.33	(0.02)	-2.96	(0.03)	-1.75	(0.03)	-0.74	(0.04)	0.47	(0.04)	**3.43**	(0.05)	-3.01	(0.04)	0.52	(0.05)	**3.53**	(0.06)
	Peru	-1.15	(0.04)	1.24	(0.02)	-2.76	(0.04)	-1.55	(0.03)	-0.75	(0.05)	0.44	(0.04)	**3.20**	(0.05)	-2.85	(0.06)	0.55	(0.04)	**3.40**	(0.06)
	Philippines	-1.34	(0.04)	1.13	(0.02)	-2.78	(0.04)	-1.74	(0.04)	-0.94	(0.04)	0.11	(0.04)	**2.89**	(0.05)	-2.77	(0.05)	0.17	(0.04)	**2.95**	(0.05)
	Qatar	0.11	(0.01)	0.86	(0.01)	-1.08	(0.02)	0.01	(0.01)	0.48	(0.01)	1.02	(0.01)	**2.10**	(0.03)	-1.05	(0.04)	1.01	(0.02)	**2.06**	(0.04)
	Romania	-0.36	(0.04)	1.03	(0.01)	-1.67	(0.04)	-0.77	(0.04)	0.03	(0.06)	0.96	(0.03)	**2.62**	(0.03)	-1.63	(0.03)	1.00	(0.03)	**2.63**	(0.03)
	Saudi Arabia	-0.29	(0.03)	1.05	(0.02)	-1.73	(0.04)	-0.53	(0.04)	0.21	(0.03)	0.89	(0.02)	**2.61**	(0.04)	-1.71	(0.04)	0.89	(0.02)	**2.60**	(0.04)
	Serbia	-0.20	(0.02)	0.84	(0.02)	-1.28	(0.04)	-0.51	(0.02)	0.13	(0.02)	0.86	(0.01)	**2.14**	(0.04)	-1.25	(0.02)	0.91	(0.01)	**2.16**	(0.02)
	Singapore	0.31	(0.01)	0.83	(0.01)	-0.87	(0.02)	0.17	(0.02)	0.72	(0.01)	1.21	(0.01)	**2.08**	(0.02)	-0.92	(0.02)	1.22	(0.01)	**2.14**	(0.02)
	Chinese Taipei	-0.19	(0.03)	0.90	(0.01)	-1.38	(0.03)	-0.47	(0.04)	0.19	(0.04)	0.91	(0.02)	**2.28**	(0.03)	-1.39	(0.03)	0.94	(0.02)	**2.34**	(0.03)
	Thailand	-1.23	(0.04)	1.13	(0.02)	-2.68	(0.04)	-1.64	(0.04)	-0.84	(0.04)	0.24	(0.05)	**2.93**	(0.06)	-2.74	(0.05)	0.31	(0.05)	**3.05**	(0.07)
	Ukrainian regions (18 of 27)	-0.35	(0.04)	0.86	(0.02)	-1.47	(0.05)	-0.64	(0.05)	-0.01	(0.04)	0.73	(0.02)	**2.20**	(0.05)	-1.49	(0.04)	0.76	(0.02)	**2.25**	(0.04)
	United Arab Emirates	0.30	(0.01)	0.76	(0.01)	-0.72	(0.01)	0.20	(0.01)	0.60	(0.01)	1.11	(0.01)	**1.83**	(0.02)	-0.71	(0.02)	1.08	(0.01)	**1.79**	(0.01)
	Uruguay	-0.83	(0.02)	1.13	(0.01)	-2.27	(0.02)	-1.27	(0.03)	-0.45	(0.03)	0.66	(0.04)	**2.93**	(0.04)	-2.30	(0.02)	0.76	(0.04)	**3.06**	(0.04)
	Uzbekistan	-0.69	(0.02)	1.00	(0.01)	-2.02	(0.03)	-1.02	(0.03)	-0.27	(0.03)	0.55	(0.02)	**2.56**	(0.02)	-2.03	(0.03)	0.57	(0.02)	**2.60**	(0.03)
	Viet Nam	-1.29	(0.05)	1.15	(0.03)	-2.70	(0.06)	-1.71	(0.04)	-1.03	(0.06)	0.28	(0.06)	**2.98**	(0.07)	-2.73	(0.07)	0.42	(0.07)	**3.15**	(0.09)

* Caution is required when interpreting estimates because one or more PISA sampling standards were not met (see Reader's Guide, Annexes A2 and A4).
Note: Values that are statistically significant are indicated in bold (see Annex A3).

Table I.B1.4.3. Socio-economic status and mathematics performance [1/2]

		Socio-economic gradient				Mathematics performance, by socio-economic status (ESCS[1]) National quarter of ESCS										Percentage of resilient students in mathematics[2]	
		Strength: Percentage of variance in mathematics performance explained by ESCS		Slope: Score-point difference in mathematics performance associated with a one-unit increase in ESCS		Bottom quarter of ESCS		Second quarter of ESCS		Third quarter of ESCS		Top quarter of ESCS		Top - Bottom quarter			
		%	S.E.	Score dif.	S.E.	Mean score	S.E.	Mean score	S.E.	Mean score	S.E.	Mean score	S.E.	Score dif.	S.E.	%	S.E.
OECD	Australia*	14.6	(0.8)	**45**	(1.5)	439	(2.1)	471	(2.4)	506	(2.7)	540	(3.1)	**101**	(3.5)	9.9	(0.7)
	Austria	19.4	(1.1)	**43**	(1.4)	435	(3.3)	473	(3.5)	510	(3.2)	542	(2.8)	**106**	(4.0)	8.2	(0.9)
	Belgium	21.8	(1.2)	**48**	(1.5)	434	(3.2)	470	(2.9)	509	(3.2)	551	(3.5)	**117**	(4.3)	8.2	(0.8)
	Canada*	10.2	(0.8)	**40**	(1.6)	460	(2.3)	487	(2.2)	512	(2.3)	536	(3.1)	**76**	(3.7)	12.7	(0.9)
	Chile	12.5	(1.2)	**29**	(1.4)	384	(2.5)	403	(3.0)	415	(3.4)	453	(3.5)	**69**	(4.2)	12.8	(1.3)
	Colombia	16.2	(2.1)	**25**	(1.7)	352	(3.3)	370	(3.2)	384	(4.2)	430	(5.9)	**79**	(6.5)	9.8	(1.4)
	Costa Rica	m	m	m	m	m	m	m	m	m	m	m	m	m	m	m	m
	Czech Republic	22.0	(1.2)	**51**	(1.8)	429	(3.3)	476	(3.3)	500	(2.9)	545	(3.2)	**116**	(4.4)	7.3	(0.8)
	Denmark*	12.2	(0.9)	**38**	(1.6)	451	(2.4)	480	(3.2)	507	(3.7)	525	(3.1)	**74**	(3.9)	10.2	(1.1)
	Estonia	13.4	(1.2)	**39**	(1.8)	472	(3.1)	496	(2.9)	520	(3.1)	553	(3.2)	**81**	(4.6)	10.3	(1.0)
	Finland	12.4	(0.8)	**38**	(1.4)	446	(2.4)	470	(2.4)	499	(2.9)	529	(2.5)	**83**	(2.9)	11.9	(0.8)
	France	21.5	(1.3)	**46**	(1.5)	422	(3.0)	457	(3.6)	489	(3.4)	535	(3.6)	**113**	(4.4)	7.4	(0.8)
	Germany	18.7	(1.3)	**40**	(1.5)	430	(3.8)	464	(4.1)	490	(3.9)	541	(4.3)	**111**	(5.1)	9.5	(1.1)
	Greece	11.8	(1.1)	**31**	(1.6)	398	(3.3)	415	(2.8)	436	(3.3)	474	(3.8)	**76**	(4.6)	12.0	(1.2)
	Hungary	25.1	(1.5)	**49**	(1.8)	414	(3.6)	455	(3.9)	490	(3.8)	535	(4.0)	**121**	(5.4)	8.2	(1.0)
	Iceland	9.3	(1.1)	**34**	(2.1)	422	(3.2)	455	(3.8)	469	(3.0)	495	(3.3)	**72**	(4.8)	11.3	(1.4)
	Ireland*	13.0	(1.2)	**35**	(1.5)	457	(3.2)	478	(3.0)	505	(2.7)	530	(3.0)	**74**	(3.8)	11.9	(1.0)
	Israel	19.6	(1.4)	**51**	(2.2)	398	(3.8)	439	(4.4)	483	(5.0)	522	(5.0)	**124**	(5.8)	7.7	(0.9)
	Italy	13.5	(1.5)	**35**	(2.2)	430	(3.1)	463	(3.5)	480	(3.9)	515	(5.5)	**85**	(5.9)	11.3	(1.1)
	Japan	11.9	(1.5)	**45**	(3.1)	494	(4.5)	526	(3.6)	549	(3.9)	575	(5.0)	**81**	(6.8)	11.5	(1.2)
	Korea	12.6	(1.4)	**45**	(3.0)	479	(5.7)	516	(5.2)	540	(4.8)	577	(6.0)	**97**	(8.0)	10.9	(1.2)
	Latvia*	13.2	(1.0)	**35**	(1.6)	448	(2.6)	471	(3.3)	494	(3.5)	522	(3.0)	**75**	(3.8)	11.7	(1.0)
	Lithuania	16.5	(1.2)	**40**	(1.7)	432	(2.7)	459	(2.8)	489	(3.2)	525	(3.2)	**92**	(4.1)	9.8	(0.9)
	Mexico	10.4	(1.3)	**19**	(1.3)	369	(2.4)	386	(2.5)	398	(3.9)	428	(4.2)	**58**	(4.6)	11.8	(1.1)
	Netherlands*	15.1	(1.3)	**47**	(2.2)	446	(4.9)	470	(5.6)	515	(4.8)	552	(3.8)	**106**	(6.3)	10.6	(1.3)
	New Zealand*	15.8	(1.4)	**42**	(2.0)	430	(2.9)	472	(3.3)	501	(3.0)	532	(3.9)	**102**	(5.2)	8.6	(1.0)
	Norway	9.6	(0.9)	**35**	(1.7)	431	(2.9)	460	(2.9)	482	(3.3)	512	(3.4)	**81**	(3.9)	12.6	(1.0)
	Poland	16.3	(1.3)	**40**	(1.9)	444	(3.0)	476	(3.5)	502	(3.3)	541	(3.5)	**96**	(4.5)	8.6	(1.0)
	Portugal	18.2	(1.3)	**34**	(1.4)	429	(3.6)	453	(3.3)	480	(3.3)	529	(3.2)	**101**	(4.7)	9.4	(1.0)
	Slovak Republic	25.7	(1.8)	**53**	(2.2)	394	(4.8)	455	(4.1)	481	(4.3)	528	(4.2)	**133**	(6.6)	6.1	(0.8)
	Slovenia	15.7	(1.1)	**42**	(1.5)	440	(2.5)	468	(2.8)	500	(3.0)	532	(2.4)	**91**	(3.6)	9.4	(1.1)
	Spain	14.2	(0.8)	**32**	(0.9)	434	(2.0)	459	(1.9)	485	(2.3)	520	(2.1)	**86**	(2.7)	11.7	(0.6)
	Sweden	15.0	(1.0)	**43**	(1.7)	436	(2.8)	467	(3.5)	500	(3.1)	535	(3.1)	**99**	(4.1)	9.9	(0.9)
	Switzerland	20.8	(1.2)	**47**	(1.5)	454	(3.3)	493	(3.8)	524	(3.3)	571	(3.0)	**117**	(4.4)	8.2	(0.9)
	Türkiye	12.6	(1.2)	**27**	(1.3)	420	(3.0)	438	(2.7)	453	(3.1)	502	(3.1)	**82**	(4.5)	11.7	(1.1)
	United Kingdom*	11.0	(1.3)	**36**	(2.5)	458	(3.3)	479	(3.5)	496	(3.3)	544	(5.0)	**86**	(6.0)	15.2	(1.2)
	United States*	14.9	(1.4)	**38**	(2.3)	421	(4.5)	445	(4.3)	473	(5.9)	523	(6.1)	**102**	(6.2)	10.6	(1.4)
	OECD average	15.5	(0.2)	**39**	(0.3)	431	(0.6)	462	(0.6)	488	(0.6)	525	(0.6)	**93**	(0.8)	10.2	(0.2)

1. ESCS refers to the PISA index of economic, social and cultural status.

2. Resilient students in mathematics are disadvantaged students who scored in the top quarter of performance in mathematics amongst students in their own country.

* Caution is required when interpreting estimates because one or more PISA sampling standards were not met (see Reader's Guide, Annexes A2 and A4).

Note: Values that are statistically significant are indicated in bold (see Annex A3).

Table I.B1.4.3. Socio-economic status and mathematics performance [2/2]

		Socio-economic gradient				Mathematics performance, by socio-economic status (ESCS[1])										Percentage of resilient students in mathematics[2]	
						National quarter of ESCS											
		Strength: Percentage of variance in mathematics performance explained by ESCS		Slope: Score-point difference in mathematics performance associated with a one-unit increase in ESCS		Bottom quarter of ESCS		Second quarter of ESCS		Third quarter of ESCS		Top quarter of ESCS		Top - Bottom quarter			
		%	S.E.	Score dif.	S.E.	Mean score	S.E.	Mean score	S.E.	Mean score	S.E.	Mean score	S.E.	Score dif.	S.E.	%	S.E.
Partners	Albania	4.5	(0.9)	**17**	(1.7)	353	(2.9)	358	(3.0)	363	(3.2)	402	(4.1)	**49**	(4.8)	17.1	(1.4)
	Argentina	15.4	(1.3)	**26**	(1.2)	345	(3.0)	363	(2.6)	385	(3.4)	420	(3.6)	**75**	(4.3)	10.2	(1.1)
	Baku (Azerbaijan)	5.2	(0.8)	**21**	(1.8)	371	(3.3)	395	(2.9)	402	(2.8)	425	(4.2)	**54**	(4.8)	14.5	(1.2)
	Brazil	14.8	(1.3)	**26**	(1.2)	348	(1.8)	365	(2.0)	379	(2.8)	425	(3.9)	**77**	(4.3)	10.2	(0.8)
	Brunei Darussalam	16.0	(0.9)	**35**	(1.0)	407	(2.1)	423	(2.1)	446	(2.4)	494	(2.1)	**86**	(2.9)	10.9	(0.9)
	Bulgaria	17.2	(1.8)	**38**	(2.3)	366	(3.9)	400	(3.3)	432	(5.4)	473	(6.0)	**108**	(7.1)	7.4	(1.1)
	Cambodia	1.9	(1.0)	**8**	(2.2)	329	(2.8)	334	(2.9)	333	(2.9)	350	(7.3)	**21**	(7.3)	18.2	(1.6)
	Croatia	13.0	(1.3)	**38**	(2.1)	427	(3.3)	446	(3.3)	471	(3.4)	509	(3.7)	**82**	(4.9)	10.7	(1.2)
	Cyprus	10.9	(0.8)	**36**	(1.5)	379	(2.3)	406	(2.7)	430	(2.3)	471	(3.0)	**92**	(4.0)	11.6	(1.0)
	Dominican Republic	10.1	(1.4)	**17**	(1.4)	322	(1.7)	330	(1.6)	339	(1.9)	367	(3.8)	**45**	(3.8)	12.6	(1.1)
	El Salvador	14.4	(1.8)	**18**	(1.3)	320	(2.4)	334	(2.2)	345	(2.6)	377	(4.7)	**57**	(4.8)	10.2	(1.2)
	Georgia	7.8	(1.0)	**25**	(2.0)	362	(3.0)	378	(2.9)	399	(3.3)	427	(4.6)	**65**	(5.0)	13.9	(1.4)
	Guatemala	12.1	(2.2)	**17**	(1.7)	319	(2.2)	333	(2.5)	346	(3.5)	379	(5.9)	**60**	(6.6)	11.2	(1.2)
	Hong Kong (China)*	5.8	(1.1)	**25**	(2.3)	511	(4.2)	535	(4.8)	543	(3.9)	576	(5.6)	**65**	(7.1)	16.7	(1.3)
	Indonesia	5.5	(1.3)	**14**	(1.7)	352	(2.8)	359	(2.5)	366	(2.8)	386	(5.0)	**34**	(5.1)	15.2	(1.6)
	Jamaica*	6.1	(0.9)	**19**	(1.7)	360	(3.3)	372	(3.9)	381	(4.5)	405	(4.6)	**45**	(4.3)	15.2	(1.9)
	Jordan	5.2	(1.0)	**13**	(1.3)	346	(2.3)	356	(2.1)	360	(2.8)	385	(3.4)	**40**	(3.7)	14.5	(1.5)
	Kazakhstan	3.9	(0.5)	**19**	(1.3)	410	(1.9)	416	(2.0)	425	(2.4)	451	(2.9)	**41**	(3.1)	16.8	(0.9)
	Kosovo	5.7	(0.7)	**17**	(1.1)	342	(2.0)	346	(1.9)	353	(2.0)	381	(2.4)	**39**	(3.1)	17.7	(1.4)
	Macao (China)	5.0	(0.7)	**23**	(1.6)	526	(3.0)	547	(2.8)	554	(3.0)	581	(2.7)	**55**	(4.1)	16.8	(1.4)
	Malaysia	18.1	(1.7)	**31**	(2.0)	375	(2.3)	393	(2.4)	410	(2.9)	458	(5.9)	**82**	(6.4)	9.3	(1.0)
	Malta	10.0	(1.0)	**32**	(1.8)	427	(3.4)	454	(4.1)	479	(4.0)	510	(3.8)	**83**	(5.0)	12.7	(1.3)
	Moldova	15.6	(1.4)	**33**	(1.7)	379	(2.1)	399	(3.0)	418	(3.6)	461	(4.4)	**82**	(4.9)	10.1	(0.9)
	Mongolia	18.1	(1.4)	**33**	(1.6)	384	(2.7)	405	(3.0)	431	(3.6)	478	(4.5)	**94**	(5.1)	8.8	(0.8)
	Montenegro	9.5	(0.9)	**29**	(1.4)	375	(2.4)	396	(2.4)	412	(2.4)	442	(2.7)	**67**	(3.7)	14.0	(1.2)
	Morocco	8.5	(2.6)	**13**	(2.2)	351	(2.7)	357	(2.8)	358	(3.3)	394	(9.2)	**43**	(9.2)	15.8	(1.5)
	North Macedonia	12.5	(0.8)	**31**	(1.2)	356	(2.1)	376	(2.1)	397	(2.2)	431	(2.2)	**76**	(3.2)	12.3	(0.9)
	Palestinian Authority	7.4	(1.0)	**17**	(1.2)	343	(2.0)	360	(2.4)	368	(2.5)	393	(3.6)	**50**	(3.9)	12.3	(1.0)
	Panama*	20.0	(2.5)	**23**	(1.8)	325	(2.4)	341	(2.8)	359	(5.0)	402	(6.9)	**77**	(7.2)	7.8	(1.1)
	Paraguay	11.2	(1.4)	**20**	(1.2)	315	(2.6)	324	(2.7)	333	(3.4)	381	(4.7)	**66**	(5.3)	12.4	(1.2)
	Peru	17.3	(1.5)	**26**	(1.1)	351	(2.4)	379	(3.0)	400	(3.7)	437	(3.8)	**86**	(4.2)	7.4	(0.8)
	Philippines	4.8	(1.3)	**12**	(1.8)	339	(2.4)	354	(1.8)	351	(4.1)	375	(5.3)	**36**	(5.6)	11.6	(1.1)
	Qatar	11.7	(0.8)	**35**	(1.4)	372	(2.4)	400	(2.3)	438	(3.2)	455	(2.7)	**84**	(3.6)	7.6	(1.0)
	Romania	25.8	(1.6)	**49**	(2.0)	368	(3.9)	408	(4.0)	437	(6.6)	500	(6.2)	**132**	(6.7)	6.6	(0.9)
	Saudi Arabia	6.4	(0.9)	**16**	(1.3)	369	(2.4)	377	(2.5)	395	(2.8)	416	(2.7)	**47**	(3.5)	14.2	(1.3)
	Serbia	13.4	(1.8)	**39**	(3.1)	401	(4.0)	429	(3.3)	449	(3.6)	482	(6.0)	**81**	(7.2)	12.3	(1.1)
	Singapore	17.0	(1.0)	**51**	(1.7)	515	(3.2)	560	(2.7)	600	(2.6)	626	(2.5)	**112**	(4.1)	10.2	(0.9)
	Chinese Taipei	15.7	(1.7)	**49**	(3.0)	490	(5.0)	533	(4.5)	559	(5.3)	609	(7.0)	**119**	(8.5)	10.1	(1.0)
	Thailand	10.1	(2.0)	**21**	(2.3)	375	(3.2)	380	(2.5)	387	(3.1)	435	(7.0)	**61**	(7.6)	15.0	(1.7)
	Ukrainian regions (18 of 27)	13.8	(1.9)	**38**	(3.3)	398	(4.8)	423	(5.3)	451	(6.1)	482	(5.7)	**84**	(6.7)	10.5	(1.6)
	United Arab Emirates	5.8	(0.4)	**33**	(1.3)	388	(1.8)	429	(2.2)	460	(1.8)	456	(1.8)	**68**	(2.6)	9.5	(0.7)
	Uruguay	17.9	(1.3)	**31**	(1.2)	371	(3.1)	394	(2.4)	412	(3.2)	462	(3.6)	**91**	(4.4)	10.4	(1.0)
	Uzbekistan	2.0	(0.5)	**9**	(1.2)	356	(2.5)	358	(2.5)	364	(2.7)	378	(3.1)	**22**	(3.5)	19.6	(1.4)
	Viet Nam	13.8	(2.0)	**28**	(2.2)	434	(5.1)	457	(4.1)	473	(5.2)	513	(6.9)	**78**	(7.7)	12.7	(1.2)

1. ESCS refers to the PISA index of economic, social and cultural status.

2. Resilient students in mathematics are disadvantaged students who scored in the top quarter of performance in mathematics amongst students in their own country.

* Caution is required when interpreting estimates because one or more PISA sampling standards were not met (see Reader's Guide, Annexes A2 and A4).

Note: Values that are statistically significant are indicated in bold (see Annex A3).

Table I.B1.4.17. Mathematics performance, by gender [1/6]

		Girls									
		Mean		Standard deviation		10th percentile		Median (50th percentile)		90th percentile	
		Mean score	S.E.	S.D.	S.E.	Score	S.E.	Score	S.E.	Score	S.E.
OECD	Australia*	481	(2.1)	94	(1.4)	361	(2.7)	478	(2.3)	605	(4.2)
	Austria	478	(2.7)	89	(1.6)	358	(5.0)	479	(3.2)	593	(3.9)
	Belgium	486	(2.8)	93	(1.5)	359	(4.5)	489	(3.9)	605	(3.0)
	Canada*	491	(1.7)	88	(1.0)	377	(2.4)	490	(2.0)	606	(2.7)
	Chile	403	(2.2)	73	(1.4)	311	(3.8)	401	(2.9)	499	(3.1)
	Colombia	378	(3.2)	71	(1.7)	291	(3.6)	374	(3.8)	474	(5.0)
	Costa Rica	377	(2.1)	63	(1.6)	298	(3.0)	375	(2.4)	457	(3.5)
	Czech Republic	483	(2.3)	89	(1.4)	367	(3.1)	482	(3.3)	601	(3.6)
	Denmark*	483	(2.1)	77	(1.3)	383	(3.0)	484	(2.8)	583	(3.4)
	Estonia	507	(2.5)	82	(1.2)	402	(3.2)	506	(3.0)	614	(3.7)
	Finland	487	(2.1)	84	(1.2)	377	(3.3)	488	(2.6)	595	(3.0)
	France	469	(2.5)	86	(1.4)	357	(3.7)	470	(3.2)	580	(3.6)
	Germany	469	(3.0)	91	(1.6)	350	(4.3)	469	(4.0)	589	(4.3)
	Greece	427	(2.2)	79	(1.3)	328	(3.4)	424	(2.6)	533	(3.4)
	Hungary	465	(2.9)	89	(1.9)	347	(4.8)	467	(3.9)	580	(4.3)
	Iceland	457	(2.2)	82	(1.7)	350	(4.1)	456	(3.0)	566	(4.9)
	Ireland*	485	(2.7)	74	(1.2)	388	(3.7)	486	(3.2)	580	(3.7)
	Israel	452	(2.9)	95	(1.6)	328	(4.4)	453	(4.0)	574	(4.5)
	Italy	461	(2.8)	82	(1.7)	357	(3.6)	458	(3.2)	569	(5.0)
	Japan	531	(2.9)	87	(2.1)	416	(5.2)	534	(3.5)	640	(4.2)
	Korea	525	(3.7)	97	(2.6)	397	(5.8)	528	(4.2)	647	(5.4)
	Latvia*	478	(2.3)	76	(1.6)	381	(4.6)	477	(2.8)	577	(4.0)
	Lithuania	473	(2.0)	83	(1.4)	366	(3.4)	471	(2.7)	582	(3.3)
	Mexico	389	(2.5)	66	(1.7)	308	(3.0)	385	(2.6)	476	(4.9)
	Netherlands*	487	(4.2)	104	(2.4)	344	(6.7)	492	(5.5)	620	(4.0)
	New Zealand*	474	(2.6)	91	(1.7)	355	(5.0)	473	(3.4)	594	(5.2)
	Norway	469	(2.4)	87	(1.0)	356	(3.1)	469	(3.5)	581	(3.7)
	Poland	486	(2.9)	84	(1.6)	375	(4.8)	487	(3.5)	594	(4.1)
	Portugal	467	(2.5)	86	(1.7)	357	(4.5)	465	(3.2)	578	(2.8)
	Slovak Republic	463	(3.3)	99	(2.1)	327	(6.7)	471	(4.5)	583	(3.9)
	Slovenia	485	(1.9)	84	(1.3)	376	(3.6)	483	(2.8)	597	(3.5)
	Spain	468	(1.6)	83	(0.9)	359	(2.9)	469	(2.2)	574	(2.3)
	Sweden	481	(2.1)	90	(1.3)	363	(3.6)	481	(2.9)	599	(3.0)
	Switzerland	502	(2.5)	92	(1.4)	380	(3.4)	503	(3.4)	621	(3.7)
	Türkiye	450	(2.7)	86	(1.4)	342	(3.5)	445	(3.9)	567	(3.4)
	United Kingdom*	482	(2.9)	92	(1.8)	364	(4.1)	480	(3.3)	602	(4.8)
	United States*	458	(3.9)	88	(1.9)	346	(4.2)	455	(4.7)	574	(6.1)
	OECD average	468	(0.4)	85	(0.3)	357	(0.7)	467	(0.6)	579	(0.7)

* Caution is required when interpreting estimates because one or more PISA sampling standards were not met (see Reader's Guide, Annexes A2 and A4).
Note: Values that are statistically significant are indicated in bold (see Annex A3).

Table I.B1.4.17. Mathematics performance, by gender [2/6]

		Girls									
		Mean		Standard deviation		10th percentile		Median (50th percentile)		90th percentile	
		Mean score	S.E.	S.D.	S.E.	Score	S.E.	Score	S.E.	Score	S.E.
Partners	Albania	378	(2.2)	79	(1.5)	280	(3.4)	374	(2.9)	482	(3.6)
	Argentina	372	(2.5)	72	(1.4)	284	(3.5)	367	(2.9)	468	(4.1)
	Baku (Azerbaijan)	401	(2.4)	80	(1.2)	300	(3.5)	399	(2.9)	506	(3.8)
	Brazil	375	(1.7)	72	(1.3)	289	(1.9)	367	(1.8)	471	(3.5)
	Brunei Darussalam	448	(1.3)	78	(1.0)	351	(2.4)	443	(2.2)	552	(2.9)
	Bulgaria	420	(3.5)	91	(2.4)	307	(4.3)	416	(3.8)	541	(6.6)
	Cambodia	338	(2.4)	69	(1.6)	252	(3.6)	338	(2.6)	426	(4.6)
	Croatia	460	(3.0)	83	(1.8)	355	(4.1)	457	(3.7)	572	(4.8)
	Cyprus	426	(1.8)	92	(1.1)	311	(3.3)	422	(2.9)	550	(3.8)
	Dominican Republic	341	(1.7)	52	(1.3)	277	(2.4)	338	(1.8)	409	(3.3)
	El Salvador	340	(2.3)	58	(1.6)	270	(3.0)	336	(2.5)	417	(4.8)
	Georgia	393	(2.3)	80	(1.8)	295	(3.0)	388	(2.6)	499	(4.4)
	Guatemala	338	(2.6)	67	(2.0)	253	(3.6)	337	(2.5)	424	(5.6)
	Hong Kong (China)*	536	(3.4)	97	(1.9)	408	(6.2)	540	(3.7)	656	(4.5)
	Indonesia	369	(2.6)	62	(1.6)	293	(2.8)	364	(2.8)	451	(4.4)
	Jamaica*	384	(2.9)	69	(1.4)	299	(3.5)	379	(3.6)	477	(4.4)
	Jordan	368	(2.9)	61	(1.5)	292	(2.9)	366	(3.1)	447	(4.8)
	Kazakhstan	426	(1.8)	74	(1.1)	335	(2.4)	422	(2.2)	521	(2.7)
	Kosovo	355	(1.3)	60	(1.0)	281	(2.4)	351	(1.6)	434	(3.0)
	Macao (China)	544	(1.8)	87	(1.4)	429	(4.1)	546	(2.4)	654	(3.7)
	Malaysia	414	(2.4)	71	(2.0)	326	(2.8)	410	(2.7)	507	(4.6)
	Malta	465	(2.4)	92	(1.9)	339	(5.0)	469	(3.5)	581	(4.4)
	Moldova	412	(2.3)	75	(1.5)	321	(3.1)	407	(2.6)	513	(4.6)
	Mongolia	427	(2.8)	81	(1.9)	328	(3.3)	422	(3.0)	536	(5.2)
	Montenegro	406	(1.4)	78	(1.3)	308	(2.4)	402	(2.2)	510	(3.4)
	Morocco	367	(3.2)	60	(1.9)	293	(3.0)	363	(3.3)	446	(6.0)
	North Macedonia	392	(1.2)	80	(1.2)	292	(2.7)	388	(2.5)	498	(3.2)
	Palestinian Authority	373	(2.4)	65	(1.3)	292	(3.0)	370	(2.5)	456	(3.9)
	Panama*	355	(2.9)	63	(2.4)	278	(3.5)	351	(2.8)	437	(7.5)
	Paraguay	332	(2.5)	75	(1.4)	238	(3.7)	329	(3.2)	430	(4.3)
	Peru	384	(2.5)	75	(1.5)	292	(3.5)	379	(2.8)	484	(3.8)
	Philippines	362	(2.7)	63	(1.7)	285	(2.9)	357	(2.9)	448	(4.7)
	Qatar	418	(1.5)	83	(1.3)	317	(3.1)	413	(2.2)	529	(3.3)
	Romania	425	(4.1)	93	(2.3)	305	(4.9)	423	(5.1)	546	(5.4)
	Saudi Arabia	388	(2.5)	61	(1.4)	312	(2.9)	385	(2.8)	468	(4.1)
	Serbia	434	(2.8)	85	(2.7)	330	(4.9)	432	(3.1)	545	(5.0)
	Singapore	568	(1.7)	98	(1.1)	436	(4.2)	575	(2.4)	691	(3.2)
	Chinese Taipei	544	(4.7)	104	(2.3)	402	(6.3)	549	(5.6)	676	(6.7)
	Thailand	397	(3.5)	72	(2.8)	312	(3.0)	389	(2.9)	493	(8.3)
	Ukrainian regions (18 of 27)	436	(4.1)	83	(2.1)	331	(5.9)	434	(5.3)	544	(5.9)
	United Arab Emirates	435	(0.9)	92	(0.8)	321	(1.5)	428	(1.3)	561	(2.2)
	Uruguay	403	(2.2)	80	(1.5)	302	(3.4)	401	(3.0)	509	(4.0)
	Uzbekistan	361	(2.0)	62	(1.3)	284	(2.8)	358	(2.3)	441	(3.6)
	Viet Nam	464	(3.7)	81	(2.2)	361	(5.0)	465	(4.2)	570	(5.8)

* Caution is required when interpreting estimates because one or more PISA sampling standards were not met (see Reader's Guide, Annexes A2 and A4).
Note: Values that are statistically significant are indicated in bold (see Annex A3).

Table I.B1.4.17. Mathematics performance, by gender [3/6]

		Boys									
		Mean		Standard deviation		10th percentile		Median (50th percentile)		90th percentile	
		Mean score	S.E.	S.D.	S.E.	Score	S.E.	Score	S.E.	Score	S.E.
OECD	Australia*	493	(2.5)	104	(1.2)	356	(3.1)	491	(2.9)	631	(4.2)
	Austria	497	(2.9)	97	(1.5)	366	(4.3)	499	(3.7)	621	(3.6)
	Belgium	493	(3.2)	100	(1.7)	360	(5.5)	496	(3.8)	623	(3.9)
	Canada*	503	(1.9)	99	(1.2)	373	(3.1)	504	(2.2)	631	(3.1)
	Chile	420	(2.6)	79	(1.4)	320	(3.8)	417	(3.5)	524	(3.6)
	Colombia	387	(3.3)	75	(1.6)	296	(3.6)	381	(4.0)	488	(4.5)
	Costa Rica	392	(2.3)	68	(1.5)	307	(3.3)	389	(2.7)	480	(4.1)
	Czech Republic	491	(3.3)	97	(1.7)	364	(3.9)	490	(4.7)	618	(4.0)
	Denmark*	495	(2.6)	85	(1.5)	383	(3.7)	495	(3.2)	606	(4.7)
	Estonia	513	(2.2)	88	(1.4)	400	(3.3)	513	(2.7)	627	(3.9)
	Finland	482	(2.3)	94	(1.1)	356	(3.0)	484	(3.1)	604	(3.3)
	France	479	(3.4)	96	(1.3)	350	(3.8)	482	(4.2)	605	(4.3)
	Germany	480	(3.7)	98	(1.6)	351	(5.2)	480	(4.4)	608	(4.1)
	Greece	433	(3.3)	88	(1.9)	323	(4.5)	429	(3.8)	551	(4.4)
	Hungary	480	(3.1)	98	(2.1)	348	(4.3)	483	(4.3)	608	(5.0)
	Iceland	461	(2.4)	93	(1.7)	339	(4.3)	460	(3.1)	582	(4.9)
	Ireland*	498	(2.7)	84	(1.2)	385	(4.0)	500	(3.3)	605	(3.6)
	Israel	463	(5.2)	118	(2.9)	307	(6.3)	466	(7.4)	616	(6.9)
	Italy	482	(4.0)	94	(1.7)	358	(4.2)	483	(4.9)	605	(5.6)
	Japan	540	(4.2)	98	(2.4)	404	(6.4)	547	(4.4)	663	(5.6)
	Korea	530	(5.6)	112	(3.4)	379	(9.3)	535	(6.6)	672	(6.5)
	Latvia*	488	(2.3)	84	(1.4)	381	(3.8)	487	(3.1)	597	(3.9)
	Lithuania	478	(2.3)	91	(1.6)	360	(3.8)	474	(3.1)	600	(4.2)
	Mexico	401	(2.6)	72	(1.6)	312	(3.7)	398	(3.2)	498	(4.2)
	Netherlands*	498	(3.9)	108	(2.2)	352	(5.8)	502	(5.4)	639	(3.8)
	New Zealand*	484	(2.9)	105	(1.8)	346	(3.8)	484	(3.9)	623	(4.5)
	Norway	468	(2.5)	100	(1.3)	337	(3.5)	468	(3.2)	598	(3.7)
	Poland	492	(2.7)	95	(1.8)	366	(4.5)	494	(3.9)	614	(4.0)
	Portugal	477	(2.6)	93	(1.7)	355	(4.1)	477	(3.7)	598	(3.3)
	Slovak Republic	465	(3.4)	103	(2.2)	328	(5.9)	466	(4.6)	597	(4.8)
	Slovenia	484	(1.7)	94	(1.4)	363	(3.6)	480	(2.6)	610	(4.1)
	Spain	478	(1.9)	90	(0.9)	359	(3.1)	480	(2.4)	593	(2.4)
	Sweden	483	(2.7)	100	(1.4)	350	(4.3)	485	(3.5)	614	(3.7)
	Switzerland	513	(2.6)	100	(1.6)	379	(3.9)	515	(3.7)	642	(3.7)
	Türkiye	456	(2.6)	93	(1.3)	339	(3.9)	449	(3.4)	586	(4.1)
	United Kingdom*	496	(3.0)	100	(1.7)	362	(4.1)	498	(3.9)	623	(4.6)
	United States*	471	(4.7)	100	(2.2)	343	(5.6)	469	(6.0)	606	(5.9)
	OECD average	477	(0.5)	94	(0.3)	353	(0.7)	477	(0.7)	600	(0.7)

* Caution is required when interpreting estimates because one or more PISA sampling standards were not met (see Reader's Guide, Annexes A2 and A4).
Note: Values that are statistically significant are indicated in bold (see Annex A3).

Table I.B1.4.17. Mathematics performance, by gender [4/6]

		Boys									
		Mean		Standard deviation		10th percentile		Median (50th percentile)		90th percentile	
		Mean score	S.E.	S.D.	S.E.	Score	S.E.	Score	S.E.	Score	S.E.
Partners	Albania	359	(2.8)	89	(1.8)	255	(3.6)	348	(3.2)	481	(5.0)
	Argentina	383	(2.4)	77	(1.3)	289	(3.3)	377	(3.2)	485	(3.8)
	Baku (Azerbaijan)	394	(2.9)	90	(1.5)	284	(3.3)	387	(3.4)	517	(5.0)
	Brazil	383	(2.0)	81	(1.3)	287	(2.4)	374	(2.3)	493	(3.7)
	Brunei Darussalam	437	(1.2)	89	(1.0)	325	(2.6)	430	(2.0)	559	(3.4)
	Bulgaria	415	(4.1)	102	(2.3)	291	(4.1)	405	(5.3)	555	(6.6)
	Cambodia	334	(3.5)	77	(2.3)	235	(4.1)	334	(3.5)	431	(6.3)
	Croatia	466	(3.0)	92	(1.6)	349	(4.2)	462	(4.1)	590	(4.4)
	Cyprus	411	(1.7)	108	(1.3)	282	(2.8)	397	(2.6)	562	(3.9)
	Dominican Republic	337	(1.9)	56	(1.5)	269	(2.7)	332	(1.9)	412	(3.4)
	El Salvador	347	(2.4)	61	(1.3)	273	(2.6)	341	(2.7)	429	(4.7)
	Georgia	387	(3.2)	89	(3.0)	283	(3.3)	378	(3.2)	506	(7.6)
	Guatemala	351	(2.5)	70	(1.8)	260	(4.1)	350	(2.6)	439	(4.1)
	Hong Kong (China)*	544	(3.4)	111	(2.0)	391	(5.4)	552	(3.9)	684	(5.2)
	Indonesia	362	(2.8)	62	(1.5)	287	(2.8)	357	(2.9)	445	(5.0)
	Jamaica*	370	(5.0)	73	(2.7)	283	(3.9)	361	(5.6)	474	(10.3)
	Jordan	353	(2.8)	62	(1.1)	277	(2.9)	350	(3.3)	435	(3.7)
	Kazakhstan	425	(2.1)	83	(1.2)	323	(2.5)	420	(2.4)	538	(3.5)
	Kosovo	355	(1.3)	65	(1.1)	278	(2.3)	348	(1.8)	443	(4.1)
	Macao (China)	559	(1.5)	97	(1.4)	430	(3.9)	562	(2.6)	683	(3.8)
	Malaysia	403	(2.8)	79	(3.0)	309	(2.4)	395	(2.8)	512	(6.8)
	Malta	467	(2.2)	105	(1.8)	328	(4.6)	471	(3.5)	602	(5.2)
	Moldova	416	(2.8)	83	(1.6)	313	(3.0)	410	(3.3)	529	(5.3)
	Mongolia	422	(2.9)	85	(1.9)	319	(3.6)	414	(3.1)	538	(5.7)
	Montenegro	405	(1.5)	85	(1.3)	303	(3.1)	396	(2.5)	523	(3.5)
	Morocco	363	(3.7)	65	(2.5)	286	(2.6)	356	(3.8)	452	(7.2)
	North Macedonia	386	(1.3)	85	(1.1)	283	(2.6)	376	(2.3)	503	(3.2)
	Palestinian Authority	357	(2.6)	67	(1.8)	278	(2.8)	350	(2.8)	446	(5.4)
	Panama*	358	(3.3)	68	(2.2)	278	(3.1)	351	(3.7)	448	(6.9)
	Paraguay	343	(2.8)	79	(1.5)	243	(3.7)	341	(3.5)	448	(4.6)
	Peru	399	(2.8)	80	(1.4)	299	(3.3)	394	(3.5)	508	(4.3)
	Philippines	348	(2.8)	66	(2.4)	274	(2.5)	337	(2.5)	436	(6.0)
	Qatar	410	(1.7)	94	(1.5)	299	(2.6)	397	(2.7)	544	(4.1)
	Romania	430	(4.5)	104	(2.3)	300	(4.3)	424	(5.9)	572	(6.8)
	Saudi Arabia	390	(2.6)	70	(1.4)	305	(2.7)	385	(3.0)	482	(4.3)
	Serbia	445	(3.9)	94	(3.2)	328	(4.7)	440	(4.0)	571	(7.5)
	Singapore	581	(1.7)	107	(1.3)	431	(4.0)	589	(2.5)	712	(3.2)
	Chinese Taipei	550	(4.7)	119	(3.0)	384	(6.9)	560	(5.7)	696	(7.5)
	Thailand	391	(3.3)	79	(2.7)	301	(3.3)	380	(2.9)	499	(8.1)
	Ukrainian regions (18 of 27)	446	(5.3)	93	(2.8)	327	(7.0)	442	(6.9)	567	(7.2)
	United Arab Emirates	428	(1.5)	109	(1.1)	296	(1.9)	416	(2.6)	579	(2.3)
	Uruguay	414	(2.5)	86	(1.4)	304	(3.1)	411	(3.4)	529	(3.6)
	Uzbekistan	367	(2.4)	71	(1.0)	281	(2.7)	362	(2.7)	463	(4.0)
	Viet Nam	475	(4.6)	90	(2.8)	360	(7.5)	473	(5.0)	591	(6.2)

* Caution is required when interpreting estimates because one or more PISA sampling standards were not met (see Reader's Guide, Annexes A2 and A4).
Note: Values that are statistically significant are indicated in bold (see Annex A3).

Table I.B1.4.17. Mathematics performance, by gender [5/6]

		Gender differences (boys - girls)									
		Mean score		Standard deviation		10th percentile		Median (50th percentile)		90th percentile	
		Score dif.	S.E.	Dif.	S.E.	Score dif.	S.E.	Score dif.	S.E.	Score dif.	S.E.
OECD	Australia*	**11**	(3.0)	**10**	(1.6)	-5	(4.0)	**13**	(3.5)	**26**	(5.5)
	Austria	**19**	(3.0)	**7**	(1.9)	7	(5.7)	**20**	(4.2)	**28**	(4.6)
	Belgium	8	(4.1)	**7**	(2.4)	1	(7.9)	7	(4.8)	**18**	(4.3)
	Canada*	**12**	(1.7)	**11**	(1.4)	-5	(3.2)	**14**	(2.3)	**25**	(3.6)
	Chile	**16**	(2.5)	**5**	(1.8)	8	(4.7)	**16**	(4.2)	**25**	(4.0)
	Colombia	**9**	(2.2)	**4**	(1.4)	5	(3.3)	**7**	(3.2)	**14**	(4.2)
	Costa Rica	**15**	(2.2)	**5**	(1.6)	**9**	(4.1)	**14**	(2.5)	**23**	(4.0)
	Czech Republic	**7**	(3.8)	**8**	(1.8)	-3	(4.7)	8	(5.5)	**18**	(5.3)
	Denmark*	**12**	(2.8)	**8**	(1.9)	0	(4.4)	**11**	(3.5)	**23**	(5.2)
	Estonia	**6**	(2.4)	**6**	(1.4)	-2	(4.0)	**7**	(3.2)	**13**	(4.7)
	Finland	**-5**	(2.3)	**10**	(1.4)	**-21**	(3.7)	-4	(3.4)	**9**	(3.7)
	France	**10**	(3.3)	**10**	(1.6)	-7	(4.7)	**12**	(4.5)	**25**	(5.2)
	Germany	**11**	(2.6)	**7**	(1.8)	1	(4.9)	**11**	(3.4)	**20**	(4.9)
	Greece	6	(3.1)	**9**	(1.9)	-4	(4.9)	5	(3.8)	**19**	(4.5)
	Hungary	**15**	(3.2)	**9**	(2.3)	2	(6.7)	**16**	(4.5)	**28**	(4.9)
	Iceland	3	(3.5)	**10**	(2.5)	-11	(6.1)	4	(4.5)	**16**	(6.9)
	Ireland*	**13**	(3.5)	**9**	(1.7)	-2	(5.1)	**14**	(4.5)	**25**	(5.3)
	Israel	**11**	(5.4)	**23**	(3.1)	**-21**	(6.8)	13	(7.6)	**42**	(7.8)
	Italy	**21**	(3.5)	**12**	(1.6)	1	(5.0)	**25**	(4.9)	**37**	(5.3)
	Japan	**9**	(4.1)	**12**	(2.5)	-12	(6.8)	**12**	(4.5)	**23**	(5.9)
	Korea	5	(5.6)	**15**	(3.3)	-18	(9.3)	7	(7.2)	**25**	(7.3)
	Latvia*	**10**	(2.3)	**7**	(1.9)	0	(5.3)	**10**	(3.0)	**20**	(4.8)
	Lithuania	**5**	(2.3)	**8**	(1.6)	-6	(4.2)	3	(3.6)	**18**	(4.3)
	Mexico	**12**	(2.3)	**6**	(1.5)	4	(3.6)	**13**	(3.0)	**21**	(4.4)
	Netherlands*	**11**	(3.0)	**4**	(2.0)	8	(6.0)	**10**	(4.9)	**19**	(4.4)
	New Zealand*	**10**	(3.8)	**14**	(2.3)	-8	(5.6)	**11**	(5.1)	**29**	(6.8)
	Norway	-1	(2.7)	**13**	(1.5)	**-19**	(4.3)	-1	(3.7)	**17**	(5.0)
	Poland	6	(3.3)	**11**	(1.9)	-9	(6.4)	7	(4.6)	**20**	(5.1)
	Portugal	**11**	(2.0)	**7**	(1.8)	-2	(4.0)	**11**	(3.5)	**20**	(3.9)
	Slovak Republic	1	(3.5)	4	(2.3)	1	(7.2)	-5	(5.5)	**14**	(5.0)
	Slovenia	-2	(2.6)	**9**	(1.8)	**-13**	(5.0)	-2	(4.0)	**13**	(5.2)
	Spain	**10**	(1.9)	**7**	(1.1)	1	(3.6)	**11**	(2.8)	**19**	(2.8)
	Sweden	2	(2.6)	**10**	(1.6)	**-13**	(5.0)	4	(3.9)	**15**	(3.9)
	Switzerland	**11**	(2.9)	**8**	(1.6)	-1	(4.5)	**13**	(4.2)	**21**	(4.5)
	Türkiye	6	(4.3)	**7**	(1.8)	-3	(5.7)	4	(5.6)	**18**	(5.3)
	United Kingdom*	**14**	(3.8)	**7**	(2.3)	-1	(5.3)	**18**	(4.8)	**21**	(6.6)
	United States*	**13**	(3.2)	**12**	(2.0)	-3	(5.8)	**14**	(4.9)	**32**	(5.3)
	OECD average	**9**	(0.5)	**9**	(0.3)	**-4**	(0.9)	**10**	(0.7)	**22**	(0.8)

* Caution is required when interpreting estimates because one or more PISA sampling standards were not met (see Reader's Guide, Annexes A2 and A4).
Note: Values that are statistically significant are indicated in bold (see Annex A3).

Table I.B1.4.17. Mathematics performance, by gender [6/6]

		Gender differences (boys - girls)									
		Mean score		Standard deviation		10th percentile		Median (50th percentile)		90th percentile	
		Score dif.	S.E.	Dif.	S.E.	Score dif.	S.E.	Score dif.	S.E.	Score dif.	S.E.
Partners	Albania	**-19**	(2.8)	**10**	(2.0)	**-25**	(4.9)	**-27**	(3.8)	-1	(5.5)
	Argentina	**11**	(2.2)	**5**	(1.5)	5	(4.0)	**10**	(3.0)	**17**	(4.5)
	Baku (Azerbaijan)	**-7**	(2.5)	**10**	(1.5)	**-16**	(4.4)	**-12**	(3.3)	**11**	(4.9)
	Brazil	**8**	(1.9)	**8**	(1.2)	-2	(3.0)	**6**	(2.5)	**22**	(4.0)
	Brunei Darussalam	**-11**	(1.6)	**11**	(1.4)	**-25**	(3.6)	**-13**	(3.0)	7	(4.3)
	Bulgaria	-6	(3.7)	**11**	(2.0)	**-17**	(5.6)	**-10**	(5.2)	**14**	(5.8)
	Cambodia	-4	(2.6)	**8**	(2.3)	**-17**	(5.0)	-4	(3.1)	6	(5.6)
	Croatia	6	(3.7)	**9**	(1.9)	-5	(5.4)	4	(5.0)	**19**	(5.0)
	Cyprus	**-16**	(2.6)	**15**	(1.7)	**-30**	(4.0)	**-25**	(3.9)	**12**	(5.4)
	Dominican Republic	**-4**	(1.6)	**5**	(1.3)	**-8**	(2.8)	**-7**	(2.1)	4	(3.6)
	El Salvador	**6**	(2.5)	4	(1.9)	3	(3.2)	6	(3.2)	**12**	(5.5)
	Georgia	-5	(2.9)	**9**	(2.4)	**-12**	(3.8)	**-10**	(3.5)	7	(6.7)
	Guatemala	**12**	(2.5)	3	(1.6)	7	(4.7)	**13**	(3.1)	**15**	(4.2)
	Hong Kong (China)*	**9**	(3.4)	**14**	(2.1)	**-17**	(6.1)	**12**	(4.2)	**28**	(5.9)
	Indonesia	**-6**	(2.7)	0	(1.7)	-6	(3.4)	**-7**	(2.7)	-5	(5.6)
	Jamaica*	**-13**	(5.0)	5	(3.0)	**-15**	(4.8)	**-18**	(5.8)	-3	(11.0)
	Jordan	**-15**	(4.2)	1	(1.8)	**-16**	(4.1)	**-16**	(4.6)	-12	(6.2)
	Kazakhstan	0	(2.0)	**9**	(1.3)	**-11**	(3.0)	-2	(2.4)	**17**	(3.5)
	Kosovo	0	(1.6)	**5**	(1.5)	-2	(3.2)	-3	(2.3)	9	(4.7)
	Macao (China)	**15**	(2.4)	**10**	(2.0)	1	(5.8)	**16**	(3.5)	**29**	(4.8)
	Malaysia	**-10**	(2.0)	**8**	(1.9)	**-16**	(2.9)	**-15**	(3.0)	5	(5.3)
	Malta	1	(3.4)	**13**	(2.5)	-12	(7.2)	2	(5.2)	**21**	(5.9)
	Moldova	4	(2.3)	**9**	(1.7)	**-9**	(4.1)	3	(3.2)	**16**	(5.0)
	Mongolia	**-6**	(2.5)	**4**	(1.8)	**-9**	(4.1)	**-8**	(3.3)	2	(5.7)
	Montenegro	0	(1.9)	**8**	(1.8)	-5	(3.6)	**-6**	(3.0)	**14**	(4.9)
	Morocco	**-4**	(1.8)	**4**	(1.4)	**-7**	(2.9)	**-7**	(2.9)	6	(4.0)
	North Macedonia	**-6**	(1.8)	**6**	(1.4)	**-10**	(3.5)	**-11**	(3.4)	5	(4.5)
	Palestinian Authority	**-16**	(3.4)	2	(2.1)	**-14**	(4.1)	**-20**	(3.6)	-10	(6.2)
	Panama*	4	(2.5)	**5**	(1.9)	-1	(4.1)	0	(3.5)	11	(6.2)
	Paraguay	**11**	(2.9)	**4**	(1.8)	5	(4.7)	**12**	(3.6)	**17**	(5.8)
	Peru	**15**	(2.5)	**6**	(1.7)	7	(4.1)	**15**	(3.3)	**24**	(4.7)
	Philippines	**-14**	(1.9)	3	(2.0)	**-11**	(3.1)	**-20**	(2.4)	**-11**	(4.8)
	Qatar	**-8**	(2.2)	**11**	(1.9)	**-18**	(3.6)	**-15**	(3.4)	**15**	(5.5)
	Romania	5	(3.0)	**11**	(2.2)	-5	(5.4)	1	(4.6)	**25**	(5.0)
	Saudi Arabia	2	(3.7)	**8**	(1.8)	-7	(3.9)	-1	(4.2)	**14**	(6.0)
	Serbia	**11**	(3.5)	**9**	(2.7)	-2	(6.5)	8	(4.1)	**27**	(6.0)
	Singapore	**12**	(2.3)	**10**	(1.7)	-5	(6.2)	**15**	(3.6)	**21**	(4.6)
	Chinese Taipei	6	(5.5)	**15**	(3.1)	**-18**	(8.1)	12	(7.0)	**21**	(8.2)
	Thailand	-6	(4.3)	6	(3.7)	**-11**	(4.1)	**-9**	(3.6)	7	(10.5)
	Ukrainian regions (18 of 27)	**10**	(4.8)	**10**	(2.7)	-4	(7.5)	8	(6.7)	**24**	(7.4)
	United Arab Emirates	**-7**	(1.7)	**17**	(1.4)	**-26**	(2.4)	**-12**	(2.8)	**19**	(3.5)
	Uruguay	**11**	(2.4)	**6**	(1.5)	2	(3.7)	**10**	(3.7)	**20**	(4.6)
	Uzbekistan	**6**	(2.0)	**9**	(1.4)	-3	(3.4)	4	(2.7)	**22**	(4.3)
	Viet Nam	**10**	(2.5)	**9**	(2.1)	-1	(5.7)	**9**	(3.8)	**21**	(5.1)

* Caution is required when interpreting estimates because one or more PISA sampling standards were not met (see Reader's Guide, Annexes A2 and A4).
Note: Values that are statistically significant are indicated in bold (see Annex A3).

Table I.B1.5.4. Mean mathematics performance, 2003 through 2022 [1/4]

		Mathematics performance, by PISA cycle													
		PISA 2003		PISA 2006		PISA 2009		PISA 2012		PISA 2015		PISA 2018		PISA 2022	
		Mean score	S.E.	Mean score	S.E.	Mean score	S.E.	Mean score	S.E.	Mean score	S.E.	Mean score	S.E.	Mean score	S.E.
OECD	Australia*	524	(2.1)	520	(2.2)	514	(2.5)	504	(1.6)	494	(1.6)	491	(1.9)	487	(1.8)
	Austria	506	(3.3)	505	(3.7)	m	m	506	(2.7)	497	(2.9)	499	(3.0)	487	(2.3)
	Belgium	529	(2.3)	520	(3.0)	515	(2.3)	515	(2.1)	507	(2.4)	508	(2.3)	489	(2.2)
	Canada*	532	(1.8)	527	(2.0)	527	(1.6)	518	(1.8)	516	(2.3)	512	(2.4)	497	(1.6)
	Chile	m	m	411	(4.6)	421	(3.1)	423	(3.1)	423	(2.5)	417	(2.4)	412	(2.1)
	Colombia	m	m	370	(3.8)	381	(3.2)	376	(2.9)	390	(2.3)	391	(3.0)	383	(3.0)
	Costa Rica	m	m	m	m	409	(3.0)	407	(3.0)	400	(2.5)	402	(3.3)	385	(1.9)
	Czech Republic	516	(3.5)	510	(3.6)	493	(2.8)	499	(2.9)	492	(2.4)	499	(2.5)	487	(2.1)
	Denmark*	514	(2.7)	513	(2.6)	503	(2.6)	500	(2.3)	511	(2.2)	509	(1.7)	489	(1.9)
	Estonia	m	m	515	(2.7)	512	(2.6)	521	(2.0)	520	(2.0)	523	(1.7)	510	(2.0)
	Finland	544	(1.9)	548	(2.3)	541	(2.2)	519	(1.9)	511	(2.3)	507	(2.0)	484	(1.9)
	France	511	(2.5)	496	(3.2)	497	(3.1)	495	(2.5)	493	(2.1)	495	(2.3)	474	(2.5)
	Germany	503	(3.3)	504	(3.9)	513	(2.9)	514	(2.9)	506	(2.9)	500	(2.6)	475	(3.1)
	Greece	445	(3.9)	459	(3.0)	466	(3.9)	453	(2.5)	454	(3.8)	451	(3.1)	430	(2.3)
	Hungary	490	(2.8)	491	(2.9)	490	(3.5)	477	(3.2)	477	(2.5)	481	(2.3)	473	(2.5)
	Iceland	515	(1.4)	506	(1.8)	507	(1.4)	493	(1.7)	488	(2.0)	495	(2.0)	459	(1.6)
	Ireland*	503	(2.4)	501	(2.8)	487	(2.5)	501	(2.2)	504	(2.1)	500	(2.2)	492	(2.0)
	Israel	m	m	442	(4.3)	447	(3.3)	466	(4.7)	470	(3.6)	463	(3.5)	458	(3.3)
	Italy	466	(3.1)	462	(2.3)	483	(1.9)	485	(2.0)	490	(2.8)	487	(2.8)	471	(3.1)
	Japan	534	(4.0)	523	(3.3)	529	(3.3)	536	(3.6)	532	(3.0)	527	(2.5)	536	(2.9)
	Korea	542	(3.2)	547	(3.8)	546	(4.0)	554	(4.6)	524	(3.7)	526	(3.1)	527	(3.9)
	Latvia*	483	(3.7)	486	(3.0)	482	(3.1)	491	(2.8)	482	(1.9)	496	(2.0)	483	(2.0)
	Lithuania	m	m	486	(2.9)	477	(2.6)	479	(2.6)	478	(2.3)	481	(2.0)	475	(1.8)
	Mexico	385	(3.6)	406	(2.9)	419	(1.8)	413	(1.4)	408	(2.2)	409	(2.5)	395	(2.3)
	Netherlands*	538	(3.1)	531	(2.6)	526	(4.7)	523	(3.5)	512	(2.2)	519	(2.6)	493	(3.8)
	New Zealand*	523	(2.3)	522	(2.4)	519	(2.3)	500	(2.2)	495	(2.3)	494	(1.7)	479	(2.0)
	Norway	495	(2.4)	490	(2.6)	498	(2.4)	489	(2.7)	502	(2.2)	501	(2.2)	468	(2.1)
	Poland	490	(2.5)	495	(2.4)	495	(2.8)	518	(3.6)	504	(2.4)	516	(2.6)	489	(2.3)
	Portugal	466	(3.4)	466	(3.1)	487	(2.9)	487	(3.8)	492	(2.5)	492	(2.7)	472	(2.4)
	Slovak Republic	498	(3.3)	492	(2.8)	497	(3.1)	482	(3.4)	475	(2.7)	486	(2.6)	464	(2.9)
	Slovenia	m	m	504	(1.0)	501	(1.2)	501	(1.2)	510	(1.3)	509	(1.4)	485	(1.2)
	Spain	485	(2.4)	480	(2.3)	483	(2.1)	484	(1.9)	486	(2.2)	m	m	473	(1.5)
	Sweden	509	(2.6)	502	(2.4)	494	(2.9)	478	(2.3)	494	(3.2)	502	(2.7)	482	(2.1)
	Switzerland	527	(3.4)	530	(3.2)	534	(3.3)	531	(3.0)	521	(2.9)	515	(2.9)	508	(2.1)
	Türkiye	423	(6.7)	424	(4.9)	445	(4.4)	448	(4.8)	420	(4.1)	454	(2.3)	453	(1.6)
	United Kingdom*	m	m	495	(2.1)	492	(2.4)	494	(3.3)	492	(2.5)	502	(2.6)	489	(2.2)
	United States*	483	(2.9)	474	(4.0)	487	(3.6)	481	(3.6)	470	(3.2)	478	(3.2)	465	(4.0)
	OECD average	m	m	m	m	m	m	488	(0.5)	485	(0.4)	m	m	472	(0.4)
	OECD average-23	502	(0.6)	501	(0.6)	502	(0.6)	499	(0.6)	496	(0.5)	496	(0.5)	480	(0.5)
	OECD average-26	m	m	m	m	m	m	484	(0.6)	480	(0.5)	483	(0.5)	468	(0.5)
	OECD average-35	m	m	491	(0.5)	m	m	491	(0.5)	487	(0.4)	490	(0.4)	475	(0.4)

1. The average decennial trend is the average change, per 10-year period, between the earliest available measurement in PISA and PISA 2022, calculated by a linear regression. The average decennial trend is only computed for countries with comparable data in more than two PISA assessments, over the period considered.

2. Curvilinear trends in performance are computed only for countries with comparable data in more than four PISA assessments. Curvilinear trends are calculated by a regression of performance over both linear and quadratic (squared) terms of the gap between the year of assessment and 2022. The coefficient for the linear term represents the annual rate of change in 2022, while the coefficient for the quadratic term represents the acceleration or deceleration of the change in performance.

* Caution is required when interpreting estimates because one or more PISA sampling standards were not met (see Reader's Guide, Annexes A2 and A4).

Notes: Values that are statistically significant are indicated in bold (see Annex A3). Costa Rica, Georgia, Malaysia, Malta, Moldova and the United Arab Emirates conducted the PISA 2009 assessment in 2010 as part of PISA 2009+. For Cambodia, Guatemala and Paraguay, results reported under PISA 2018 refer to the results of the PISA for Development assessment, in 2017.

Table I.B1.5.4. Mean mathematics performance, 2003 through 2022 [2/4]

		Mathematics performance, by PISA cycle											
		PISA 2003		PISA 2006		PISA 2009		PISA 2012		PISA 2015		PISA 2018		PISA 2022	
		Mean score	S.E.	Mean score	S.E.	Mean score	S.E.	Mean score	S.E.	Mean score	S.E.	Mean score	S.E.	Mean score	S.E.
Partners	Albania	m	m	m	m	377	(4.0)	394	(2.0)	413	(3.4)	437	(2.4)	368	(2.1)
	Argentina	m	m	381	(6.2)	388	(4.1)	388	(3.5)	m	m	379	(2.8)	378	(2.3)
	Baku (Azerbaijan)	m	m	m	m	m	m	m	m	m	m	420	(2.8)	397	(2.4)
	Brazil	356	(4.8)	370	(2.9)	386	(2.4)	389	(1.9)	377	(2.9)	384	(2.0)	379	(1.6)
	Brunei Darussalam	m	m	m	m	m	m	m	m	m	m	430	(1.2)	442	(0.9)
	Bulgaria	m	m	413	(6.1)	428	(5.9)	439	(4.0)	441	(4.0)	436	(3.8)	417	(3.3)
	Cambodia	m	m	m	m	m	m	m	m	m	m	325	(2.7)	336	(2.7)
	Croatia	m	m	467	(2.4)	460	(3.1)	471	(3.5)	464	(2.8)	464	(2.5)	463	(2.4)
	Cyprus	m	m	m	m	m	m	440	(1.1)	437	(1.7)	451	(1.4)	418	(1.2)
	Dominican Republic	m	m	m	m	m	m	m	m	328	(2.7)	325	(2.6)	339	(1.6)
	El Salvador	m	m	m	m	m	m	m	m	m	m	m	m	343	(2.0)
	Georgia	m	m	m	m	379	(2.8)	m	m	404	(2.8)	398	(2.6)	390	(2.4)
	Guatemala	m	m	m	m	m	m	m	m	m	m	334	(3.2)	344	(2.2)
	Hong Kong (China)*	550	(4.5)	547	(2.7)	555	(2.7)	561	(3.2)	548	(3.0)	551	(3.0)	540	(3.0)
	Indonesia	360	(3.9)	391	(5.6)	371	(3.7)	375	(4.0)	386	(3.1)	379	(3.1)	366	(2.4)
	Jamaica*	m	m	m	m	m	m	m	m	m	m	m	m	377	(3.1)
	Jordan	m	m	384	(3.3)	387	(3.7)	386	(3.1)	380	(2.7)	400	(3.3)	361	(2.0)
	Kazakhstan	m	m	m	m	405	(3.0)	432	(3.0)	m	m	423	(1.9)	425	(1.7)
	Kosovo	m	m	m	m	m	m	m	m	362	(1.6)	366	(1.5)	355	(1.0)
	Macao (China)	527	(2.9)	525	(1.3)	525	(0.9)	538	(1.0)	544	(1.1)	558	(1.5)	552	(1.1)
	Malaysia	m	m	m	m	404	(2.7)	421	(3.2)	m	m	440	(2.9)	409	(2.4)
	Malta	m	m	m	m	463	(1.4)	m	m	479	(1.7)	472	(1.9)	466	(1.6)
	Moldova	m	m	m	m	397	(3.1)	m	m	420	(2.5)	421	(2.4)	414	(2.3)
	Mongolia	m	m	m	m	m	m	m	m	m	m	m	m	425	(2.6)
	Montenegro	m	m	399	(1.4)	403	(2.0)	410	(1.1)	418	(1.5)	430	(1.2)	406	(1.1)
	Morocco	m	m	m	m	m	m	m	m	m	m	368	(3.3)	365	(3.4)
	North Macedonia	m	m	m	m	m	m	m	m	371	(1.3)	394	(1.6)	389	(0.9)
	Palestinian Authority	m	m	m	m	m	m	m	m	m	m	m	m	366	(1.8)
	Panama*	m	m	m	m	360	(5.2)	m	m	m	m	353	(2.7)	357	(2.8)
	Paraguay	m	m	m	m	m	m	m	m	m	m	326	(2.9)	338	(2.2)
	Peru	m	m	m	m	365	(4.0)	368	(3.7)	387	(2.7)	400	(2.6)	391	(2.3)
	Philippines	m	m	m	m	m	m	m	m	m	m	353	(3.5)	355	(2.6)
	Qatar	m	m	318	(1.0)	368	(0.7)	376	(0.8)	402	(1.3)	414	(1.2)	414	(1.1)
	Romania	m	m	415	(4.2)	427	(3.4)	445	(3.8)	444	(3.8)	430	(4.9)	428	(4.0)
	Saudi Arabia	m	m	m	m	m	m	m	m	m	m	373	(3.0)	389	(1.8)
	Serbia	m	m	435	(3.5)	442	(2.9)	449	(3.4)	m	m	448	(3.2)	440	(3.0)
	Singapore	m	m	m	m	562	(1.4)	573	(1.3)	564	(1.5)	569	(1.6)	575	(1.2)
	Chinese Taipei	m	m	549	(4.1)	543	(3.4)	560	(3.3)	542	(3.0)	531	(2.9)	547	(3.8)
	Thailand	417	(3.0)	417	(2.3)	419	(3.2)	427	(3.4)	415	(3.0)	419	(3.4)	394	(2.7)
	Ukrainian regions (18 of 27)	m	m	m	m	m	m	m	m	m	m	m	m	441	(4.1)
	United Arab Emirates	m	m	m	m	421	(2.5)	434	(2.4)	427	(2.4)	435	(2.1)	431	(0.9)
	Uruguay	422	(3.3)	427	(2.6)	427	(2.6)	409	(2.8)	418	(2.5)	418	(2.6)	409	(2.0)
	Uzbekistan	m	m	m	m	m	m	m	m	m	m	m	m	364	(2.0)
	Viet Nam	m	m	m	m	m	m	m	m	m	m	m	m	469	(3.9)

1. The average decennial trend is the average change, per 10-year period, between the earliest available measurement in PISA and PISA 2022, calculated by a linear regression. The average decennial trend is only computed for countries with comparable data in more than two PISA assessments, over the period considered.

2. Curvilinear trends in performance are computed only for countries with comparable data in more than four PISA assessments. Curvilinear trends are calculated by a regression of performance over both linear and quadratic (squared) terms of the gap between the year of assessment and 2022. The coefficient for the linear term represents the annual rate of change in 2022, while the coefficient for the quadratic term represents the acceleration or deceleration of the change in performance.

* Caution is required when interpreting estimates because one or more PISA sampling standards were not met (see Reader's Guide, Annexes A2 and A4).

Notes: Values that are statistically significant are indicated in bold (see Annex A3). Costa Rica, Georgia, Malaysia, Malta, Moldova and the United Arab Emirates conducted the PISA 2009 assessment in 2010 as part of PISA 2009+. For Cambodia, Guatemala and Paraguay, results reported under PISA 2018 refer to the results of the PISA for Development assessment, in 2017.

Table I.B1.5.4. Mean mathematics performance, 2003 through 2022 [3/4]

		Change in mathematics performance between PISA 2022 and:												Average decennial trend in mathematics performance across PISA assessments (since 2003 or earliest assessment available)			Average decennial trend in mathematics performance since 2012 (or earliest assessment available after 2012)			Curvilinear trend in mathematics performance across PISA assessments			
		PISA 2003 (PISA 2022 - PISA 2003)		PISA 2006 (PISA 2022 - PISA 2006)		PISA 2009 (PISA 2022 - PISA 2009)		PISA 2012 (PISA 2022 - PISA 2012)		PISA 2015 (PISA 2022 - PISA 2015)		PISA 2018 (PISA 2022 - PISA 2018)									Annual rate of change in 2022 (linear term)		Rate of acceleration or deceleration in performance (quadratic term)	
		Score dif.	S.E.	Score dif.	S.E.	Score dif.	S.E.	Score dif.	S.E.	Score dif.	S.E.	Score dif.	S.E.	Coef.	S.E.	p-value	Coef.	S.E.	p-value	Coef.	S.E.	Coef.	S.E.
OECD	Australia*	**-37**	(6.2)	**-33**	(5.0)	**-27**	(5.3)	**-17**	(4.3)	-7	(3.6)	-4	(3.5)	**-21**	(3.0)	0.000	**-16**	(4.0)	0.000	**-1.5**	(0.5)	0.04	(0.03)
	Austria	**-18**	(6.8)	**-18**	(6.0)	m	m	**-18**	(5.0)	**-9**	(4.6)	**-12**	(4.4)	**-9**	(3.3)	0.007	**-16**	(4.8)	0.001	**-2.2**	(0.7)	-0.07	(0.04)
	Belgium	**-40**	(6.4)	**-31**	(5.5)	**-26**	(5.3)	**-25**	(4.7)	**-17**	(4.2)	**-19**	(3.9)	**-18**	(3.1)	0.000	**-23**	(4.4)	0.000	**-2.4**	(0.6)	-0.03	(0.03)
	Canada*	**-36**	(6.0)	**-30**	(4.8)	**-30**	(4.8)	**-21**	(4.3)	**-19**	(3.9)	**-15**	(3.6)	**-17**	(2.9)	0.000	**-21**	(4.1)	0.000	**-2.8**	(0.5)	-0.05	(0.03)
	Chile	m	m	0	(6.5)	-9	(5.7)	**-11**	(5.2)	**-11**	(4.3)	-6	(3.9)	-1	(3.7)	0.759	**-12**	(4.8)	0.014	**-2.9**	(0.8)	**-0.18**	(0.06)
	Colombia	m	m	**13**	(6.3)	2	(6.2)	6	(5.5)	-7	(4.7)	-8	(4.8)	**9**	(3.7)	0.015	5	(5.2)	0.361	-1.4	(0.8)	**-0.14**	(0.06)
	Costa Rica	m	m	m	m	**-25**	(5.5)	**-22**	(5.1)	**-16**	(4.1)	**-18**	(4.4)	**-17**	(4.3)	0.000	**-20**	(4.8)	0.000	**-3.5**	(0.8)	-0.13	(0.09)
	Czech Republic	**-29**	(6.9)	**-23**	(5.8)	-6	(5.5)	**-12**	(5.0)	-5	(4.2)	**-12**	(3.9)	**-12**	(3.2)	0.000	-9	(4.8)	0.055	0.2	(0.6)	**0.07**	(0.04)
	Denmark*	**-25**	(6.5)	**-24**	(5.2)	**-14**	(5.4)	**-11**	(4.7)	**-22**	(4.0)	**-20**	(3.4)	**-9**	(3.0)	0.003	**-12**	(4.3)	0.006	**-1.7**	(0.6)	-0.04	(0.03)
	Estonia	m	m	-5	(5.3)	-2	(5.4)	**-11**	(4.6)	**-10**	(4.0)	**-13**	(3.5)	1	(3.3)	0.869	**-9**	(4.2)	0.036	**-2.1**	(0.7)	**-0.13**	(0.05)
	Finland	**-60**	(6.1)	**-64**	(5.0)	**-56**	(5.1)	**-35**	(4.5)	**-27**	(4.0)	**-23**	(3.5)	**-34**	(2.9)	0.000	**-33**	(4.2)	0.000	**-5.0**	(0.5)	**-0.08**	(0.03)
	France	**-37**	(6.6)	**-22**	(5.7)	**-23**	(5.8)	**-21**	(5.0)	**-19**	(4.3)	**-21**	(4.1)	**-14**	(3.1)	0.000	**-20**	(4.7)	0.000	**-2.0**	(0.6)	-0.04	(0.04)
	Germany	**-28**	(7.1)	**-29**	(6.4)	**-38**	(6.0)	**-39**	(5.5)	**-31**	(5.0)	**-25**	(4.6)	**-12**	(3.3)	0.000	**-38**	(5.2)	0.000	**-6.2**	(0.7)	**-0.26**	(0.04)
	Greece	**-15**	(7.2)	**-29**	(5.6)	**-36**	(6.2)	**-23**	(5.0)	**-23**	(5.2)	**-21**	(4.5)	**-9**	(3.3)	0.009	**-22**	(4.7)	0.000	**-5.2**	(0.7)	**-0.23**	(0.04)
	Hungary	**-17**	(6.7)	**-18**	(5.6)	**-17**	(6.0)	-4	(5.4)	-4	(4.5)	**-8**	(4.1)	**-10**	(3.2)	0.002	-3	(5.1)	0.561	-0.8	(0.7)	0.01	(0.04)
	Iceland	**-56**	(5.9)	**-47**	(4.7)	**-48**	(4.8)	**-34**	(4.3)	**-29**	(3.7)	**-36**	(3.4)	**-24**	(2.9)	0.000	**-30**	(4.1)	0.000	**-4.4**	(0.5)	**-0.10**	(0.03)
	Ireland*	-11	(6.4)	-10	(5.3)	5	(5.4)	**-10**	(4.7)	**-12**	(4.0)	**-8**	(3.7)	-2	(3.0)	0.413	**-10**	(4.4)	0.018	-0.5	(0.6)	-0.01	(0.03)
	Israel	m	m	**16**	(6.8)	11	(6.3)	-9	(6.7)	**-12**	(5.6)	-5	(5.3)	**11**	(3.9)	0.004	-10	(6.3)	0.126	**-3.2**	(1.0)	**-0.27**	(0.07)
	Italy	6	(7.1)	10	(5.6)	**-12**	(5.6)	**-14**	(5.1)	**-18**	(5.0)	**-15**	(4.7)	**8**	(3.2)	0.015	**-14**	(4.9)	0.003	**-3.3**	(0.7)	**-0.21**	(0.04)
	Japan	1	(7.4)	**12**	(6.0)	7	(6.2)	-1	(5.9)	3	(5.0)	9	(4.4)	2	(3.4)	0.574	-2	(5.5)	0.764	0.7	(0.8)	0.02	(0.04)
	Korea	**-15**	(7.5)	**-20**	(6.8)	**-19**	(7.0)	**-26**	(7.0)	3	(6.0)	1	(5.4)	**-13**	(3.4)	0.000	**-23**	(6.5)	0.000	**-2.7**	(0.9)	-0.07	(0.05)
	Latvia*	0	(7.0)	-3	(5.5)	1	(5.6)	-7	(5.0)	1	(3.9)	**-13**	(3.6)	2	(3.2)	0.510	-3	(4.5)	0.543	-0.4	(0.6)	-0.03	(0.04)
	Lithuania	m	m	**-11**	(5.4)	-1	(5.3)	-4	(4.8)	-3	(4.0)	-6	(3.5)	-4	(3.3)	0.267	-2	(4.6)	0.586	0.1	(0.7)	0.03	(0.05)
	Mexico	10	(7.0)	-11	(5.5)	**-23**	(5.2)	**-18**	(4.4)	**-13**	(4.2)	**-14**	(4.0)	2	(3.2)	0.469	**-17**	(4.3)	0.000	**-4.9**	(0.6)	**-0.27**	(0.04)
	Netherlands*	**-45**	(7.4)	**-38**	(6.1)	**-33**	(7.4)	**-30**	(6.2)	**-20**	(5.2)	**-27**	(5.1)	**-20**	(3.4)	0.000	**-27**	(5.9)	0.000	**-3.2**	(0.9)	-0.06	(0.04)
	New Zealand*	**-44**	(6.3)	**-43**	(5.1)	**-40**	(5.3)	**-21**	(4.7)	**-16**	(4.1)	**-15**	(3.4)	**-24**	(3.0)	0.000	**-19**	(4.4)	0.000	**-2.9**	(0.6)	-0.02	(0.03)
	Norway	**-27**	(6.4)	**-21**	(5.3)	**-30**	(5.3)	**-21**	(5.0)	**-33**	(4.1)	**-33**	(3.8)	**-7**	(3.0)	0.021	**-21**	(4.6)	0.000	**-4.1**	(0.6)	**-0.18**	(0.03)
	Poland	-1	(6.5)	-6	(5.3)	-6	(5.6)	**-29**	(5.6)	**-16**	(4.3)	**-27**	(4.1)	5	(3.1)	0.134	**-24**	(5.2)	0.000	**-3.7**	(0.7)	**-0.22**	(0.04)
	Portugal	6	(6.9)	6	(5.6)	**-15**	(5.7)	**-15**	(5.7)	**-20**	(4.4)	**-21**	(4.2)	**8**	(3.2)	0.011	**-15**	(5.3)	0.006	**-3.8**	(0.7)	**-0.24**	(0.04)
	Slovak Republic	**-34**	(7.1)	**-28**	(5.8)	**-33**	(6.0)	**-18**	(5.7)	**-11**	(4.8)	**-22**	(4.5)	**-16**	(3.2)	0.000	**-14**	(5.3)	0.008	**-2.3**	(0.7)	-0.04	(0.04)
	Slovenia	m	m	**-20**	(4.4)	**-17**	(4.6)	**-17**	(4.0)	**-25**	(3.3)	**-24**	(2.9)	**-7**	(2.9)	0.020	**-17**	(3.7)	0.000	**-3.9**	(0.5)	**-0.20**	(0.03)
	Spain	-12	(6.2)	-7	(4.9)	**-10**	(5.0)	**-11**	(4.3)	**-13**	(3.8)	m	m	-4	(2.9)	0.146	**-12**	(4.0)	0.002	**-1.6**	(0.5)	**-0.06**	(0.03)
	Sweden	**-27**	(6.4)	**-21**	(5.2)	**-12**	(5.6)	4	(4.7)	**-12**	(4.7)	**-21**	(4.0)	**-9**	(3.1)	0.002	4	(4.5)	0.375	0.5	(0.6)	**0.08**	(0.03)
	Switzerland	**-19**	(6.8)	**-22**	(5.6)	**-26**	(5.8)	**-23**	(5.2)	**-13**	(4.5)	-7	(4.3)	**-12**	(3.2)	0.000	**-23**	(4.9)	0.000	**-3.6**	(0.7)	**-0.13**	(0.04)
	Türkiye	**30**	(8.9)	**29**	(6.6)	8	(6.4)	5	(6.2)	**33**	(5.2)	0	(3.6)	**14**	(3.8)	0.000	**15**	(5.8)	0.009	1.2	(0.9)	-0.01	(0.05)
	United Kingdom*	m	m	-6	(5.1)	-3	(5.4)	-5	(5.3)	-4	(4.3)	**-13**	(4.1)	-1	(3.2)	0.819	-2	(5.0)	0.625	-0.8	(0.8)	-0.04	(0.05)
	United States*	**-18**	(7.4)	-9	(7.0)	**-23**	(6.9)	**-16**	(6.5)	-5	(5.8)	**-13**	(5.6)	**-8**	(3.5)	0.026	**-13**	(6.0)	0.029	**-2.1**	(0.8)	-0.07	(0.04)
	OECD average	m	m	m	m	m	m	**-16**	(3.6)	**-12**	(2.8)	m	m	**-7**	(2.7)	0.008	**-14**	(3.4)	0.000	**-2.4**	(0.3)	**-0.09**	(0.03)
	OECD average-23	**-22**	(5.6)	**-21**	(4.2)	**-21**	(4.3)	**-18**	(3.7)	**-15**	(2.8)	**-16**	(2.3)	**-10**	(2.7)	0.000	**-17**	(3.4)	0.000	**-2.6**	(0.4)	**-0.09**	(0.02)
	OECD average-26	m	m	m	m	m	m	**-16**	(3.7)	**-13**	(2.8)	**-15**	(2.3)	**-7**	(2.8)	0.015	**-15**	(3.4)	0.000	**-2.6**	(0.4)	**-0.11**	(0.03)
	OECD average-35	m	m	**-16**	(4.1)	m	m	**-16**	(3.6)	**-12**	(2.8)	**-15**	(2.3)	**-7**	(2.7)	0.009	**-14**	(3.4)	0.000	**-2.4**	(0.4)	**-0.09**	(0.02)

1. The average decennial trend is the average change, per 10-year period, between the earliest available measurement in PISA and PISA 2022, calculated by a linear regression. The average decennial trend is only computed for countries with comparable data in more than two PISA assessments, over the period considered.
2. Curvilinear trends in performance are computed only for countries with comparable data in more than four PISA assessments. Curvilinear trends are calculated by a regression of performance over both linear and quadratic (squared) terms of the gap between the year of assessment and 2022. The coefficient for the linear term represents the annual rate of change in 2022, while the coefficient for the quadratic term represents the acceleration or deceleration of the change in performance.
* Caution is required when interpreting estimates because one or more PISA sampling standards were not met (see Reader's Guide, Annexes A2 and A4).
Notes: Values that are statistically significant are indicated in bold (see Annex A3). Costa Rica, Georgia, Malaysia, Malta, Moldova and the United Arab Emirates conducted the PISA 2009 assessment in 2010 as part of PISA 2009+. For Cambodia, Guatemala and Paraguay, results reported under PISA 2018 refer to the results of the PISA for Development assessment, in 2017.

Table I.B1.5.4. Mean mathematics performance, 2003 through 2022 [4/4]

		Change in mathematics performance between PISA 2022 and:												Average decennial trend in mathematics performance[1] across PISA assessments (since 2003 or earliest assessment available)			Average decennial trend in mathematics performance since 2012 (or earliest assessment available after 2012)			Curvilinear trend in mathematics performance across PISA assessments[2]			
		PISA 2003 (PISA 2022 - PISA 2003)		PISA 2006 (PISA 2022 - PISA 2006)		PISA 2009 (PISA 2022 - PISA 2009)		PISA 2012 (PISA 2022 - PISA 2012)		PISA 2015 (PISA 2022 - PISA 2015)		PISA 2018 (PISA 2022 - PISA 2018)									Annual rate of change in 2022 (linear term)		Rate of acceleration or deceleration in performance (quadratic term)	
		Score dif.	S.E.	Score dif.	S.E.	Score dif.	S.E.	Score dif.	S.E.	Score dif.	S.E.	Score dif.	S.E.	Coef.	S.E.	p-value	Coef.	S.E.	p-value	Coef.	S.E.	Coef.	S.E.
Partners	Albania	m	m	m	m	-9	(6.2)	**-26**	(4.6)	**-45**	(4.9)	**-69**	(3.9)	4	(4.4)	0.325	**-21**	(4.5)	0.000	**-14.9**	(1.0)	**-1.18**	(0.09)
	Argentina	m	m	-4	(7.8)	-11	(6.3)	**-11**	(5.5)	m	m	-2	(4.2)	-5	(4.2)	0.255	**-11**	(5.6)	0.047	-2.2	(1.1)	-0.11	(0.08)
	Baku (Azerbaijan)	m	m	m	m	m	m	m	m	m	m	**-23**	(4.3)	m	m	m	m	m	m	m	m	m	m
	Brazil	**23**	(7.5)	9	(5.3)	-7	(5.2)	**-10**	(4.4)	2	(4.3)	-5	(3.4)	**10**	(3.3)	0.003	-7	(4.2)	0.087	**-2.9**	(0.6)	**-0.20**	(0.04)
	Brunei Darussalam	m	m	m	m	m	m	m	m	m	m	**12**	(2.7)	m	m	m	m	m	m	m	m	m	m
	Bulgaria	m	m	4	(8.1)	-11	(8.0)	**-21**	(6.3)	**-24**	(5.8)	**-19**	(5.5)	3	(4.6)	0.461	**-22**	(5.9)	0.000	**-6.1**	(1.1)	**-0.40**	(0.08)
	Cambodia	m	m	m	m	m	m	m	m	m	m	**12**	(4.4)	m	m	m	m	m	m	m	m	m	m
	Croatia	m	m	-4	(5.3)	3	(5.8)	-8	(5.6)	-1	(4.6)	-1	(4.1)	-1	(3.4)	0.722	-7	(5.1)	0.202	-0.4	(0.8)	-0.02	(0.05)
	Cyprus	m	m	m	m	m	m	**-21**	(3.9)	**-19**	(3.4)	**-32**	(2.9)	m	m	m	**-17**	(3.6)	0.000	m	m	m	m
	Dominican Republic	m	m	m	m	m	m	m	m	**11**	(4.2)	**14**	(3.8)	m	m	m	**17**	(5.6)	0.002	m	m	m	m
	El Salvador	m	m	m	m	m	m	m	m	m	m	m	m	m	m	m	m	m	m	m	m	m	m
	Georgia	m	m	m	m	11	(5.6)	m	m	**-14**	(4.6)	-8	(4.2)	8	(4.5)	0.061	**-20**	(6.7)	0.003	m	m	m	m
	Guatemala	m	m	m	m	m	m	m	m	m	m	**10**	(4.5)	m	m	m	m	m	m	m	m	m	m
	Hong Kong (China)*	-10	(7.8)	-7	(5.7)	**-14**	(5.9)	**-21**	(5.7)	-8	(5.0)	**-11**	(4.8)	-3	(3.4)	0.316	**-18**	(5.4)	0.001	**-2.5**	(0.8)	**-0.11**	(0.04)
	Indonesia	5	(7.2)	**-25**	(7.3)	-6	(6.1)	-10	(5.9)	**-21**	(4.7)	**-13**	(4.5)	0	(3.5)	0.942	**-12**	(5.5)	0.033	**-3.2**	(0.8)	**-0.17**	(0.04)
	Jamaica*	m	m	m	m	m	m	m	m	m	m	m	m	m	m	m	m	m	m	m	m	m	m
	Jordan	m	m	**-23**	(5.6)	**-25**	(6.0)	**-24**	(5.2)	**-19**	(4.3)	**-39**	(4.5)	**-8**	(3.6)	0.020	**-19**	(5.0)	0.000	**-4.7**	(0.8)	**-0.24**	(0.05)
	Kazakhstan	m	m	m	m	**21**	(5.5)	-6	(5.0)	m	m	2	(3.4)	**10**	(4.1)	0.015	-7	(5.1)	0.168	m	m	m	m
	Kosovo	m	m	m	m	m	m	m	m	**-7**	(3.3)	**-11**	(2.9)	m	m	m	**-10**	(4.6)	0.040	m	m	m	m
	Macao (China)	**25**	(6.3)	**27**	(4.4)	**27**	(4.5)	**14**	(3.9)	**8**	(3.2)	**-6**	(2.9)	**18**	(2.9)	0.000	**16**	(3.6)	0.000	**2.2**	(0.5)	0.02	(0.03)
	Malaysia	m	m	m	m	4	(5.6)	**-12**	(5.4)	m	m	**-32**	(4.4)	7	(4.3)	0.088	-8	(5.4)	0.120	m	m	m	m
	Malta	m	m	m	m	3	(4.8)	m	m	**-13**	(3.6)	-6	(3.3)	3	(3.8)	0.508	**-17**	(5.3)	0.001	m	m	m	m
	Moldova	m	m	m	m	**17**	(5.8)	m	m	-5	(4.3)	-6	(4.0)	**14**	(4.6)	0.002	-8	(6.2)	0.194	m	m	m	m
	Mongolia	m	m	m	m	m	m	m	m	m	m	m	m	m	m	m	m	m	m	m	m	m	m
	Montenegro	m	m	6	(4.5)	3	(4.9)	-4	(3.9)	**-12**	(3.3)	**-24**	(2.8)	**10**	(2.9)	0.000	-2	(3.7)	0.647	**-2.7**	(0.5)	**-0.23**	(0.04)
	Morocco	m	m	m	m	m	m	m	m	m	m	-3	(5.2)	m	m	m	m	m	m	m	m	m	m
	North Macedonia	m	m	m	m	m	m	m	m	**17**	(3.1)	**-6**	(2.9)	m	m	m	**23**	(4.4)	0.000	m	m	m	m
	Palestinian Authority	m	m	m	m	m	m	m	m	m	m	m	m	m	m	m	m	m	m	m	m	m	m
	Panama*	m	m	m	m	-3	(7.3)	m	m	m	m	4	(4.5)	-4	(5.8)	0.536	m	m	m	m	m	m	m
	Paraguay	m	m	m	m	m	m	m	m	m	m	**11**	(4.3)	m	m	m	m	m	m	m	m	m	m
	Peru	m	m	m	m	**26**	(6.3)	**23**	(5.6)	5	(4.5)	**-9**	(4.2)	**26**	(4.5)	0.000	**24**	(5.3)	0.000	-0.6	(1.0)	**-0.24**	(0.09)
	Philippines	m	m	m	m	m	m	m	m	m	m	2	(4.9)	m	m	m	m	m	m	m	m	m	m
	Qatar	m	m	**96**	(4.4)	**46**	(4.5)	**38**	(3.8)	**12**	(3.2)	0	(2.8)	**58**	(2.9)	0.000	**36**	(3.6)	0.000	**-1.6**	(0.4)	**-0.46**	(0.03)
	Romania	m	m	13	(7.1)	1	(6.8)	**-17**	(6.6)	**-16**	(6.1)	-2	(6.7)	6	(4.2)	0.153	**-19**	(6.2)	0.002	**-4.8**	(1.1)	**-0.33**	(0.07)
	Saudi Arabia	m	m	m	m	m	m	m	m	m	m	**16**	(4.1)	m	m	m	m	m	m	m	m	m	m
	Serbia	m	m	5	(6.2)	-3	(6.0)	-9	(5.8)	m	m	-8	(4.9)	3	(3.7)	0.464	-8	(5.8)	0.144	**-2.8**	(1.0)	**-0.19**	(0.07)
	Singapore	m	m	m	m	**13**	(4.7)	1	(4.0)	**10**	(3.3)	6	(3.0)	6	(3.5)	0.066	3	(3.7)	0.469	0.8	(0.6)	0.01	(0.06)
	Chinese Taipei	m	m	-2	(6.9)	4	(6.6)	**-13**	(6.2)	5	(5.6)	**16**	(5.3)	-6	(3.9)	0.160	**-13**	(5.8)	0.024	-0.1	(1.0)	0.03	(0.06)
	Thailand	**-23**	(6.8)	**-23**	(5.4)	**-25**	(6.0)	**-33**	(5.6)	**-22**	(4.9)	**-25**	(4.9)	**-8**	(3.2)	0.009	**-30**	(5.3)	0.000	**-4.4**	(0.7)	**-0.18**	(0.04)
	Ukrainiennes (18 of 27)	m	m	m	m	m	m	m	m	m	m	m	m	m	m	m	m	m	m	m	m	m	m
	United Arab Emirates	m	m	m	m	**10**	(5.0)	-3	(4.4)	4	(3.8)	-4	(3.2)	7	(3.9)	0.093	0	(4.2)	0.964	-1.2	(0.7)	-0.14	(0.08)
	Uruguay	**-13**	(6.8)	**-18**	(5.3)	**-18**	(5.4)	-1	(5.0)	**-9**	(4.2)	**-9**	(4.0)	**-8**	(3.1)	0.012	-2	(4.6)	0.738	-1.1	(0.6)	-0.02	(0.04)
	Uzbekistan	m	m	m	m	m	m	m	m	m	m	m	m	m	m	m	m	m	m	m	m	m	m
	Viet Nam	m	m	m	m	m	m	m	m	m	m	m	m	m	m	m	m	m	m	m	m	m	m

1. The average decennial trend is the average change, per 10-year period, between the earliest available measurement in PISA and PISA 2022, calculated by a linear regression. The average decennial trend is only computed for countries with comparable data in more than two PISA assessments, over the period considered. 2. Curvilinear trends in performance are computed only for countries with comparable data in more than four PISA assessments. Curvilinear trends are calculated by a regression of performance over both linear and quadratic (squared) terms of the gap between the year of assessment and 2022. The coefficient for the linear term represents the annual rate of change in 2022, while the coefficient for the quadratic term represents the acceleration or deceleration of the change in performance. * Caution is required when interpreting estimates because one or more PISA sampling standards were not met (see Reader's Guide, Annexes A2 and A4). Notes: Values that are statistically significant are indicated in bold (see Annex A3). Costa Rica, Georgia, Malaysia, Malta, Moldova and the United Arab Emirates conducted the PISA 2009 assessment in 2010 as part of PISA 2009+. For Cambodia, Guatemala and Paraguay, results reported under PISA 2018 refer to the results of the PISA for Development assessment, in 2017.

Table I.B1.5.5. Mean reading performance, 2000 through 2022 [1/6]

		Reading performance, by PISA cycle													
		PISA 2000		PISA 2003		PISA 2006		PISA 2009		PISA 2012		PISA 2015		PISA 2018		PISA 2022	
		Mean score	S.E.	Mean score	S.E.	Mean score	S.E.	Mean score	S.E.	Mean score	S.E.	Mean score	S.E.	Mean score	S.E.	Mean score	S.E.
OECD	Australia*	528	(3.5)	525	(2.1)	513	(2.1)	515	(2.3)	512	(1.6)	503	(1.7)	503	(1.6)	498	(2.0)
	Austria	492	(2.7)	491	(3.8)	490	(4.1)	m	m	490	(2.8)	485	(2.8)	484	(2.7)	480	(2.7)
	Belgium	507	(3.6)	507	(2.6)	501	(3.0)	506	(2.3)	509	(2.3)	499	(2.4)	493	(2.3)	479	(2.5)
	Canada*	534	(1.6)	528	(1.7)	527	(2.4)	524	(1.5)	523	(1.9)	527	(2.3)	520	(1.8)	507	(2.0)
	Chile	410	(3.6)	m	m	442	(5.0)	449	(3.1)	441	(2.9)	459	(2.6)	452	(2.6)	448	(2.6)
	Colombia	m	m	m	m	385	(5.1)	413	(3.7)	403	(3.4)	425	(2.9)	412	(3.3)	409	(3.8)
	Costa Rica	m	m	m	m	m	m	443	(3.2)	441	(3.5)	427	(2.6)	426	(3.4)	415	(2.7)
	Czech Republic	492	(2.4)	489	(3.5)	483	(4.2)	478	(2.9)	493	(2.9)	487	(2.6)	490	(2.5)	489	(2.2)
	Denmark*	497	(2.4)	492	(2.8)	494	(3.2)	495	(2.1)	496	(2.6)	500	(2.5)	501	(1.8)	489	(2.6)
	Estonia	m	m	m	m	501	(2.9)	501	(2.6)	516	(2.0)	519	(2.2)	523	(1.8)	511	(2.4)
	Finland	546	(2.6)	543	(1.6)	547	(2.1)	536	(2.3)	524	(2.4)	526	(2.5)	520	(2.3)	490	(2.3)
	France	505	(2.7)	496	(2.7)	488	(4.1)	496	(3.4)	505	(2.8)	499	(2.5)	493	(2.3)	474	(3.1)
	Germany	484	(2.5)	491	(3.4)	495	(4.4)	497	(2.7)	508	(2.8)	509	(3.0)	498	(3.0)	480	(3.6)
	Greece	474	(5.0)	472	(4.1)	460	(4.0)	483	(4.3)	477	(3.3)	467	(4.3)	457	(3.6)	438	(2.8)
	Hungary	480	(4.0)	482	(2.5)	482	(3.3)	494	(3.2)	488	(3.2)	470	(2.7)	476	(2.3)	473	(2.8)
	Iceland	507	(1.5)	492	(1.6)	484	(1.9)	500	(1.4)	483	(1.8)	482	(2.0)	474	(1.7)	436	(2.1)
	Ireland*	527	(3.2)	515	(2.6)	517	(3.5)	496	(3.0)	523	(2.6)	521	(2.5)	518	(2.2)	516	(2.3)
	Israel	452	(8.5)	m	m	439	(4.6)	474	(3.6)	486	(5.0)	479	(3.8)	470	(3.7)	474	(3.5)
	Italy	487	(2.9)	476	(3.0)	469	(2.4)	486	(1.6)	490	(2.0)	485	(2.7)	476	(2.4)	482	(2.7)
	Japan	522	(5.2)	498	(3.9)	498	(3.6)	520	(3.5)	538	(3.7)	516	(3.2)	504	(2.7)	516	(3.2)
	Korea	525	(2.4)	534	(3.1)	556	(3.8)	539	(3.5)	536	(3.9)	517	(3.5)	514	(2.9)	515	(3.6)
	Latvia*	458	(5.3)	491	(3.7)	479	(3.7)	484	(3.0)	489	(2.4)	488	(1.8)	479	(1.6)	475	(2.5)
	Lithuania	m	m	m	m	470	(3.0)	468	(2.4)	477	(2.5)	472	(2.7)	476	(1.5)	472	(2.2)
	Mexico	422	(3.3)	400	(4.1)	410	(3.1)	425	(2.0)	424	(1.5)	423	(2.6)	420	(2.7)	415	(2.9)
	Netherlands*	m	m	513	(2.9)	507	(2.9)	508	(5.1)	511	(3.5)	503	(2.4)	485	(2.7)	459	(4.3)
	New Zealand*	529	(2.8)	522	(2.5)	521	(3.0)	521	(2.4)	512	(2.4)	509	(2.4)	506	(2.0)	501	(2.1)
	Norway	505	(2.8)	500	(2.8)	484	(3.2)	503	(2.6)	504	(3.2)	513	(2.5)	499	(2.2)	477	(2.5)
	Poland	479	(4.5)	497	(2.9)	508	(2.8)	500	(2.6)	518	(3.1)	506	(2.5)	512	(2.7)	489	(2.7)
	Portugal	470	(4.5)	478	(3.7)	472	(3.6)	489	(3.1)	488	(3.8)	498	(2.7)	492	(2.4)	477	(2.7)
	Slovak Republic	m	m	469	(3.1)	466	(3.1)	477	(2.5)	463	(4.2)	453	(2.8)	458	(2.2)	447	(3.1)
	Slovenia	m	m	m	m	494	(1.0)	483	(1.0)	481	(1.2)	505	(1.5)	495	(1.2)	469	(1.6)
	Spain	493	(2.7)	481	(2.6)	461	(2.2)	481	(2.0)	488	(1.9)	496	(2.4)	m	m	474	(1.7)
	Sweden	516	(2.2)	514	(2.4)	507	(3.4)	497	(2.9)	483	(3.0)	500	(3.5)	506	(3.0)	487	(2.5)
	Switzerland	494	(4.2)	499	(3.3)	499	(3.1)	501	(2.4)	509	(2.6)	492	(3.0)	484	(3.1)	483	(2.3)
	Türkiye	m	m	441	(5.8)	447	(4.2)	464	(3.5)	475	(4.2)	428	(4.0)	466	(2.2)	456	(1.9)
	United Kingdom*	m	m	m	m	495	(2.3)	494	(2.3)	499	(3.5)	498	(2.8)	504	(2.6)	494	(2.4)
	United States*	504	(7.0)	495	(3.2)	m	m	500	(3.7)	498	(3.7)	497	(3.4)	505	(3.6)	504	(4.3)
	OECD average	m	m	m	m	m	m	m	m	492	(0.5)	489	(0.5)	m	m	476	(0.5)
	OECD average-23	500	(0.7)	497	(0.6)	495	(0.7)	499	(0.6)	501	(0.6)	497	(0.6)	493	(0.5)	482	(0.6)
	OECD average-26	m	m	m	m	m	m	m	m	487	(0.6)	482	(0.6)	480	(0.5)	469	(0.5)
	OECD average-35	m	m	m	m	m	m	m	m	494	(0.5)	490	(0.5)	488	(0.4)	477	(0.5)

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Table I.B1.5.5. Mean reading performance, 2000 through 2022 [2/6]

		Reading performance, by PISA cycle															
		PISA 2000		PISA 2003		PISA 2006		PISA 2009		PISA 2012		PISA 2015		PISA 2018		PISA 2022	
		Mean score	S.E.	Mean score	S.E.	Mean score	S.E.	Mean score	S.E.	Mean score	S.E.	Mean score	S.E.	Mean score	S.E.	Mean score	S.E.
Partners	Albania	349	(3.3)	m	m	m	m	385	(4.0)	394	(3.2)	405	(4.1)	405	(1.9)	358	(1.9)
	Argentina	418	(9.9)	m	m	374	(7.2)	398	(4.6)	396	(3.7)	m	m	402	(3.0)	401	(2.6)
	Baku (Azerbaijan)	m	m	m	m	m	m	m	m	m	m	m	m	389	(2.5)	365	(2.5)
	Brazil	396	(3.1)	403	(4.6)	393	(3.7)	412	(2.7)	407	(2.0)	407	(2.8)	413	(2.1)	410	(2.1)
	Brunei Darussalam	m	m	m	m	m	m	m	m	m	m	m	m	408	(0.9)	429	(1.2)
	Bulgaria	430	(4.9)	m	m	402	(6.9)	429	(6.7)	436	(6.0)	432	(5.0)	420	(3.9)	404	(3.4)
	Cambodia	m	m	m	m	m	m	m	m	m	m	m	m	321	(2.1)	329	(2.1)
	Croatia	m	m	m	m	477	(2.8)	476	(2.9)	485	(3.3)	487	(2.7)	479	(2.7)	475	(2.4)
	Cyprus	m	m	m	m	m	m	m	m	449	(1.2)	443	(1.7)	424	(1.4)	381	(1.2)
	Dominican Republic	m	m	m	m	m	m	m	m	m	m	358	(3.1)	342	(2.9)	351	(2.4)
	El Salvador	m	m	m	m	m	m	m	m	m	m	m	m	m	m	365	(2.8)
	Georgia	m	m	m	m	m	m	374	(2.9)	m	m	401	(3.0)	380	(2.2)	374	(2.3)
	Guatemala	m	m	m	m	m	m	m	m	m	m	m	m	369	(3.5)	374	(2.4)
	Hong Kong (China)*	525	(2.9)	510	(3.7)	536	(2.4)	533	(2.1)	545	(2.8)	527	(2.7)	524	(2.7)	500	(2.8)
	Indonesia	371	(4.0)	382	(3.4)	393	(5.9)	402	(3.7)	396	(4.2)	397	(2.9)	371	(2.6)	359	(2.9)
	Jamaica*	m	m	m	m	m	m	m	m	m	m	m	m	m	m	410	(4.2)
	Jordan	m	m	m	m	m	m	m	m	m	m	m	m	m	m	342	(2.4)
	Kazakhstan	m	m	m	m	m	m	390	(3.1)	393	(2.7)	m	m	387	(1.5)	386	(1.7)
	Kosovo	m	m	m	m	m	m	m	m	m	m	347	(1.6)	353	(1.1)	342	(1.1)
	Macao (China)	m	m	498	(2.2)	492	(1.1)	487	(0.9)	509	(0.9)	509	(1.3)	525	(1.2)	510	(1.3)
	Malaysia	m	m	m	m	m	m	414	(2.9)	398	(3.3)	m	m	415	(2.9)	388	(2.7)
	Malta	m	m	m	m	m	m	442	(1.6)	m	m	447	(1.8)	448	(1.7)	445	(1.9)
	Moldova	m	m	m	m	m	m	388	(2.8)	m	m	416	(2.5)	424	(2.4)	411	(2.5)
	Mongolia	m	m	m	m	m	m	m	m	m	m	m	m	m	m	378	(2.3)
	Montenegro	m	m	m	m	392	(1.2)	408	(1.7)	422	(1.2)	427	(1.6)	421	(1.1)	405	(1.3)
	Morocco	m	m	m	m	m	m	m	m	m	m	m	m	359	(3.1)	339	(4.0)
	North Macedonia	373	(1.9)	m	m	m	m	m	m	m	m	352	(1.4)	393	(1.1)	359	(0.8)
	Palestinian Authority	m	m	m	m	m	m	m	m	m	m	m	m	m	m	349	(2.0)
	Panama*	m	m	m	m	m	m	371	(6.5)	m	m	m	m	377	(3.0)	392	(3.4)
	Paraguay	m	m	m	m	m	m	m	m	m	m	m	m	370	(3.7)	373	(2.4)
	Peru	327	(4.4)	m	m	m	m	370	(4.0)	384	(4.3)	398	(2.9)	401	(3.0)	408	(2.7)
	Philippines	m	m	m	m	m	m	m	m	m	m	m	m	340	(3.3)	347	(3.4)
	Qatar	m	m	m	m	312	(1.2)	372	(0.8)	388	(0.8)	402	(1.0)	407	(0.8)	419	(1.4)
	Romania	m	m	m	m	396	(4.7)	424	(4.1)	438	(4.0)	434	(4.1)	428	(5.1)	428	(4.0)
	Saudi Arabia	m	m	m	m	m	m	m	m	m	m	m	m	399	(3.0)	383	(2.0)
	Serbia	m	m	m	m	401	(3.5)	442	(2.4)	446	(3.4)	m	m	439	(3.3)	440	(2.8)
	Singapore	m	m	m	m	m	m	526	(1.1)	542	(1.4)	535	(1.6)	549	(1.6)	543	(1.9)
	Chinese Taipei	m	m	m	m	496	(3.4)	495	(2.6)	523	(3.0)	497	(2.5)	503	(2.8)	515	(3.3)
	Thailand	431	(3.2)	420	(2.8)	417	(2.6)	421	(2.6)	441	(3.1)	409	(3.3)	393	(3.2)	379	(2.8)
	Ukrainian regions (18 of 27)	m	m	m	m	m	m	m	m	m	m	m	m	m	m	428	(3.9)
	United Arab Emirates	m	m	m	m	m	m	431	(2.9)	442	(2.5)	434	(2.9)	432	(2.3)	417	(1.3)
	Uruguay	m	m	434	(3.4)	413	(3.4)	426	(2.6)	411	(3.2)	437	(2.5)	427	(2.8)	430	(2.4)
	Uzbekistan	m	m	m	m	m	m	m	m	m	m	m	m	m	m	336	(2.0)
	Viet Nam**	m	m	m	m	m	m	m	m	m	m	m	m	m	m	462	(3.9)

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Table I.B1.5.5. Mean reading performance, 2000 through 2022 [3/6]

		Change in reading performance between PISA 2022 and:													
		PISA 2000 (PISA 2022 - PISA 2000)		PISA 2003 (PISA 2022 - PISA 2003)		PISA 2006 (PISA 2022 - PISA 2006)		PISA 2009 (PISA 2022 - PISA 2009)		PISA 2012 (PISA 2022 - PISA 2012)		PISA 2015 (PISA 2022 - PISA 2015)		PISA 2018 (PISA 2022 - PISA 2018)	
		Score dif.	S.E.	Score dif.	S.E.	Score dif.	S.E.	Score dif.	S.E.	Score dif.	S.E.	Score dif.	S.E.	Score dif.	S.E.
OECD	Australia*	**-30**	(7.8)	**-27**	(6.0)	-15	(9.0)	**-17**	(5.6)	**-14**	(6.5)	-5	(4.5)	-5	(3.0)
OECD	Austria	-12	(7.7)	-10	(7.0)	-10	(9.9)	m	m	-9	(7.1)	-4	(5.3)	-4	(4.1)
OECD	Belgium	**-28**	(8.0)	**-28**	(6.4)	**-22**	(9.4)	**-27**	(5.8)	**-30**	(6.9)	**-20**	(5.0)	**-14**	(3.7)
OECD	Canada*	**-27**	(7.1)	**-21**	(5.9)	**-20**	(9.1)	**-17**	(5.3)	**-16**	(6.6)	**-20**	(4.7)	**-13**	(3.0)
OECD	Chile	**38**	(8.0)	m	m	6	(10.3)	-1	(6.2)	7	(7.2)	**-11**	(5.2)	-4	(4.0)
OECD	Colombia	m	m	m	m	**23**	(10.6)	-5	(7.1)	5	(7.9)	**-16**	(6.0)	-4	(5.2)
OECD	Costa Rica	m	m	m	m	m	m	**-27**	(6.2)	**-25**	(7.4)	**-12**	(5.2)	**-11**	(4.6)
OECD	Czech Republic	-3	(7.4)	0	(6.7)	6	(9.8)	10	(5.9)	-4	(7.0)	1	(5.0)	-2	(3.7)
OECD	Denmark*	-8	(7.5)	-4	(6.5)	-6	(9.5)	-6	(5.7)	-7	(7.1)	**-11**	(5.1)	**-12**	(3.5)
OECD	Estonia	m	m	m	m	10	(9.3)	10	(5.9)	-5	(6.8)	-8	(4.9)	**-12**	(3.3)
OECD	Finland	**-56**	(7.5)	**-53**	(5.9)	**-57**	(9.1)	**-46**	(5.6)	**-34**	(6.8)	**-36**	(5.0)	**-30**	(3.5)
OECD	France	**-31**	(7.8)	**-22**	(6.6)	-14	(10.0)	**-22**	(6.6)	**-32**	(7.3)	**-25**	(5.4)	**-19**	(4.1)
OECD	Germany	-4	(8.0)	-12	(7.2)	-15	(10.3)	**-18**	(6.5)	**-28**	(7.6)	**-29**	(5.9)	**-18**	(4.9)
OECD	Greece	**-35**	(8.8)	**-34**	(7.2)	**-21**	(9.9)	**-44**	(7.0)	**-39**	(7.4)	**-29**	(6.3)	**-19**	(4.8)
OECD	Hungary	-7	(8.3)	-9	(6.5)	-9	(9.6)	**-21**	(6.3)	**-15**	(7.4)	3	(5.3)	-3	(3.9)
OECD	Iceland	**-71**	(7.1)	**-56**	(5.9)	**-49**	(9.0)	**-64**	(5.3)	**-47**	(6.6)	**-46**	(4.6)	**-38**	(3.1)
OECD	Ireland*	-11	(7.8)	1	(6.3)	-1	(9.6)	**20**	(6.0)	-7	(6.9)	-5	(5.0)	-2	(3.6)
OECD	Israel	22	(11.3)	m	m	**35**	(10.3)	0	(6.9)	-12	(8.6)	-5	(6.3)	3	(5.3)
OECD	Italy	-6	(7.8)	6	(6.6)	13	(9.3)	-4	(5.6)	-8	(6.9)	-3	(5.2)	5	(3.9)
OECD	Japan	-6	(9.0)	**18**	(7.3)	18	(9.8)	-4	(6.6)	**-22**	(7.7)	0	(5.8)	**12**	(4.4)
OECD	Korea	-9	(8.0)	**-19**	(7.1)	**-41**	(10.1)	**-24**	(6.8)	**-20**	(8.1)	-2	(6.2)	1	(4.9)
OECD	Latvia*	16	(8.8)	**-16**	(6.9)	-5	(9.7)	-9	(6.0)	**-14**	(6.9)	**-13**	(4.7)	-4	(3.3)
OECD	Lithuania	m	m	m	m	2	(9.3)	3	(5.7)	-5	(6.9)	-1	(5.1)	-4	(3.1)
OECD	Mexico	-7	(8.0)	**16**	(7.3)	5	(9.5)	-10	(5.8)	-8	(6.9)	-8	(5.3)	-5	(4.3)
OECD	Netherlands*	m	m	**-54**	(7.4)	**-48**	(10.0)	**-49**	(8.2)	**-52**	(8.2)	**-44**	(6.1)	**-26**	(5.2)
OECD	New Zealand*	**-28**	(7.5)	**-21**	(6.2)	**-20**	(9.3)	**-20**	(5.6)	-11	(6.8)	-8	(4.8)	-5	(3.3)
OECD	Norway	**-29**	(7.7)	**-23**	(6.5)	-8	(9.5)	**-27**	(5.9)	**-27**	(7.3)	**-37**	(5.1)	**-23**	(3.7)
OECD	Poland	10	(8.5)	-8	(6.6)	**-19**	(9.4)	**-12**	(6.0)	**-29**	(7.3)	**-17**	(5.2)	**-23**	(4.1)
OECD	Portugal	6	(8.5)	-1	(7.0)	4	(9.6)	**-13**	(6.2)	-11	(7.6)	**-22**	(5.2)	**-15**	(3.9)
OECD	Slovak Republic	m	m	**-22**	(6.9)	**-19**	(9.6)	**-31**	(6.1)	**-16**	(7.9)	-6	(5.6)	**-11**	(4.1)
OECD	Slovenia	m	m	m	m	**-26**	(8.8)	**-15**	(5.0)	**-13**	(6.3)	**-37**	(4.2)	**-27**	(2.5)
OECD	Spain	**-18**	(7.4)	-6	(6.1)	13	(9.0)	-7	(5.3)	**-14**	(6.5)	**-21**	(4.6)	m	m
OECD	Sweden	**-29**	(7.5)	**-27**	(6.3)	**-20**	(9.6)	-10	(6.0)	4	(7.2)	**-13**	(5.6)	**-19**	(4.2)
OECD	Switzerland	-11	(8.2)	**-16**	(6.6)	-16	(9.4)	**-17**	(5.7)	**-26**	(6.9)	-9	(5.2)	-1	(4.1)
OECD	Türkiye	m	m	15	(8.0)	9	(9.7)	-8	(6.1)	**-19**	(7.6)	**28**	(5.7)	**-10**	(3.2)
OECD	United Kingdom*	m	m	m	m	-1	(9.2)	0	(5.7)	-5	(7.3)	-4	(5.1)	**-10**	(3.8)
OECD	United States*	0	(10.6)	9	(7.5)	m	m	4	(7.3)	6	(8.3)	7	(6.6)	-1	(5.8)
	OECD average	m	m	m	m	m	m	m	m	**-16**	(6.0)	**-13**	(3.7)	m	m
	OECD average-23	**-18**	(6.7)	**-15**	(5.3)	-14	(8.6)	**-17**	(4.7)	**-19**	(6.1)	**-15**	(3.7)	**-11**	(1.7)
	OECD average-26	m	m	m	m	m	m	m	m	**-18**	(6.1)	**-13**	(3.7)	**-11**	(1.6)
	OECD average-35	m	m	m	m	m	m	m	m	**-16**	(6.0)	**-13**	(3.7)	**-10**	(1.6)

* Caution is required when interpreting estimates because one or more PISA sampling standards were not met (see Reader's Guide, Annexes A2 and A4). ** Caution is required when comparing estimates based on PISA 2022 with other countries/economies as a strong linkage to the international PISA reading scale could not be established (see Reader's Guide and Annex A4). 1. The average decennial trend is the average change, per 10-year period, between the earliest available measurement in PISA and PISA 2022, calculated by a linear regression. The average decennial trend is only computed for countries with comparable data in more than two PISA assessments, over the period considered. 2. Curvilinear trends in performance are computed only for countries with comparable data in more than four PISA assessments. Curvilinear trends are calculated by a regression of performance over both linear and quadratic (squared) terms of the gap between the year of assessment and 2022. The coefficient for the linear term represents the annual rate of change in 2022, while the coefficient for the quadratic term represents the acceleration or deceleration of the change in performance. Notes: Values that are statistically significant are indicated in bold (see Annex A3). Costa Rica, Georgia, Malaysia, Malta, Moldova and the United Arab Emirates conducted the PISA 2009 assessment in 2010 as part of PISA 2009+. For Cambodia, Guatemala and Paraguay, results reported under PISA 2018 refer to the results of the PISA for Development assessment, in 2017.

Table I.B1.5.5. Mean reading performance, 2000 through 2022 [4/6]

		Change in reading performance between PISA 2022 and:													
		PISA 2000 (PISA 2022 - PISA 2000)		PISA 2003 (PISA 2022 - PISA 2003)		PISA 2006 (PISA 2022 - PISA 2006)		PISA 2009 (PISA 2022 - PISA 2009)		PISA 2012 (PISA 2022 - PISA 2012)		PISA 2015 (PISA 2022 - PISA 2015)		PISA 2018 (PISA 2022 - PISA 2018)	
		Score dif.	S.E.	Score dif.	S.E.	Score dif.	S.E.	Score dif.	S.E.	Score dif.	S.E.	Score dif.	S.E.	Score dif.	S.E.
Partners	Albania	10	(7.7)	m	m	m	m	**-26**	(6.5)	**-36**	(7.1)	**-47**	(5.8)	**-47**	(3.1)
	Argentina	-18	(12.2)	m	m	**27**	(11.5)	2	(7.1)	5	(7.5)	m	m	-1	(4.2)
	Baku (Azerbaijan)	m	m	m	m	m	m	m	m	m	m	m	m	**-24**	(3.8)
	Brazil	14	(7.6)	8	(7.3)	17	(9.6)	-1	(5.8)	4	(6.7)	3	(5.0)	-3	(3.3)
	Brunei Darussalam	m	m	m	m	m	m	m	m	m	m	m	m	**21**	(2.1)
	Bulgaria	**-26**	(8.9)	m	m	2	(11.5)	**-25**	(8.8)	**-32**	(9.2)	**-27**	(7.0)	**-16**	(5.4)
	Cambodia	m	m	m	m	m	m	m	m	m	m	m	m	**8**	(3.3)
	Croatia	m	m	m	m	-2	(9.3)	0	(6.0)	-9	(7.3)	**-11**	(5.1)	-3	(3.9)
	Cyprus	m	m	m	m	m	m	m	m	**-68**	(6.2)	**-62**	(4.2)	**-43**	(2.3)
	Dominican Republic	m	m	m	m	m	m	m	m	m	m	-6	(5.3)	**10**	(4.0)
	El Salvador	m	m	m	m	m	m	m	m	m	m	m	m	m	m
	Georgia	m	m	m	m	m	m	0	(5.9)	m	m	**-27**	(5.2)	-6	(3.5)
	Guatemala	m	m	m	m	m	m	m	m	m	m	m	m	5	(4.5)
	Hong Kong (China)*	**-26**	(7.8)	-10	(7.0)	**-36**	(9.3)	**-33**	(5.9)	**-45**	(7.2)	**-27**	(5.3)	**-25**	(4.2)
	Indonesia	-12	(8.3)	**-23**	(6.9)	**-34**	(10.8)	**-43**	(6.6)	**-38**	(7.9)	**-39**	(5.5)	**-12**	(4.1)
	Jamaica*	m	m	m	m	m	m	m	m	m	m	m	m	m	m
	Jordan	m	m	m	m	m	m	m	m	m	m	m	m	m	m
	Kazakhstan	m	m	m	m	m	m	-4	(5.8)	-6	(6.8)	m	m	-1	(2.7)
	Kosovo	m	m	m	m	m	m	m	m	m	m	-5	(4.1)	**-11**	(2.1)
	Macao (China)	m	m	**13**	(5.8)	**18**	(8.7)	**24**	(4.9)	1	(6.2)	2	(4.1)	**-15**	(2.3)
	Malaysia	m	m	m	m	m	m	**-26**	(6.1)	-10	(7.4)	m	m	**-27**	(4.2)
	Malta	m	m	m	m	m	m	3	(5.3)	m	m	-1	(4.5)	-3	(3.0)
	Moldova	m	m	m	m	m	m	**23**	(6.0)	m	m	-5	(5.1)	**-13**	(3.8)
	Mongolia	m	m	m	m	m	m	m	m	m	m	m	m	m	m
	Montenegro	m	m	m	m	13	(8.8)	-3	(5.1)	**-17**	(6.3)	**-22**	(4.2)	**-16**	(2.3)
	Morocco	m	m	m	m	m	m	m	m	m	m	m	m	**-20**	(5.3)
	North Macedonia	**-14**	(7.0)	m	m	m	m	m	m	m	m	7	(4.0)	**-34**	(2.0)
	Palestinian Authority	m	m	m	m	m	m	m	m	m	m	m	m	m	m
	Panama*	m	m	m	m	m	m	**21**	(8.7)	m	m	m	m	**15**	(4.7)
	Paraguay	m	m	m	m	m	m	m	m	m	m	m	m	3	(4.7)
	Peru	**81**	(8.5)	m	m	m	m	**39**	(6.7)	**24**	(7.9)	**11**	(5.4)	8	(4.3)
	Philippines	m	m	m	m	m	m	m	m	m	m	m	m	7	(5.0)
	Qatar	m	m	m	m	**107**	(8.8)	**48**	(4.9)	**32**	(6.2)	**17**	(4.0)	**12**	(2.2)
	Romania	m	m	m	m	**33**	(10.5)	4	(7.4)	-9	(8.2)	-5	(6.7)	1	(6.7)
	Saudi Arabia	m	m	m	m	m	m	m	m	m	m	m	m	**-17**	(3.9)
	Serbia	m	m	m	m	**39**	(9.6)	-2	(5.9)	-6	(7.5)	m	m	1	(4.5)
	Singapore	m	m	m	m	m	m	**17**	(5.1)	0	(6.4)	7	(4.4)	**-7**	(2.9)
	Chinese Taipei	m	m	m	m	19	(9.8)	**20**	(6.2)	-8	(7.5)	**18**	(5.5)	**13**	(4.6)
	Thailand	**-52**	(7.9)	**-41**	(6.6)	**-38**	(9.4)	**-43**	(6.1)	**-63**	(7.3)	**-30**	(5.7)	**-14**	(4.5)
	Ukrainian regions (18 of 27)	m	m	m	m	m	m	m	m	m	m	m	m	m	m
	United Arab Emirates	m	m	m	m	m	m	**-14**	(5.6)	**-24**	(6.6)	**-16**	(4.8)	**-14**	(3.0)
	Uruguay	m	m	-4	(6.7)	18	(9.5)	5	(5.9)	**19**	(7.2)	-6	(5.0)	3	(3.9)
	Uzbekistan	m	m	m	m	m	m	m	m	m	m	m	m	m	m
	Viet Nam**	m	m	m	m	m	m	m	m	m	m	m	m	m	m

1. The average decennial trend is the average change, per 10-year period, between the earliest available measurement in PISA and PISA 2022, calculated by a linear regression. The average decennial trend is only computed for countries with comparable data in more than two PISA assessments, over the period considered. 2. Curvilinear trends in performance are computed only for countries with comparable data in more than four PISA assessments. Curvilinear trends are calculated by a regression of performance over both linear and quadratic (squared) terms of the gap between the year of assessment and 2022. The coefficient for the linear term represents the annual rate of change in 2022, while the coefficient for the quadratic term represents the acceleration or deceleration of the change in performance. * Caution is required when interpreting estimates because one or more PISA sampling standards were not met (see Reader's Guide, Annexes A2 and A4). ** Caution is required when comparing estimates based on PISA 2022 with other countries/economies as a strong linkage to the international PISA reading scale could not be established (see Reader's Guide and Annex A4). Notes: Values that are statistically significant are indicated in bold (see Annex A3). Costa Rica, Georgia, Malaysia, Malta, Moldova and the United Arab Emirates conducted the PISA 2009 assessment in 2010 as part of PISA 2009+. For Cambodia, Guatemala and Paraguay, results reported under PISA 2018 refer to the results of the PISA for Development assessment, in 2017.

Table I.B1.5.5. Mean reading performance, 2000 through 2022 [5/6]

		Average decennial trend in reading performance[1] across PISA assessments (since 2000 or earliest assessment available)			Average decennial trend in reading performance[1] since 2012 (or earliest assessment available after 2012)			Curvilinear trend in reading performance across PISA assessments [2]			
								Annual rate of change in 2022 (linear term)		Rate of acceleration or deceleration in performance (quadratic term)	
		Coef.	S.E.	p-value	Coef.	S.E.	p-value	Coef.	S.E.	Coef.	S.E.
OECD	Australia*	**-14**	(4.3)	0.001	-12	(6.4)	0.052	-0.8	(0.8)	0.02	(0.04)
	Austria	-5	(4.4)	0.254	-9	(6.8)	0.209	-1.0	(0.8)	-0.02	(0.04)
	Belgium	**-11**	(4.3)	0.012	**-29**	(6.6)	0.000	**-3.3**	(0.8)	**-0.10**	(0.04)
	Canada*	**-9**	(4.2)	0.031	**-17**	(6.4)	0.007	**-1.7**	(0.7)	-0.04	(0.03)
	Chile	**16**	(4.6)	0.000	4	(6.8)	0.583	**-2.1**	(0.8)	**-0.17**	(0.04)
	Colombia	**12**	(5.9)	0.048	0	(7.5)	0.984	**-3.6**	(1.1)	**-0.30**	(0.07)
	Costa Rica	**-21**	(6.3)	0.001	**-23**	(7.1)	0.001	**-2.3**	(1.1)	-0.02	(0.10)
	Czech Republic	1	(4.3)	0.894	-3	(6.7)	0.643	0.9	(0.8)	0.04	(0.04)
	Denmark*	0	(4.3)	0.989	-7	(6.7)	0.286	-0.8	(0.8)	-0.03	(0.04)
	Estonia	**11**	(5.4)	0.043	-4	(6.4)	0.569	**-2.1**	(0.8)	**-0.20**	(0.05)
	Finland	**-23**	(4.2)	0.000	**-34**	(6.6)	0.000	**-4.9**	(0.7)	**-0.12**	(0.04)
	France	-8	(4.3)	0.079	**-31**	(7.0)	0.000	**-2.6**	(0.8)	**-0.08**	(0.04)
	Germany	2	(4.4)	0.716	**-30**	(7.2)	0.000	**-4.1**	(0.8)	**-0.19**	(0.04)
	Greece	**-12**	(4.5)	0.007	**-39**	(7.1)	0.000	**-4.7**	(0.9)	**-0.16**	(0.04)
	Hungary	-5	(4.4)	0.270	-12	(7.0)	0.094	**-2.2**	(0.8)	-0.08	(0.04)
	Iceland	**-24**	(4.2)	0.000	**-46**	(6.3)	0.000	**-5.7**	(0.7)	**-0.15**	(0.03)
	Ireland*	-1	(4.3)	0.862	-7	(6.6)	0.286	1.5	(0.8)	0.07	(0.04)
	Israel	**13**	(5.5)	0.015	-13	(8.1)	0.096	-0.8	(1.0)	-0.10	(0.06)
	Italy	1	(4.3)	0.870	-9	(6.6)	0.169	0.0	(0.8)	0.00	(0.04)
	Japan	2	(4.5)	0.632	**-22**	(7.4)	0.003	-0.6	(0.9)	-0.04	(0.04)
	Korea	**-11**	(4.4)	0.011	**-19**	(7.8)	0.017	**-4.3**	(0.9)	**-0.14**	(0.04)
	Latvia*	3	(4.5)	0.489	**-15**	(6.6)	0.019	**-3.2**	(0.8)	**-0.16**	(0.04)
	Lithuania	2	(5.4)	0.679	-4	(6.6)	0.533	-0.8	(0.8)	-0.06	(0.06)
	Mexico	4	(4.4)	0.420	-9	(6.6)	0.196	-0.6	(0.8)	-0.04	(0.04)
	Netherlands*	**-25**	(5.1)	0.000	**-53**	(7.7)	0.000	**-7.1**	(1.0)	**-0.24**	(0.06)
	New Zealand*	**-12**	(4.3)	0.004	-11	(6.5)	0.088	-1.4	(0.7)	-0.01	(0.04)
	Norway	-5	(4.3)	0.257	**-30**	(6.9)	0.000	**-2.8**	(0.8)	**-0.10**	(0.04)
	Poland	5	(4.4)	0.215	**-26**	(7.0)	0.000	**-4.3**	(0.8)	**-0.22**	(0.04)
	Portugal	7	(4.5)	0.111	-13	(7.3)	0.078	**-2.2**	(0.9)	**-0.13**	(0.04)
	Slovak Republic	**-13**	(4.9)	0.011	-13	(7.5)	0.080	**-2.5**	(0.9)	-0.06	(0.05)
	Slovenia	-7	(5.1)	0.156	**-17**	(6.2)	0.006	**-4.2**	(0.7)	**-0.21**	(0.05)
	Spain	-1	(4.2)	0.858	**-17**	(6.1)	0.007	-0.1	(0.7)	0.00	(0.04)
	Sweden	**-11**	(4.3)	0.010	3	(6.9)	0.635	0.3	(0.8)	0.07	(0.04)
	Switzerland	-7	(4.4)	0.131	**-25**	(6.7)	0.000	**-3.1**	(0.8)	**-0.11**	(0.04)
	Türkiye	5	(5.2)	0.322	-6	(7.2)	0.402	-1.6	(1.0)	-0.11	(0.06)
	United Kingdom*	2	(5.3)	0.719	-3	(7.0)	0.658	-1.0	(0.9)	-0.08	(0.06)
	United States*	2	(4.7)	0.733	8	(7.9)	0.292	1.3	(1.0)	0.05	(0.05)
	OECD average	-4	(4.3)	0.393	**-16**	(5.8)	0.006	**-2.1**	(0.6)	**-0.09**	(0.03)
	OECD average-23	-6	(4.1)	0.176	**-19**	(5.8)	0.001	**-2.2**	(0.6)	**-0.07**	(0.03)
	OECD average-26	-3	(4.4)	0.434	**-17**	(5.8)	0.003	**-2.4**	(0.6)	**-0.10**	(0.03)
	OECD average-35	-3	(4.3)	0.447	**-16**	(5.8)	0.007	**-2.2**	(0.6)	**-0.09**	(0.03)

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Table I.B1.5.5. Mean reading performance, 2000 through 2022 [6/6]

		Average decennial trend in reading performance[1] across PISA assessments (since 2000 or earliest assessment available)			Average decennial trend in reading performance[1] since 2012 (or earliest assessment available after 2012)			Curvilinear trend in reading performance across PISA assessments [2]			
								Annual rate of change in 2022 (linear term)		Rate of acceleration or deceleration in performance (quadratic term)	
		Coef.	S.E.	p-value	Coef.	S.E.	p-value	Coef.	S.E.	Coef.	S.E.
Partners	Albania	**12**	(4.3)	0.005	**-35**	(6.7)	0.000	**-6.5**	(0.8)	**-0.35**	(0.04)
	Argentina	-2	(5.8)	0.790	5	(7.7)	0.500	**3.2**	(1.2)	**0.16**	(0.07)
	Baku (Azerbaijan)	m	m	m	m	m	m	m	m	m	m
	Brazil	7	(4.4)	0.096	5	(6.5)	0.437	0.2	(0.8)	-0.02	(0.04)
	Brunei Darussalam	m	m	m	m	m	m	m	m	m	m
	Bulgaria	-5	(4.9)	0.321	**-33**	(8.7)	0.000	**-2.5**	(1.1)	-0.09	(0.05)
	Cambodia	m	m	m	m	m	m	m	m	m	m
	Croatia	0	(5.4)	0.979	-11	(6.9)	0.114	**-2.1**	(0.9)	**-0.13**	(0.06)
	Cyprus	m	m	m	**-69**	(6.0)	0.000	m	m	m	m
	Dominican Republic	m	m	m	-7	(7.4)	0.346	m	m	m	m
	El Salvador	m	m	m	m	m	m	m	m	m	m
	Georgia	-2	(5.8)	0.731	**-38**	(7.5)	0.000	m	m	m	m
	Guatemala	m	m	m	m	m	m	m	m	m	m
	Hong Kong (China)*	-5	(4.6)	0.267	**-42**	(6.9)	0.000	**-5.4**	(0.8)	**-0.22**	(0.04)
	Indonesia	-5	(4.6)	0.229	**-42**	(7.5)	0.000	**-7.1**	(0.9)	**-0.30**	(0.04)
	Jamaica*	m	m	m	m	m	m	m	m	m	m
	Jordan	m	m	m	m	m	m	m	m	m	m
	Kazakhstan	-4	(5.8)	0.467	-6	(7.1)	0.362	m	m	m	m
	Kosovo	m	m	m	-8	(5.7)	0.166	m	m	m	m
	Macao (China)	**14**	(4.7)	0.003	4	(5.9)	0.455	1.2	(0.7)	-0.01	(0.05)
	Malaysia	-12	(6.3)	0.063	-7	(7.7)	0.352	m	m	m	m
	Malta	3	(5.4)	0.596	-2	(6.1)	0.720	m	m	m	m
	Moldova	**20**	(5.9)	0.001	-9	(7.3)	0.230	m	m	m	m
	Mongolia	m	m	m	m	m	m	m	m	m	m
	Montenegro	9	(5.1)	0.073	**-18**	(6.0)	0.003	**-5.8**	(0.6)	**-0.42**	(0.04)
	Morocco	m	m	m	m	m	m	m	m	m	m
	North Macedonia	-2	(4.3)	0.633	4	(5.5)	0.431	m	m	m	m
	Palestinian Authority	m	m	m	m	m	m	m	m	m	m
	Panama*	15	(7.5)	0.051	m	m	m	m	m	m	m
	Paraguay	m	m	m	m	m	m	m	m	m	m
	Peru	**38**	(4.6)	0.000	**22**	(7.5)	0.003	1.4	(0.9)	**-0.11**	(0.04)
	Philippines	m	m	m	m	m	m	m	m	m	m
	Qatar	**59**	(5.1)	0.000	**31**	(6.0)	0.000	**-2.2**	(0.6)	**-0.51**	(0.04)
	Romania	**15**	(5.6)	0.008	-10	(8.0)	0.223	**-4.3**	(1.2)	**-0.36**	(0.08)
	Saudi Arabia	m	m	m	m	m	m	m	m	m	m
	Serbia	**16**	(5.5)	0.003	-6	(7.7)	0.451	**-5.4**	(1.1)	**-0.44**	(0.08)
	Singapore	**12**	(5.5)	0.026	4	(6.4)	0.508	-1.2	(0.9)	**-0.19**	(0.07)
	Chinese Taipei	8	(5.6)	0.131	-4	(7.2)	0.568	0.4	(1.0)	-0.03	(0.06)
	Thailand	**-20**	(4.5)	0.000	**-61**	(7.1)	0.000	**-5.9**	(0.8)	**-0.18**	(0.04)
	Ukrainian regions (18 of 27)	m	m	m	m	m	m	m	m	m	m
	United Arab Emirates	**-12**	(6.0)	0.038	**-23**	(6.4)	0.000	**-4.6**	(0.9)	**-0.26**	(0.09)
	Uruguay	3	(4.9)	0.516	**13**	(6.8)	0.049	**2.1**	(0.8)	0.09	(0.05)
	Uzbekistan	m	m	m	m	m	m	m	m	m	m
	Viet Nam**	m	m	m	m	m	m	m	m	m	m

1. The average decennial trend is the average change, per 10-year period, between the earliest available measurement in PISA and PISA 2022, calculated by a linear regression. The average decennial trend is only computed for countries with comparable data in more than two PISA assessments, over the period considered.2. Curvilinear trends in performance are computed only for countries with comparable data in more than four PISA assessments. Curvilinear trends are calculated by a regression of performance over both linear and quadratic (squared) terms of the gap between the year of assessment and 2022. The coefficient for the linear term represents the annual rate of change in 2022, while the coefficient for the quadratic term represents the acceleration or deceleration of the change in performance. * Caution is required when interpreting estimates because one or more PISA sampling standards were not met (see Reader's Guide, Annexes A2 and A4).** Caution is required when comparing estimates based on PISA 2022 with other countries/economies as a strong linkage to the international PISA reading scale could not be established (see Reader's Guide and Annex A4). Notes: Values that are statistically significant are indicated in bold (see Annex A3). Costa Rica, Georgia, Malaysia, Malta, Moldova and the United Arab Emirates conducted the PISA 2009 assessment in 2010 as part of PISA 2009+. For Cambodia, Guatemala and Paraguay, results reported under PISA 2018 refer to the results of the PISA for Development assessment, in 2017.

Table I.B1.5.6. Mean science performance, 2006 through 2022 [1/6]

		Science performance, by PISA cycle											
		PISA 2006		PISA 2009		PISA 2012		PISA 2015		PISA 2018		PISA 2022	
		Mean score	S.E.	Mean score	S.E.	Mean score	S.E.	Mean score	S.E.	Mean score	S.E.	Mean score	S.E.
OECD	Australia*	527	(2.3)	527	(2.5)	521	(1.8)	510	(1.5)	503	(1.8)	507	(1.9)
OECD	Austria	511	(3.9)	m	m	506	(2.7)	495	(2.4)	490	(2.8)	491	(2.7)
OECD	Belgium	510	(2.5)	507	(2.5)	505	(2.2)	502	(2.3)	499	(2.2)	491	(2.5)
OECD	Canada*	534	(2.0)	529	(1.6)	525	(1.9)	528	(2.1)	518	(2.2)	515	(1.9)
OECD	Chile	438	(4.3)	447	(2.9)	445	(2.9)	447	(2.4)	444	(2.4)	444	(2.5)
OECD	Colombia	388	(3.4)	402	(3.6)	399	(3.1)	416	(2.4)	413	(3.1)	411	(3.3)
OECD	Costa Rica	m	m	430	(2.8)	429	(2.9)	420	(2.1)	416	(3.3)	411	(2.4)
OECD	Czech Republic	513	(3.5)	500	(3.0)	508	(3.0)	493	(2.3)	497	(2.5)	498	(2.3)
OECD	Denmark*	496	(3.1)	499	(2.5)	498	(2.7)	502	(2.4)	493	(1.9)	494	(2.5)
OECD	Estonia	531	(2.5)	528	(2.7)	541	(1.9)	534	(2.1)	530	(1.9)	526	(2.1)
OECD	Finland	563	(2.0)	554	(2.3)	545	(2.2)	531	(2.4)	522	(2.5)	511	(2.5)
OECD	France	495	(3.4)	498	(3.6)	499	(2.6)	495	(2.1)	493	(2.2)	487	(2.7)
OECD	Germany	516	(3.8)	520	(2.8)	524	(3.0)	509	(2.7)	503	(2.9)	492	(3.5)
OECD	Greece	473	(3.2)	470	(4.0)	467	(3.1)	455	(3.9)	452	(3.1)	441	(2.8)
OECD	Hungary	504	(2.7)	503	(3.1)	494	(2.9)	477	(2.4)	481	(2.3)	486	(2.7)
OECD	Iceland	491	(1.6)	496	(1.4)	478	(2.1)	473	(1.7)	475	(1.8)	447	(1.8)
OECD	Ireland*	508	(3.2)	508	(3.3)	522	(2.5)	503	(2.4)	496	(2.2)	504	(2.3)
OECD	Israel	454	(3.7)	455	(3.1)	470	(5.0)	467	(3.4)	462	(3.6)	465	(3.4)
OECD	Italy	475	(2.0)	489	(1.8)	494	(1.9)	481	(2.5)	468	(2.4)	477	(3.2)
OECD	Japan	531	(3.4)	539	(3.4)	547	(3.6)	538	(3.0)	529	(2.6)	547	(2.8)
OECD	Korea	522	(3.4)	538	(3.4)	538	(3.7)	516	(3.1)	519	(2.8)	528	(3.6)
OECD	Latvia*	490	(3.0)	494	(3.1)	502	(2.8)	490	(1.6)	487	(1.8)	494	(2.3)
OECD	Lithuania	488	(2.8)	491	(2.9)	496	(2.6)	475	(2.7)	482	(1.6)	484	(2.3)
OECD	Mexico	410	(2.7)	416	(1.8)	415	(1.3)	416	(2.1)	419	(2.6)	410	(2.4)
OECD	Netherlands*	525	(2.7)	522	(5.4)	522	(3.5)	509	(2.3)	503	(2.8)	488	(4.1)
OECD	New Zealand*	530	(2.7)	532	(2.6)	516	(2.1)	513	(2.4)	508	(2.1)	504	(2.2)
OECD	Norway	487	(3.1)	500	(2.6)	495	(3.1)	498	(2.3)	490	(2.3)	478	(2.4)
OECD	Poland	498	(2.3)	508	(2.4)	526	(3.1)	501	(2.5)	511	(2.6)	499	(2.5)
OECD	Portugal	474	(3.0)	493	(2.9)	489	(3.7)	501	(2.4)	492	(2.8)	484	(2.6)
OECD	Slovak Republic	488	(2.6)	490	(3.0)	471	(3.6)	461	(2.6)	464	(2.3)	462	(3.0)
OECD	Slovenia	519	(1.1)	512	(1.1)	514	(1.3)	513	(1.3)	507	(1.3)	500	(1.4)
OECD	Spain	488	(2.6)	488	(2.1)	496	(1.8)	493	(2.1)	m	m	485	(1.6)
OECD	Sweden	503	(2.4)	495	(2.7)	485	(3.0)	493	(3.6)	499	(3.1)	494	(2.4)
OECD	Switzerland	512	(3.2)	517	(2.8)	515	(2.7)	506	(2.9)	495	(3.0)	503	(2.2)
OECD	Türkiye	424	(3.8)	454	(3.6)	463	(3.9)	425	(3.9)	468	(2.0)	476	(1.9)
OECD	United Kingdom*	515	(2.3)	514	(2.5)	514	(3.4)	509	(2.6)	505	(2.6)	500	(2.4)
OECD	United States*	489	(4.2)	502	(3.6)	497	(3.8)	496	(3.2)	502	(3.3)	499	(4.3)
	OECD average	m	m	m	m	497	(0.5)	489	(0.4)	m	m	485	(0.4)
	OECD average-23	503	(0.6)	506	(0.6)	505	(0.6)	497	(0.5)	493	(0.5)	491	(0.5)
	OECD average-26	m	m	m	m	491	(0.6)	482	(0.5)	482	(0.5)	479	(0.5)
	OECD average-35	495	(0.5)	m	m	499	(0.5)	491	(0.4)	489	(0.4)	487	(0.5)

1. The average decennial trend is the average change, per 10-year period, between the earliest available measurement in PISA and PISA 2022, calculated by a linear regression. The average decennial trend is only computed for countries with comparable data in more than two PISA assessments, over the period considered.

2. Curvilinear trends in performance are computed only for countries with comparable data in more than four PISA assessments. Curvilinear trends are calculated by a regression of performance over both linear and quadratic (squared) terms of the gap between the year of assessment and 2022. The coefficient for the linear term represents the annual rate of change in 2022, while the coefficient for the quadratic term represents the acceleration or deceleration of the change in performance.

* Caution is required when interpreting estimates because one or more PISA sampling standards were not met (see Reader's Guide, Annexes A2 and A4).

Notes: Values that are statistically significant are indicated in bold (see Annex A3). Costa Rica, Georgia, Malaysia, Malta, Moldova and the United Arab Emirates conducted the PISA 2009 assessment in 2010 as part of PISA 2009+. For Cambodia, Guatemala and Paraguay, results reported under PISA 2018 refer to the results of the PISA for Development assessment, in 2017.

Table I.B1.5.6. Mean science performance, 2006 through 2022 [2/6]

		Science performance, by PISA cycle											
		PISA 2006		PISA 2009		PISA 2012		PISA 2015		PISA 2018		PISA 2022	
		Mean score	S.E.	Mean score	S.E.	Mean score	S.E.	Mean score	S.E.	Mean score	S.E.	Mean score	S.E.
Partners	Albania	m	m	391	(3.9)	397	(2.4)	427	(3.3)	417	(2.0)	376	(2.2)
	Argentina	391	(6.1)	401	(4.6)	406	(3.9)	m	m	404	(2.9)	406	(2.5)
	Baku (Azerbaijan)	m	m	m	m	m	m	m	m	398	(2.4)	380	(2.2)
	Brazil	390	(2.8)	405	(2.4)	402	(2.1)	401	(2.3)	404	(2.1)	403	(1.9)
	Brunei Darussalam	m	m	m	m	m	m	m	m	431	(1.2)	446	(1.3)
	Bulgaria	434	(6.1)	439	(5.9)	446	(4.8)	446	(4.4)	424	(3.6)	421	(3.2)
	Cambodia	m	m	m	m	m	m	m	m	330	(1.9)	347	(2.1)
	Croatia	493	(2.4)	486	(2.8)	491	(3.1)	475	(2.5)	472	(2.8)	483	(2.4)
	Cyprus	m	m	m	m	438	(1.2)	433	(1.4)	439	(1.4)	411	(1.5)
	Dominican Republic	m	m	m	m	m	m	332	(2.6)	336	(2.5)	360	(2.0)
	El Salvador	m	m	m	m	m	m	m	m	m	m	373	(2.6)
	Georgia	m	m	373	(2.9)	m	m	411	(2.4)	383	(2.3)	384	(2.3)
	Guatemala	m	m	m	m	m	m	m	m	365	(2.9)	373	(2.2)
	Hong Kong (China)*	542	(2.5)	549	(2.8)	555	(2.6)	523	(2.5)	517	(2.5)	520	(2.8)
	Indonesia	393	(5.7)	383	(3.8)	382	(3.8)	403	(2.6)	396	(2.4)	383	(2.6)
	Jamaica*	m	m	m	m	m	m	m	m	m	m	403	(3.9)
	Jordan	m	m	m	m	m	m	m	m	m	m	375	(2.4)
	Kazakhstan	m	m	400	(3.1)	425	(3.0)	m	m	397	(1.7)	423	(1.7)
	Kosovo	m	m	m	m	m	m	378	(1.7)	365	(1.2)	357	(1.3)
	Macao (China)	511	(1.1)	511	(1.0)	521	(0.8)	529	(1.1)	544	(1.5)	543	(1.1)
	Malaysia	m	m	422	(2.7)	420	(3.0)	m	m	438	(2.7)	416	(2.3)
	Malta	m	m	461	(1.7)	m	m	465	(1.6)	457	(1.9)	466	(1.7)
	Moldova	m	m	413	(3.0)	m	m	428	(2.0)	428	(2.3)	417	(2.4)
	Mongolia	m	m	m	m	m	m	m	m	m	m	412	(2.4)
	Montenegro	412	(1.1)	401	(2.0)	410	(1.1)	411	(1.0)	415	(1.3)	403	(1.2)
	Morocco	m	m	m	m	m	m	m	m	377	(3.0)	365	(3.4)
	North Macedonia	m	m	m	m	m	m	384	(1.2)	413	(1.4)	380	(0.9)
	Palestinian Authority	m	m	m	m	m	m	m	m	m	m	369	(2.1)
	Panama*	m	m	376	(5.7)	m	m	m	m	365	(2.9)	388	(3.5)
	Paraguay	m	m	m	m	m	m	m	m	358	(3.3)	368	(2.1)
	Peru	m	m	369	(3.5)	373	(3.6)	397	(2.4)	404	(2.7)	408	(2.6)
	Philippines	m	m	m	m	m	m	m	m	357	(3.2)	356	(3.1)
	Qatar	349	(0.9)	379	(0.9)	384	(0.7)	418	(1.0)	419	(0.9)	432	(1.5)
	Romania	418	(4.2)	428	(3.4)	439	(3.3)	435	(3.2)	426	(4.6)	428	(3.9)
	Saudi Arabia	m	m	m	m	m	m	m	m	386	(2.8)	390	(2.0)
	Serbia	436	(3.0)	443	(2.4)	445	(3.4)	m	m	440	(3.0)	447	(2.9)
	Singapore	m	m	542	(1.4)	551	(1.5)	556	(1.2)	551	(1.5)	561	(1.3)
	Chinese Taipei	532	(3.6)	520	(2.6)	523	(2.3)	532	(2.7)	516	(2.9)	537	(3.3)
	Thailand	421	(2.1)	425	(3.0)	444	(2.9)	421	(2.8)	426	(3.2)	409	(2.8)
	Ukrainian regions (18 of 27)	m	m	m	m	m	m	m	m	m	m	450	(3.8)
	United Arab Emirates	m	m	438	(2.6)	448	(2.8)	437	(2.4)	434	(2.0)	432	(1.3)
	Uruguay	428	(2.7)	427	(2.6)	416	(2.8)	435	(2.2)	426	(2.5)	435	(2.5)
	Uzbekistan	m	m	m	m	m	m	m	m	m	m	355	(2.0)
	Viet Nam	m	m	m	m	m	m	m	m	m	m	472	(3.6)

1. The average decennial trend is the average change, per 10-year period, between the earliest available measurement in PISA and PISA 2022, calculated by a linear regression. The average decennial trend is only computed for countries with comparable data in more than two PISA assessments, over the period considered.

2. Curvilinear trends in performance are computed only for countries with comparable data in more than four PISA assessments. Curvilinear trends are calculated by a regression of performance over both linear and quadratic (squared) terms of the gap between the year of assessment and 2022. The coefficient for the linear term represents the annual rate of change in 2022, while the coefficient for the quadratic term represents the acceleration or deceleration of the change in performance.

* Caution is required when interpreting estimates because one or more PISA sampling standards were not met (see Reader's Guide, Annexes A2 and A4).

Notes: Values that are statistically significant are indicated in bold (see Annex A3). Costa Rica, Georgia, Malaysia, Malta, Moldova and the United Arab Emirates conducted the PISA 2009 assessment in 2010 as part of PISA 2009+. For Cambodia, Guatemala and Paraguay, results reported under PISA 2018 refer to the results of the PISA for Development assessment, in 2017.

Table I.B1.5.6. Mean science performance, 2006 through 2022 [3/6]

		Change in science performance between PISA 2022 and:									
		PISA 2006 (PISA 2022 - PISA 2006)		PISA 2009 (PISA 2022 - PISA 2009)		PISA 2012 (PISA 2022 - PISA 2012)		PISA 2015 (PISA 2022 - PISA 2015)		PISA 2018 (PISA 2022 - PISA 2018)	
		Score dif.	S.E.	Score dif.	S.E.	Score dif.	S.E.	Score dif.	S.E.	Score dif.	S.E.
OECD	Australia*	**-20**	(4.7)	**-20**	(6.7)	**-14**	(5.8)	-3	(2.8)	4	(3.1)
OECD	Austria	**-20**	(6.0)	m	m	**-15**	(6.4)	-4	(3.9)	1	(4.2)
OECD	Belgium	**-20**	(5.1)	**-16**	(6.9)	**-14**	(6.2)	**-11**	(3.6)	**-8**	(3.7)
OECD	Canada*	**-19**	(4.6)	**-14**	(6.4)	-10	(5.9)	**-13**	(3.2)	-3	(3.3)
OECD	Chile	5	(6.2)	-4	(7.0)	-1	(6.4)	-3	(3.7)	0	(3.8)
OECD	Colombia	**23**	(6.0)	9	(7.7)	12	(6.9)	-5	(4.3)	-2	(4.8)
OECD	Costa Rica	m	m	**-19**	(7.0)	**-18**	(6.4)	**-9**	(3.5)	-5	(4.4)
OECD	Czech Republic	**-15**	(5.6)	-3	(7.0)	-11	(6.4)	5	(3.5)	1	(3.8)
OECD	Denmark*	-2	(5.4)	-6	(6.9)	-5	(6.4)	**-8**	(3.7)	1	(3.5)
OECD	Estonia	-6	(4.9)	-2	(6.8)	**-16**	(5.9)	**-8**	(3.2)	-4	(3.2)
OECD	Finland	**-52**	(4.9)	**-43**	(6.8)	**-34**	(6.2)	**-20**	(3.7)	**-11**	(3.9)
OECD	France	-8	(5.7)	-11	(7.4)	-12	(6.4)	**-8**	(3.7)	-6	(3.9)
OECD	Germany	**-23**	(6.3)	**-28**	(7.4)	**-32**	(6.9)	**-17**	(4.6)	**-11**	(4.8)
OECD	Greece	**-33**	(5.6)	**-29**	(7.7)	**-26**	(6.7)	**-14**	(5.0)	**-11**	(4.5)
OECD	Hungary	**-18**	(5.3)	**-17**	(7.2)	-8	(6.6)	**9**	(3.9)	5	(3.9)
OECD	Iceland	**-44**	(4.4)	**-49**	(6.3)	**-31**	(5.9)	**-26**	(2.8)	**-28**	(3.0)
OECD	Ireland*	-4	(5.4)	-4	(7.1)	**-18**	(6.2)	1	(3.6)	**8**	(3.5)
OECD	Israel	11	(6.2)	10	(7.5)	-5	(7.9)	-2	(5.0)	3	(5.2)
OECD	Italy	2	(5.3)	-11	(6.9)	**-16**	(6.4)	-3	(4.3)	**9**	(4.3)
OECD	Japan	**15**	(5.7)	7	(7.4)	0	(6.9)	8	(4.3)	**17**	(4.1)
OECD	Korea	6	(6.1)	-10	(7.7)	-10	(7.3)	**12**	(5.0)	9	(4.8)
OECD	Latvia*	4	(5.3)	0	(7.1)	-8	(6.3)	4	(3.1)	**7**	(3.3)
OECD	Lithuania	-3	(5.2)	-7	(7.0)	-11	(6.2)	**9**	(3.8)	2	(3.3)
OECD	Mexico	0	(5.2)	-6	(6.6)	-5	(5.9)	-6	(3.5)	**-9**	(3.9)
OECD	Netherlands*	**-37**	(6.1)	**-34**	(9.0)	**-34**	(7.5)	**-20**	(4.9)	**-15**	(5.2)
OECD	New Zealand*	**-26**	(5.1)	**-28**	(6.8)	-12	(6.1)	**-9**	(3.6)	-4	(3.5)
OECD	Norway	-8	(5.4)	**-22**	(6.9)	**-16**	(6.5)	**-20**	(3.6)	**-12**	(3.7)
OECD	Poland	1	(5.1)	-9	(6.9)	**-27**	(6.6)	-2	(3.8)	**-12**	(4.0)
OECD	Portugal	10	(5.4)	-9	(7.1)	-5	(6.9)	**-17**	(3.8)	-7	(4.1)
OECD	Slovak Republic	**-26**	(5.4)	**-28**	(7.3)	-9	(7.0)	1	(4.2)	-2	(4.1)
OECD	Slovenia	**-19**	(4.1)	-12	(6.2)	**-14**	(5.5)	**-13**	(2.4)	**-7**	(2.5)
OECD	Spain	-4	(4.8)	-4	(6.5)	**-12**	(5.7)	**-8**	(3.0)	m	m
OECD	Sweden	**-10**	(5.0)	-2	(6.9)	9	(6.4)	0	(4.5)	-6	(4.2)
OECD	Switzerland	-9	(5.3)	**-14**	(6.9)	**-13**	(6.3)	-3	(3.9)	7	(4.0)
OECD	Türkiye	**52**	(5.7)	**22**	(7.2)	13	(6.8)	**50**	(4.6)	**8**	(3.2)
OECD	United Kingdom*	**-15**	(4.9)	**-14**	(6.9)	**-14**	(6.6)	**-10**	(3.8)	-5	(3.8)
OECD	United States*	11	(7.1)	-3	(8.2)	2	(7.7)	3	(5.5)	-3	(5.7)
	OECD average	m	m	m	m	**-12**	(5.2)	**-4**	(1.5)	m	m
	OECD average-23	**-12**	(3.8)	**-15**	(6.0)	**-14**	(5.3)	**-6**	(1.6)	-3	(1.8)
	OECD average-26	m	m	m	m	**-12**	(5.3)	-3	(1.6)	-3	(1.8)
	OECD average-35	**-8**	(3.7)	m	m	**-12**	(5.2)	**-4**	(1.5)	-2	(1.7)

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Table I.B1.5.6. Mean science performance, 2006 through 2022 [4/6]

		Change in science performance between PISA 2022 and:									
		PISA 2006 (PISA 2022 - PIS A 2006)		PISA 2009 (PISA 2022 - PIS A 2009)		PISA 2012 (PISA 2022 - PIS A 2012)		PISA 2015 (PISA 2022 - PIS A 2015)		PISA 2018 (PISA 2022 - PIS A 2018)	
		Score dif.	S.E.	Score dif.	S.E.	Score dif.	S.E.	Score dif.	S.E.	Score dif.	S.E.
Partners	Albania	m	m	**-15**	(7.4)	**-21**	(6.2)	**-51**	(4.2)	**-41**	(3.4)
	Argentina	**15**	(7.5)	5	(7.9)	1	(7.0)	m	m	2	(4.1)
	Baku (Azerbaijan)	m	m	m	m	m	m	m	m	**-18**	(3.6)
	Brazil	**13**	(5.0)	-2	(6.7)	1	(5.9)	2	(3.3)	-1	(3.2)
	Brunei Darussalam	m	m	m	m	m	m	m	m	**15**	(2.4)
	Bulgaria	-13	(7.8)	**-18**	(8.9)	**-25**	(7.7)	**-25**	(5.6)	-3	(5.1)
	Cambodia	m	m	m	m	m	m	m	m	**17**	(3.3)
	Croatia	**-11**	(5.0)	-4	(7.0)	-9	(6.5)	**7**	(3.7)	**10**	(4.0)
	Cyprus	m	m	m	m	**-27**	(5.5)	**-22**	(2.4)	**-28**	(2.6)
	Dominican Republic	m	m	m	m	m	m	**29**	(3.6)	**25**	(3.6)
	El Salvador	m	m	m	m	m	m	m	m	m	m
	Georgia	m	m	11	(7.0)	m	m	**-27**	(3.6)	1	(3.6)
	Guatemala	m	m	m	m	m	m	m	m	**8**	(4.0)
	Hong Kong (China)*	**-22**	(5.2)	**-29**	(7.1)	**-35**	(6.5)	-3	(4.0)	4	(4.1)
	Indonesia	-11	(7.3)	0	(7.5)	1	(6.9)	**-20**	(3.9)	**-13**	(3.9)
	Jamaica*	m	m	m	m	m	m	m	m	m	m
	Jordan	m	m	m	m	m	m	m	m	m	m
	Kazakhstan	m	m	**23**	(6.9)	-2	(6.2)	m	m	**26**	(2.9)
	Kosovo	m	m	m	m	m	m	**-21**	(2.5)	**-8**	(2.4)
	Macao (China)	**32**	(4.0)	**32**	(6.1)	**23**	(5.4)	**15**	(2.1)	0	(2.4)
	Malaysia	m	m	-6	(6.9)	-3	(6.4)	m	m	**-21**	(3.9)
	Malta	m	m	4	(6.4)	m	m	1	(2.7)	**9**	(3.0)
	Moldova	m	m	4	(7.1)	m	m	**-11**	(3.4)	**-12**	(3.7)
	Mongolia	m	m	m	m	m	m	m	m	m	m
	Montenegro	**-9**	(4.0)	2	(6.4)	-7	(5.4)	**-8**	(2.1)	**-12**	(2.4)
	Morocco	m	m	m	m	m	m	m	m	**-11**	(4.8)
	North Macedonia	m	m	m	m	m	m	-4	(2.1)	**-33**	(2.3)
	Palestinian Authority	m	m	m	m	m	m	m	m	m	m
	Panama*	m	m	12	(9.0)	m	m	m	m	**23**	(4.8)
	Paraguay	m	m	m	m	m	m	m	m	**10**	(4.2)
	Peru	m	m	**38**	(7.4)	**35**	(6.8)	**11**	(3.8)	4	(4.1)
	Philippines	m	m	m	m	m	m	m	m	-1	(4.7)
	Qatar	**83**	(4.1)	**53**	(6.2)	**49**	(5.5)	**15**	(2.3)	**13**	(2.4)
	Romania	9	(6.8)	-1	(7.8)	-11	(7.2)	-7	(5.2)	2	(6.2)
	Saudi Arabia	m	m	m	m	m	m	m	m	4	(3.8)
	Serbia	**12**	(5.6)	5	(7.0)	3	(6.9)	m	m	8	(4.5)
	Singapore	m	m	**20**	(6.2)	10	(5.6)	**6**	(2.3)	**10**	(2.6)
	Chinese Taipei	5	(6.1)	**17**	(7.3)	**14**	(6.6)	5	(4.5)	**22**	(4.7)
	Thailand	**-12**	(5.1)	**-16**	(7.2)	**-35**	(6.6)	**-12**	(4.2)	**-17**	(4.5)
	Ukrainian regions (18 of 27)	m	m	m	m	m	m	m	m	m	m
	United Arab Emirates	m	m	-6	(6.6)	**-16**	(6.1)	-5	(3.1)	-2	(2.9)
	Uruguay	7	(5.2)	8	(6.9)	**20**	(6.4)	0	(3.6)	**10**	(3.9)
	Uzbekistan	m	m	m	m	m	m	m	m	m	m
	Viet Nam	m	m	m	m	m	m	m	m	m	m

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2. Curvilinear trends in performance are computed only for countries with comparable data in more than four PISA assessments. Curvilinear trends are calculated by a regression of performance over both linear and quadratic (squared) terms of the gap between the year of assessment and 2022. The coefficient for the linear term represents the annual rate of change in 2022, while the coefficient for the quadratic term represents the acceleration or deceleration of the change in performance.

* Caution is required when interpreting estimates because one or more PISA sampling standards were not met (see Reader's Guide, Annexes A2 and A4).

Notes: Values that are statistically significant are indicated in bold (see Annex A3). Costa Rica, Georgia, Malaysia, Malta, Moldova and the United Arab Emirates conducted the PISA 2009 assessment in 2010 as part of PISA 2009+. For Cambodia, Guatemala and Paraguay, results reported under PISA 2018 refer to the results of the PISA for Development assessment, in 2017.

Table I.B1.5.6. Mean science performance, 2006 through 2022 [5/6]

		Average decennial trend in science performance[1] across PISA assessments (since 2006 or earliest assessment available)			Average decennial trend in science performance[1] since 2012 (or earliest assessment available after 2012)			Curvilinear trend in science performance across PISA assessments [2]			
								Annual rate of change in 2022 (linear term)		Rate of acceleration or deceleration in performance (quadratic term)	
		Coef.	S.E.	p-value	Coef.	S.E.	p-value	Coef.	S.E.	Coef.	S.E.
OECD	Australia*	**-16**	(4.6)	0.000	**-14**	(5.3)	0.007	-0.8	(0.7)	0.05	(0.04)
	Austria	**-14**	(5.0)	0.004	**-14**	(5.9)	0.015	-0.8	(0.8)	0.04	(0.05)
	Belgium	**-11**	(4.8)	0.016	**-14**	(5.7)	0.012	**-1.8**	(0.8)	-0.04	(0.05)
	Canada*	**-12**	(4.6)	0.011	**-13**	(5.4)	0.018	**-1.4**	(0.7)	-0.01	(0.04)
	Chile	2	(5.0)	0.730	-2	(6.0)	0.769	-1.1	(0.9)	-0.08	(0.06)
	Colombia	**15**	(5.1)	0.003	10	(6.4)	0.119	-0.9	(1.0)	**-0.15**	(0.06)
	Costa Rica	**-16**	(5.9)	0.006	**-18**	(5.9)	0.003	-1.4	(1.0)	0.02	(0.10)
	Czech Republic	-9	(4.9)	0.064	-8	(6.0)	0.198	0.7	(0.8)	0.10	(0.05)
	Denmark*	-3	(4.8)	0.581	-7	(5.8)	0.222	-1.4	(0.8)	-0.07	(0.05)
	Estonia	-3	(4.7)	0.545	**-15**	(5.4)	0.005	**-2.3**	(0.7)	**-0.12**	(0.04)
	Finland	**-34**	(4.7)	0.000	**-34**	(5.7)	0.000	**-3.1**	(0.8)	0.02	(0.05)
	France	-6	(5.0)	0.255	-12	(5.9)	0.053	**-2.0**	(0.8)	-0.09	(0.05)
	Germany	**-17**	(5.1)	0.001	**-31**	(6.4)	0.000	**-4.6**	(1.0)	**-0.18**	(0.06)
	Greece	**-21**	(5.0)	0.000	**-24**	(6.3)	0.000	**-2.7**	(0.9)	-0.04	(0.06)
	Hungary	**-15**	(4.8)	0.002	-5	(6.1)	0.373	1.1	(0.9)	**0.16**	(0.05)
	Iceland	**-27**	(4.6)	0.000	**-29**	(5.5)	0.000	**-4.9**	(0.6)	**-0.14**	(0.04)
	Ireland*	-7	(4.8)	0.155	**-17**	(5.7)	0.003	-1.4	(0.8)	-0.04	(0.05)
	Israel	7	(5.1)	0.185	-5	(7.3)	0.483	-1.2	(1.1)	-0.11	(0.07)
	Italy	-6	(4.8)	0.215	**-17**	(6.1)	0.004	**-2.6**	(0.9)	**-0.12**	(0.05)
	Japan	4	(5.0)	0.454	-1	(6.4)	0.851	0.3	(0.9)	-0.01	(0.06)
	Korea	-4	(5.1)	0.393	-7	(6.9)	0.311	-0.6	(1.0)	-0.01	(0.06)
	Latvia*	-1	(4.8)	0.829	-8	(5.7)	0.154	-0.9	(0.8)	-0.05	(0.05)
	Lithuania	-6	(4.7)	0.232	-7	(5.8)	0.209	-0.2	(0.8)	0.02	(0.05)
	Mexico	1	(4.8)	0.866	-4	(5.5)	0.466	**-1.7**	(0.7)	**-0.11**	(0.05)
	Netherlands*	**-23**	(5.2)	0.000	**-32**	(6.9)	0.000	**-4.3**	(1.1)	**-0.12**	(0.06)
	New Zealand*	**-18**	(4.8)	0.000	**-12**	(5.6)	0.039	-1.1	(0.8)	0.05	(0.05)
	Norway	-7	(4.8)	0.175	**-18**	(6.0)	0.003	**-4.4**	(0.8)	**-0.23**	(0.05)
	Poland	-1	(4.8)	0.795	**-21**	(6.0)	0.000	**-4.1**	(0.8)	**-0.24**	(0.05)
	Portugal	5	(4.8)	0.295	-7	(6.3)	0.246	**-3.6**	(0.8)	**-0.26**	(0.05)
	Slovak Republic	**-20**	(4.9)	0.000	-7	(6.5)	0.291	0.3	(0.9)	**0.14**	(0.05)
	Slovenia	**-10**	(4.5)	0.026	**-14**	(5.0)	0.004	**-1.7**	(0.6)	-0.05	(0.04)
	Spain	-2	(4.4)	0.612	**-12**	(5.0)	0.016	**-2.2**	(0.7)	**-0.12**	(0.05)
	Sweden	-2	(4.8)	0.601	9	(6.0)	0.137	**1.7**	(0.8)	**0.12**	(0.05)
	Switzerland	**-11**	(4.9)	0.029	**-14**	(5.8)	0.019	-1.3	(0.8)	-0.01	(0.05)
	Türkiye	**24**	(4.9)	0.000	**25**	(6.3)	0.000	**2.8**	(0.9)	0.03	(0.06)
	United Kingdom*	**-10**	(4.7)	0.033	**-15**	(6.1)	0.013	**-2.1**	(0.8)	-0.07	(0.05)
	United States*	5	(5.4)	0.372	4	(7.2)	0.606	-0.6	(1.1)	-0.06	(0.07)
	OECD average	-7	(4.4)	0.098	**-11**	(4.8)	0.020	**-1.5**	(0.4)	-0.05	(0.03)
	OECD average-23	**-9**	(4.4)	0.031	**-13**	(4.8)	0.005	**-1.8**	(0.5)	-0.05	(0.03)
	OECD average-26	-7	(4.4)	0.104	**-11**	(4.8)	0.026	**-1.4**	(0.5)	-0.04	(0.03)
	OECD average-35	-7	(4.4)	0.102	**-11**	(4.8)	0.022	**-1.5**	(0.5)	-0.05	(0.03)

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								Annual rate of change in 2022 (linear term)		Rate of acceleration or deceleration in performance (quadratic term)	
		Coef.	S.E.	p-value	Coef.	S.E.	p-value	Coef.	S.E.	Coef.	S.E.
Partners	Albania	-5	(5.8)	0.351	**-26**	(5.8)	0.000	**-12.4**	(1.0)	**-0.92**	(0.09)
	Argentina	7	(5.4)	0.178	0	(7.1)	0.996	-1.2	(1.2)	-0.12	(0.09)
	Baku (Azerbaijan)	m	m	m	m	m	m	m	m	m	m
	Brazil	5	(4.7)	0.290	2	(5.4)	0.720	-0.9	(0.7)	**-0.09**	(0.05)
	Brunei Darussalam	m	m	m	m	m	m	m	m	m	m
	Bulgaria	-11	(5.7)	0.059	**-30**	(7.2)	0.000	**-5.0**	(1.2)	**-0.25**	(0.08)
	Cambodia	m	m	m	m	m	m	m	m	m	m
	Croatia	**-10**	(4.8)	0.044	-7	(6.0)	0.212	0.9	(0.8)	**0.12**	(0.05)
	Cyprus	m	m	m	**-24**	(5.2)	0.000	m	m	m	m
	Dominican Republic	m	m	m	**41**	(5.0)	0.000	m	m	m	m
	El Salvador	m	m	m	m	m	m	m	m	m	m
	Georgia	6	(5.6)	0.314	**-36**	(5.3)	0.000	m	m	m	m
	Guatemala	m	m	m	m	m	m	m	m	m	m
	Hong Kong (China)*	**-21**	(4.8)	0.000	**-31**	(5.9)	0.000	**-3.1**	(0.8)	-0.06	(0.05)
	Indonesia	0	(5.3)	0.973	-3	(6.3)	0.652	-1.3	(1.0)	-0.08	(0.07)
	Jamaica*	m	m	m	m	m	m	m	m	m	m
	Jordan	m	m	m	m	m	m	m	m	m	m
	Kazakhstan	6	(5.6)	0.258	-5	(6.4)	0.427	m	m	m	m
	Kosovo	m	m	m	**-29**	(4.0)	0.000	m	m	m	m
	Macao (China)	**24**	(4.5)	0.000	**24**	(4.9)	0.000	**2.4**	(0.5)	0.00	(0.03)
	Malaysia	1	(5.9)	0.834	0	(6.6)	0.956	m	m	m	m
	Malta	2	(5.2)	0.760	3	(3.9)	0.518	m	m	m	m
	Moldova	5	(5.7)	0.425	**-16**	(4.8)	0.001	m	m	m	m
	Mongolia	m	m	m	m	m	m	m	m	m	m
	Montenegro	0	(4.5)	0.945	-6	(5.0)	0.242	-1.0	(0.5)	-0.06	(0.03)
	Morocco	m	m	m	m	m	m	m	m	m	m
	North Macedonia	m	m	m	**-10**	(3.3)	0.003	m	m	m	m
	Palestinian Authority	m	m	m	m	m	m	m	m	m	m
	Panama*	5	(7.1)	0.461	m	m	m	m	m	m	m
	Paraguay	m	m	m	m	m	m	m	m	m	m
	Peru	**33**	(5.9)	0.000	**33**	(6.3)	0.000	1.2	(1.0)	-0.17	(0.09)
	Philippines	m	m	m	m	m	m	m	m	m	m
	Qatar	**51**	(4.5)	0.000	**44**	(5.0)	0.000	**1.8**	(0.5)	**-0.21**	(0.03)
	Romania	3	(5.3)	0.590	-13	(6.9)	0.070	**-2.8**	(1.1)	**-0.19**	(0.07)
	Saudi Arabia	m	m	m	m	m	m	m	m	m	m
	Serbia	4	(4.8)	0.356	2	(7.0)	0.796	0.0	(1.1)	-0.03	(0.07)
	Singapore	**12**	(5.2)	0.017	8	(5.1)	0.101	0.7	(0.5)	-0.04	(0.06)
	Chinese Taipei	2	(5.0)	0.650	9	(6.2)	0.144	**3.0**	(0.9)	**0.17**	(0.06)
	Thailand	-8	(4.8)	0.103	**-30**	(6.1)	0.000	**-5.1**	(0.8)	**-0.27**	(0.05)
	Ukrainian regions (18 of 27)	m	m	m	m	m	m	m	m	m	m
	United Arab Emirates	-8	(5.7)	0.152	**-15**	(5.6)	0.006	**-1.8**	(0.8)	-0.07	(0.09)
	Uruguay	5	(4.8)	0.320	**15**	(6.1)	0.017	**2.0**	(0.8)	0.09	(0.05)
	Uzbekistan	m	m	m	m	m	m	m	m	m	m
	Viet Nam	m	m	m	m	m	m	m	m	m	m

1. The average decennial trend is the average change, per 10-year period, between the earliest available measurement in PISA and PISA 2022, calculated by a linear regression. The average decennial trend is only computed for countries with comparable data in more than two PISA assessments, over the period considered. 2. Curvilinear trends in performance are computed only for countries with comparable data in more than four PISA assessments. Curvilinear trends are calculated by a regression of performance over both linear and quadratic (squared) terms of the gap between the year of assessment and 2022. The coefficient for the linear term represents the annual rate of change in 2022, while the coefficient for the quadratic term represents the acceleration or deceleration of the change in performance. * Caution is required when interpreting estimates because one or more PISA sampling standards were not met (see Reader's Guide, Annexes A2 and A4). Notes: Values that are statistically significant are indicated in bold (see Annex A3). Costa Rica, Georgia, Malaysia, Malta, Moldova and the United Arab Emirates conducted the PISA 2009 assessment in 2010 as part of PISA 2009+. For Cambodia, Guatemala and Paraguay, results reported under PISA 2018 refer to the results of the PISA for Development assessment, in 2017.

Table I.B1.7.1. Percentage of students with an immigrant background in PISA 2022 [1/2]

Based on students' reports

		PISA 2022									
		Non-immigrant students		Immigrant students						Difference between first generation immigrant and second generation-immigrant students	
				All immigrant students		Second-generation immigrant students		First-generation immigrant students			
		%	S.E.	%	S.E.	%	S.E.	%	S.E.	% dif.	S.E.
OECD	Australia*	70.7	(0.9)	29.3	(0.9)	15.5	(0.6)	13.9	(0.5)	**-1.6**	(0.7)
	Austria	73.4	(1.1)	26.6	(1.1)	17.0	(0.8)	9.6	(0.6)	**-7.4**	(0.9)
	Belgium	79.5	(1.1)	20.5	(1.1)	11.5	(0.7)	8.9	(0.5)	**-2.6**	(0.7)
	Canada*	65.6	(1.1)	34.4	(1.1)	18.3	(0.8)	16.1	(0.6)	**-2.1**	(0.9)
	Chile	93.1	(0.9)	6.9	(0.9)	0.9	(0.2)	6.0	(0.9)	**5.1**	(0.9)
	Colombia	97.1	(0.5)	2.9	(0.5)	0.2	(0.1)	2.6	(0.5)	**2.4**	(0.5)
	Costa Rica	87.5	(0.9)	12.5	(0.9)	8.7	(0.8)	3.8	(0.4)	**-4.8**	(0.7)
	Czech Republic	95.9	(0.4)	4.1	(0.4)	2.0	(0.2)	2.1	(0.3)	0.1	(0.2)
	Denmark*	89.3	(0.4)	10.7	(0.4)	6.8	(0.3)	4.0	(0.3)	**-2.8**	(0.4)
	Estonia	91.3	(0.4)	8.7	(0.4)	7.5	(0.4)	1.3	(0.1)	**-6.2**	(0.5)
	Finland	93.2	(0.3)	6.8	(0.3)	2.9	(0.1)	3.9	(0.2)	**1.0**	(0.2)
	France	83.5	(0.8)	16.5	(0.8)	11.3	(0.7)	5.2	(0.3)	**-6.0**	(0.7)
	Germany	74.2	(1.1)	25.8	(1.1)	16.6	(0.7)	9.2	(0.7)	**-7.5**	(0.9)
	Greece	86.8	(0.7)	13.2	(0.7)	10.6	(0.7)	2.5	(0.2)	**-8.1**	(0.7)
	Hungary	97.8	(0.2)	2.2	(0.2)	1.2	(0.1)	1.0	(0.1)	-0.2	(0.2)
	Iceland	92.6	(0.5)	7.4	(0.5)	3.5	(0.3)	3.9	(0.4)	0.5	(0.5)
	Ireland*	82.6	(1.2)	17.4	(1.2)	9.4	(0.7)	8.0	(0.7)	**-1.5**	(0.7)
	Israel	84.9	(0.9)	15.1	(0.9)	11.5	(0.8)	3.7	(0.4)	**-7.8**	(0.7)
	Italy	89.3	(0.6)	10.7	(0.6)	7.6	(0.4)	3.1	(0.3)	**-4.5**	(0.4)
	Japan	99.3	(0.1)	0.7	(0.1)	0.4	(0.1)	0.3	(0.1)	-0.1	(0.1)
	Korea	99.6	(0.1)	0.4	(0.1)	0.1	(0.0)	0.3	(0.1)	**0.3**	(0.1)
	Latvia*	96.7	(0.3)	3.3	(0.3)	2.5	(0.2)	0.8	(0.1)	**-1.7**	(0.2)
	Lithuania	98.2	(0.2)	1.8	(0.2)	1.1	(0.1)	0.7	(0.1)	**-0.4**	(0.2)
	Mexico	98.5	(0.2)	1.5	(0.2)	0.5	(0.1)	1.0	(0.2)	**0.5**	(0.2)
	Netherlands*	86.4	(1.0)	13.6	(1.0)	9.0	(0.8)	4.6	(0.4)	**-4.5**	(0.8)
	New Zealand*	71.5	(1.2)	28.5	(1.2)	14.2	(0.8)	14.3	(0.7)	0.1	(1.0)
	Norway	84.1	(1.0)	15.9	(1.0)	8.7	(0.8)	7.3	(0.4)	-1.4	(0.8)
	Poland	98.8	(0.2)	1.2	(0.2)	0.1	(0.1)	1.0	(0.2)	**0.9**	(0.2)
	Portugal	88.7	(0.7)	11.3	(0.7)	4.6	(0.4)	6.7	(0.6)	**2.1**	(0.7)
	Slovak Republic	98.2	(0.2)	1.8	(0.2)	0.7	(0.1)	1.1	(0.2)	0.4	(0.2)
	Slovenia	90.2	(0.5)	9.8	(0.5)	3.7	(0.3)	6.1	(0.5)	**2.3**	(0.6)
	Spain	84.9	(0.6)	15.1	(0.6)	8.8	(0.4)	6.3	(0.4)	**-2.5**	(0.4)
	Sweden	78.7	(0.8)	21.3	(0.8)	10.8	(0.6)	10.6	(0.5)	-0.2	(0.8)
	Switzerland	65.1	(1.0)	34.9	(1.0)	22.2	(0.8)	12.7	(0.5)	**-9.5**	(0.8)
	Türkiye	98.3	(0.2)	1.7	(0.2)	0.3	(0.1)	1.4	(0.2)	**1.1**	(0.2)
	United Kingdom*	79.9	(1.1)	20.1	(1.1)	11.1	(0.7)	9.0	(0.7)	**-2.2**	(0.9)
	United States*	76.3	(1.7)	23.7	(1.7)	18.6	(1.5)	5.1	(0.5)	**-13.5**	(1.4)
	OECD average	87.1	(0.1)	12.9	(0.1)	7.6	(0.1)	5.4	(0.1)	**-2.2**	(0.1)

* Caution is required when interpreting estimates because one or more PISA sampling standards were not met (see Reader's Guide, Annexes A2 and A4).
Note: Values that are statistically significant are indicated in bold (see Annex A3).

Table I.B1.7.1. Percentage of students with an immigrant background in PISA 2022 [2/2]

Based on students' reports

		PISA 2022									
		Non-immigrant students		Immigrant students						Difference between first generation immigrant and second generation-immigrant students	
				All immigrant students		Second-generation immigrant students[1]		First-generation immigrant students[2]			
		%	S.E.	%	S.E.	%	S.E.	%	S.E.	% dif.	S.E.
Partners	Albania	98.9	(0.1)	1.1	(0.1)	0.6	(0.1)	0.5	(0.1)	-0.1	(0.1)
	Argentina	94.7	(0.6)	5.3	(0.6)	3.5	(0.4)	1.7	(0.2)	**-1.8**	(0.4)
	Baku (Azerbaijan)	95.6	(0.3)	4.4	(0.3)	3.0	(0.2)	1.4	(0.2)	**-1.6**	(0.3)
	Brazil	99.5	(0.1)	0.5	(0.1)	0.3	(0.1)	0.2	(0.1)	-0.1	(0.1)
	Brunei Darussalam	92.1	(0.4)	7.9	(0.4)	3.0	(0.2)	4.9	(0.3)	**2.0**	(0.4)
	Bulgaria	98.9	(0.2)	1.1	(0.2)	0.5	(0.1)	0.6	(0.1)	0.1	(0.2)
	Cambodia	99.6	(0.1)	0.4	(0.1)	0.2	(0.1)	0.2	(0.1)	0.0	(0.1)
	Croatia	91.2	(0.5)	8.8	(0.5)	7.5	(0.5)	1.3	(0.1)	**-6.2**	(0.5)
	Cyprus	80.5	(0.5)	19.5	(0.5)	7.7	(0.3)	11.9	(0.6)	**4.2**	(0.8)
	Dominican Republic	95.8	(0.3)	4.2	(0.3)	2.1	(0.2)	2.1	(0.3)	-0.1	(0.3)
	El Salvador	99.3	(0.1)	0.7	(0.1)	0.3	(0.1)	0.4	(0.1)	0.0	(0.1)
	Georgia	98.9	(0.2)	1.1	(0.2)	0.5	(0.1)	0.7	(0.2)	0.2	(0.2)
	Guatemala	99.2	(0.2)	0.8	(0.2)	0.3	(0.1)	0.5	(0.2)	0.2	(0.2)
	Hong Kong (China)*	60.5	(1.3)	39.5	(1.3)	31.3	(1.2)	8.2	(0.6)	**-23.2**	(1.3)
	Indonesia	99.6	(0.1)	0.4	(0.1)	0.3	(0.1)	0.1	(0.1)	**-0.2**	(0.1)
	Jamaica*	98.8	(0.2)	1.2	(0.2)	0.6	(0.1)	0.6	(0.2)	0.0	(0.2)
	Jordan	88.5	(0.6)	11.5	(0.6)	5.0	(0.3)	6.5	(0.4)	**1.6**	(0.5)
	Kazakhstan	92.6	(0.5)	7.4	(0.5)	4.3	(0.3)	3.1	(0.3)	**-1.1**	(0.3)
	Kosovo	98.6	(0.2)	1.4	(0.2)	1.0	(0.1)	0.4	(0.1)	**-0.6**	(0.2)
	Macao (China)	39.7	(0.7)	60.3	(0.7)	38.3	(0.8)	22.0	(0.6)	**-16.3**	(1.3)
	Malaysia	98.5	(0.2)	1.5	(0.2)	1.2	(0.2)	0.4	(0.1)	**-0.8**	(0.2)
	Malta	88.1	(0.5)	11.9	(0.5)	3.0	(0.3)	8.9	(0.5)	**5.9**	(0.7)
	Moldova	98.2	(0.2)	1.8	(0.2)	1.2	(0.2)	0.5	(0.1)	**-0.7**	(0.2)
	Mongolia	99.6	(0.1)	0.4	(0.1)	0.2	(0.1)	0.1	(0.0)	-0.1	(0.1)
	Montenegro	93.8	(0.4)	6.2	(0.4)	3.5	(0.2)	2.7	(0.3)	**-0.8**	(0.4)
	Morocco	99.3	(0.1)	0.7	(0.1)	0.2	(0.1)	0.5	(0.1)	**0.2**	(0.1)
	North Macedonia	98.0	(0.2)	2.0	(0.2)	1.1	(0.1)	0.9	(0.1)	-0.2	(0.2)
	Palestinian Authority	97.8	(0.2)	2.2	(0.2)	1.4	(0.1)	0.8	(0.1)	**-0.6**	(0.2)
	Panama*	95.5	(0.6)	4.5	(0.6)	1.2	(0.2)	3.3	(0.5)	**2.1**	(0.5)
	Paraguay	97.9	(0.4)	2.1	(0.4)	1.2	(0.2)	1.0	(0.2)	-0.2	(0.2)
	Peru	98.8	(0.2)	1.2	(0.2)	0.2	(0.1)	0.9	(0.2)	**0.7**	(0.2)
	Philippines	98.0	(0.2)	2.0	(0.2)	1.1	(0.1)	0.9	(0.1)	-0.2	(0.2)
	Qatar	40.9	(0.5)	59.1	(0.5)	17.8	(0.6)	41.2	(0.7)	**23.4**	(1.2)
	Romania	99.4	(0.1)	0.6	(0.1)	0.4	(0.1)	0.3	(0.1)	-0.1	(0.1)
	Saudi Arabia	89.2	(1.0)	10.8	(1.0)	4.7	(0.5)	6.1	(0.6)	**1.5**	(0.4)
	Serbia	89.3	(0.5)	10.7	(0.5)	9.9	(0.4)	0.8	(0.1)	**-9.1**	(0.4)
	Singapore	71.4	(0.7)	28.6	(0.7)	11.1	(0.4)	17.5	(0.7)	**6.4**	(0.9)
	Chinese Taipei	99.3	(0.2)	0.7	(0.2)	0.5	(0.1)	0.2	(0.1)	-0.2	(0.1)
	Thailand	97.5	(0.5)	2.5	(0.5)	1.9	(0.4)	0.6	(0.2)	**-1.3**	(0.3)
	Ukrainian regions (18 of 27)	99.1	(0.2)	0.9	(0.2)	0.8	(0.2)	0.2	(0.1)	**-0.6**	(0.2)
	United Arab Emirates	47.1	(0.5)	52.9	(0.5)	18.6	(0.3)	34.3	(0.4)	**15.7**	(0.5)
	Uruguay	98.4	(0.3)	1.6	(0.3)	0.3	(0.1)	1.2	(0.2)	**0.9**	(0.2)
	Uzbekistan	99.0	(0.1)	1.0	(0.1)	0.7	(0.1)	0.3	(0.0)	**-0.3**	(0.1)
	Viet Nam	99.9	(0.0)	0.1	(0.0)	0.1	(0.0)	0.1	(0.0)	0.0	(0.0)

* Caution is required when interpreting estimates because one or more PISA sampling standards were not met (see Reader's Guide, Annexes A2 and A4).
Note: Values that are statistically significant are indicated in bold (see Annex A3).

Table I.B1.7.17. Mathematics performance of students with an immigrant background in PISA 2022 [1/2]

		Mathematics performance											
		All students		Non-immigrant students		Immigrant students						Difference between immigrant and non-immigrant students	
						All immigrant students		Second-generation immigrant students[1]		First-generation immigrant students[2]			
		Mean score	S.E.	Mean score	S.E.	Mean score	S.E.	Mean score	S.E.	Mean score	S.E.	Score dif.	S.E.
OECD	Australia*	487	(1.8)	483	(1.5)	507	(3.7)	509	(4.4)	506	(4.5)	**24**	(3.5)
	Austria	487	(2.3)	505	(2.4)	447	(3.7)	451	(4.3)	439	(6.3)	**-58**	(4.2)
	Belgium	489	(2.2)	504	(2.3)	446	(3.6)	452	(4.0)	439	(5.5)	**-58**	(4.0)
	Canada*	497	(1.6)	497	(1.8)	508	(2.9)	517	(3.4)	499	(3.7)	**12**	(3.2)
	Chile	412	(2.1)	417	(2.1)	388	(6.6)	435	(12.9)	381	(6.9)	**-29**	(6.7)
	Colombia	383	(3.0)	387	(2.9)	363	(9.6)	c	c	366	(10.6)	**-24**	(9.2)
	Costa Rica	385	(1.9)	387	(2.0)	371	(3.9)	373	(4.3)	367	(6.0)	**-16**	(4.1)
	Czech Republic	487	(2.1)	489	(2.2)	463	(6.5)	484	(9.4)	443	(8.2)	**-25**	(6.5)
	Denmark*	489	(1.9)	497	(2.1)	442	(4.0)	445	(4.1)	437	(6.6)	**-54**	(4.3)
	Estonia	510	(2.0)	514	(2.1)	490	(5.4)	492	(5.2)	475	(13.2)	**-25**	(5.8)
	Finland	484	(1.9)	491	(1.9)	425	(3.3)	442	(4.1)	413	(5.0)	**-65**	(3.5)
	France	474	(2.5)	485	(2.5)	434	(5.0)	438	(5.9)	425	(6.3)	**-51**	(5.3)
	Germany	475	(3.1)	495	(3.0)	436	(4.2)	457	(4.3)	398	(5.9)	**-59**	(4.4)
	Greece	430	(2.3)	438	(2.4)	398	(3.6)	404	(3.9)	373	(8.3)	**-40**	(4.3)
	Hungary	473	(2.5)	474	(2.5)	482	(10.1)	499	(11.1)	462	(15.6)	8	(9.8)
	Iceland	459	(1.6)	464	(1.7)	427	(5.3)	436	(8.5)	419	(7.7)	**-37**	(5.6)
	Ireland*	492	(2.0)	495	(2.2)	487	(3.2)	489	(4.3)	484	(4.0)	**-8**	(3.4)
	Israel	458	(3.3)	467	(3.3)	454	(5.5)	468	(5.6)	410	(9.1)	**-13**	(5.1)
	Italy	471	(3.1)	476	(3.2)	446	(4.9)	453	(4.9)	430	(8.3)	**-30**	(4.9)
	Japan	536	(2.9)	537	(2.9)	504	(18.0)	c	c	c	c	-33	(17.5)
	Korea	527	(3.9)	529	(3.8)	c	c	c	c	c	c	c	c
	Latvia*	483	(2.0)	484	(1.9)	492	(8.8)	491	(7.7)	496	(20.4)	8	(8.3)
	Lithuania	475	(1.8)	477	(1.8)	463	(8.4)	453	(7.8)	479	(17.3)	-14	(8.7)
	Mexico	395	(2.3)	398	(2.2)	334	(8.1)	352	(11.1)	325	(10.0)	**-64**	(8.3)
	Netherlands*	493	(3.8)	508	(3.3)	450	(7.1)	460	(7.9)	431	(10.1)	**-58**	(7.5)
	New Zealand*	479	(2.0)	479	(2.4)	491	(4.1)	500	(6.0)	482	(4.9)	**12**	(5.1)
	Norway	468	(2.1)	479	(2.2)	443	(4.0)	448	(5.5)	436	(4.3)	**-36**	(4.5)
	Poland	489	(2.3)	492	(2.2)	447	(14.8)	c	c	435	(13.7)	**-45**	(14.9)
	Portugal	472	(2.4)	477	(2.2)	445	(5.1)	461	(6.8)	434	(5.9)	**-32**	(4.9)
	Slovak Republic	464	(2.9)	467	(2.9)	456	(10.8)	459	(17.1)	454	(13.3)	-11	(10.9)
	Slovenia	485	(1.2)	492	(1.3)	433	(4.8)	447	(7.4)	424	(6.2)	**-60**	(5.2)
	Spain	473	(1.5)	481	(1.5)	448	(2.6)	459	(2.9)	433	(3.9)	**-33**	(2.5)
	Sweden	482	(2.1)	499	(2.0)	436	(3.5)	449	(3.8)	423	(5.2)	**-63**	(3.9)
	Switzerland	508	(2.1)	528	(2.1)	475	(3.0)	477	(3.6)	472	(4.2)	**-53**	(3.0)
	Türkiye	453	(1.6)	455	(1.6)	418	(13.4)	c	c	410	(16.0)	**-37**	(13.4)
	United Kingdom*	489	(2.2)	494	(2.3)	496	(5.6)	507	(6.2)	483	(6.7)	2	(5.6)
	United States*	465	(4.0)	470	(3.8)	460	(7.5)	466	(8.4)	441	(8.9)	-10	(6.9)
	OECD average	472	(0.4)	479	(0.4)	447	(1.2)	459	(1.3)	435	(1.6)	**-30**	(1.2)

* Caution is required when interpreting estimates because one or more PISA sampling standards were not met (see Reader's Guide, Annexes A2 and A4).
Note: Values that are statistically significant are indicated in bold (see Annex A3).

Table I.B1.7.17. Mathematics performance of students with an immigrant background in PISA 2022 [2/2]

		Mathematics performance											
		All students		Non-immigrant students		Immigrant students						Difference between immigrant and non-immigrant students	
						All immigrant students		Second-generation immigrant students[1]		First-generation immigrant students[2]			
		Mean score	S.E.	Mean score	S.E.	Mean score	S.E.	Mean score	S.E.	Mean score	S.E.	Score dif.	S.E.
Partners	Albania	368	(2.1)	375	(2.1)	335	(14.2)	c	c	c	c	**-40**	(13.9)
	Argentina	378	(2.3)	380	(2.3)	372	(5.3)	375	(5.9)	365	(8.8)	-8	(5.6)
	Baku (Azerbaijan)	397	(2.4)	404	(2.3)	395	(5.8)	399	(6.9)	385	(10.5)	-9	(6.1)
	Brazil	379	(1.6)	384	(1.6)	338	(15.0)	c	c	c	c	**-46**	(15.3)
	Brunei Darussalam	442	(0.9)	439	(1.0)	493	(4.2)	475	(7.1)	505	(5.2)	**55**	(4.2)
	Bulgaria	417	(3.3)	424	(3.3)	395	(17.4)	c	c	413	(23.1)	-29	(17.1)
	Cambodia	336	(2.7)	340	(2.7)	c	c	c	c	c	c	c	c
	Croatia	463	(2.4)	466	(2.4)	452	(4.6)	451	(5.0)	459	(12.0)	**-14**	(4.5)
	Cyprus	418	(1.2)	424	(1.3)	431	(3.6)	419	(5.2)	439	(4.8)	7	(3.9)
	Dominican Republic	339	(1.6)	345	(1.6)	322	(4.9)	311	(6.5)	332	(6.2)	**-23**	(5.1)
	El Salvador	343	(2.0)	346	(2.0)	328	(15.4)	c	c	c	c	-18	(15.0)
	Georgia	390	(2.4)	396	(2.4)	361	(17.5)	341	(15.4)	374	(24.5)	**-35**	(17.3)
	Guatemala	344	(2.2)	350	(2.2)	332	(27.5)	c	c	c	c	-18	(26.7)
	Hong Kong (China)*	540	(3.0)	547	(3.5)	539	(3.5)	542	(3.7)	527	(7.0)	**-8**	(3.5)
	Indonesia	366	(2.4)	367	(2.3)	301	(12.6)	303	(14.1)	c	c	**-67**	(12.9)
	Jamaica*	377	(3.1)	383	(3.1)	346	(13.8)	c	c	c	c	**-38**	(13.3)
	Jordan	361	(2.0)	363	(2.2)	370	(3.6)	376	(4.5)	364	(4.7)	7	(3.7)
	Kazakhstan	425	(1.7)	426	(1.7)	430	(4.2)	430	(5.7)	431	(4.7)	5	(4.1)
	Kosovo	355	(1.0)	358	(1.1)	343	(8.2)	340	(9.4)	c	c	-15	(8.1)
	Macao (China)	552	(1.1)	543	(2.0)	560	(1.7)	558	(2.1)	564	(2.7)	**17**	(2.8)
	Malaysia	409	(2.4)	411	(2.5)	384	(10.9)	387	(8.7)	c	c	**-27**	(10.8)
	Malta	466	(1.6)	469	(1.7)	475	(5.9)	451	(10.9)	484	(6.8)	6	(6.2)
	Moldova	414	(2.3)	416	(2.3)	406	(9.1)	418	(10.9)	378	(15.3)	-10	(8.9)
	Mongolia	425	(2.6)	427	(2.4)	c	c	c	c	c	c	c	c
	Montenegro	406	(1.1)	407	(1.2)	410	(4.8)	417	(5.6)	402	(8.5)	3	(5.1)
	Morocco	365	(3.4)	367	(3.4)	318	(9.6)	c	c	324	(12.0)	**-49**	(9.7)
	North Macedonia	389	(0.9)	393	(1.0)	352	(9.2)	341	(12.5)	366	(14.7)	**-41**	(9.2)
	Palestinian Authority	366	(1.8)	368	(1.9)	347	(7.0)	359	(8.9)	329	(13.6)	**-21**	(7.1)
	Panama*	357	(2.8)	358	(2.6)	411	(13.3)	416	(13.7)	410	(16.3)	**54**	(12.7)
	Paraguay	338	(2.2)	342	(2.0)	357	(16.3)	352	(21.3)	363	(18.5)	15	(16.4)
	Peru	391	(2.3)	394	(2.3)	370	(11.3)	c	c	388	(12.1)	**-24**	(11.6)
	Philippines	355	(2.6)	359	(2.6)	296	(9.0)	278	(7.0)	319	(17.7)	**-63**	(9.2)
	Qatar	414	(1.1)	378	(1.8)	449	(1.8)	428	(3.3)	458	(2.3)	**71**	(2.4)
	Romania	428	(4.0)	431	(4.0)	397	(22.3)	c	c	c	c	-34	(22.2)
	Saudi Arabia	389	(1.8)	386	(1.9)	415	(4.5)	412	(5.3)	418	(6.0)	**29**	(4.7)
	Serbia	440	(3.0)	441	(3.0)	448	(4.7)	448	(4.9)	445	(14.1)	7	(4.0)
	Singapore	575	(1.2)	568	(1.5)	598	(2.8)	608	(3.8)	591	(4.1)	**30**	(3.3)
	Chinese Taipei	547	(3.8)	549	(3.8)	481	(19.5)	c	c	c	c	**-68**	(19.6)
	Thailand	394	(2.7)	397	(2.8)	364	(8.2)	364	(8.8)	366	(13.9)	**-32**	(8.5)
	Ukrainian regions (18 of 27)	441	(4.1)	439	(4.0)	435	(20.7)	c	c	c	c	-4	(20.1)
	United Arab Emirates	431	(0.9)	390	(1.0)	481	(1.6)	466	(2.2)	489	(1.9)	**90**	(1.8)
	Uruguay	409	(2.0)	411	(2.1)	420	(11.9)	c	c	425	(13.2)	9	(12.2)
	Uzbekistan	364	(2.0)	365	(2.0)	337	(7.5)	336	(10.0)	c	c	**-28**	(7.6)
	Viet Nam	469	(3.9)	471	(3.8)	c	c	c	c	c	c	c	c

* Caution is required when interpreting estimates because one or more PISA sampling standards were not met (see Reader's Guide, Annexes A2 and A4).
Note: Values that are statistically significant are indicated in bold (see Annex A3).

Table I.B1.2. How did countries perform in PISA 2022? Chapter 2 tables

	Table I.B1.2.1	Mean score and variation in mathematics performance
	Table I.B1.2.2	Mean score and variation in reading performance
	Table I.B1.2.3	Mean score and variation in science performance
WEB	Table I.B1.2.4	Mean score and variation in student performance on the mathematics process subscale formulating
WEB	Table I.B1.2.5	Mean score and variation in student performance on the mathematics process subscale employing
WEB	Table I.B1.2.6	Mean score and variation in student performance on the mathematics process subscale interpreting
WEB	Table I.B1.2.7	Mean score and variation in student performance on the mathematics process subscale reasoning
WEB	Table I.B1.2.8	Mean score and variation in student performance on the mathematics content subscale change and relationships
WEB	Table I.B1.2.9	Mean score and variation in student performance on the mathematics content subscale quantity
WEB	Table I.B1.2.10	Mean score and variation in student performance on the mathematics content subscale space and shape
WEB	Table I.B1.2.11	Mean score and variation in student performance on the mathematics content subscale uncertainty and data
WEB	Table I.B1.2.12	Total variation in mathematics performance, and variation between and within schools
WEB	Table I.B1.2.13	Total variation in mathematics performance, and variation between and within schools (without modal grade restriction)
WEB	Table I.B1.2.14	Modal grade by country/economy
WEB	Table I.B1.2.15	Percentage of students, including those with missing information, at each grade level
WEB	Table I.B1.2.16	Index of mathematics anxiety and growth mindset
WEB	Table I.B1.2.17	Mathematics performance, mathematics anxiety and growth mindset

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Table I.B1.3. What can students do in mathematics, reading and science? Chapter 3 tables

	Table I.B1.3.1	Percentage of students at each proficiency level in mathematics
	Table I.B1.3.2	Percentage of students at each proficiency level in reading
	Table I.B1.3.3	Percentage of students at each proficiency level in science
WEB	Table I.B1.3.4	Percentage of students at each proficiency level on the mathematics process subscale formulating
WEB	Table I.B1.3.5	Percentage of students at each proficiency level on the mathematics process subscale employing
WEB	Table I.B1.3.6	Percentage of students at each proficiency level on the mathematics process subscale interpreting
WEB	Table I.B1.3.7	Percentage of students at each proficiency level on the mathematics process subscale reasoning
WEB	Table I.B1.3.8	Percentage of students at each proficiency level on the mathematics content subscale change and relationships
WEB	Table I.B1.3.9	Percentage of students at each proficiency level on the mathematics content subscale quantity
WEB	Table I.B1.3.10	Percentage of students at each proficiency level on the mathematics content subscale space and shape
WEB	Table I.B1.3.11	Percentage of students at each proficiency level on the mathematics content subscale uncertainty and data
WEB	Table I.B1.3.12	Disparities in minimum achievement in reading and mathematics (SDG 4.5)

StatLink https://stat.link/znxau8

Table I.B1.4. Equity in education in PISA 2022 annex tables

WEB	Table I.B1.4.1	Access to education among 15-year-olds: change between 2012 and 2022
	Table I.B1.4.2	Students' socio-economic status
	Table I.B1.4.3	Socio-economic status and mathematics performance
WEB	Table I.B1.4.4	Socio-economic status and reading performance
WEB	Table I.B1.4.5	Socio-economic status and science performance
WEB	Table I.B1.4.6	Percentage of students by international quintiles of socio-economic status
WEB	Table I.B1.4.7	Percentage of students by international deciles of socio-economic status
WEB	Table I.B1.4.8	Mathematics performance, by international quintiles of socio-economic status
WEB	Table I.B1.4.9	Reading performance, by international quintiles of socio-economic status
WEB	Table I.B1.4.10	Science performance, by international quintiles of socio-economic status

WEB	Table I.B1.4.11	Mathematics performance, by international deciles of socio-economic status
WEB	Table I.B1.4.12	Reading performance, by international deciles of socio-economic status
WEB	Table I.B1.4.13	Science performance, by international deciles of socio-economic status
WEB	Table I.B1.4.14	Low and top performance in mathematics, by students' socio-economic status
WEB	Table I.B1.4.15	Low and top performance in reading, by students' socio-economic status
WEB	Table I.B1.4.16	Low and top performance in science, by students' socio-economic status
	Table I.B1.4.17	Mathematics performance, by gender
WEB	Table I.B1.4.18	Reading performance, by gender
WEB	Table I.B1.4.19	Science performance, by gender
WEB	Table I.B1.4.20	Mean score and variation in the process subscale of mathematics formulating, by gender
WEB	Table I.B1.4.21	Mean score and variation in the process subscale of mathematics employing, by gender
WEB	Table I.B1.4.22	Mean score and variation in the process subscale of mathematics interpreting, by gender
WEB	Table I.B1.4.23	Mean score and variation in the process subscale of mathematics reasoning, by gender
WEB	Table I.B1.4.24	Mean score and variation in the content subscale of mathematics change and relationships, by gender
WEB	Table I.B1.4.25	Mean score and variation in the content subscale of mathematics quantity, by gender
WEB	Table I.B1.4.26	Mean score and variation in the content subscale of mathematics space and shape, by gender
WEB	Table I.B1.4.27	Mean score and variation in the content subscale of mathematics uncertainty and data, by gender
WEB	Table I.B1.4.28	Percentage of students at each proficiency level in mathematics, by gender
WEB	Table I.B1.4.29	Percentage of students at each proficiency level in reading, by gender
WEB	Table I.B1.4.30	Percentage of students at each proficiency level in science, by gender
WEB	Table I.B1.4.31	Low and top performance in mathematics, by gender
WEB	Table I.B1.4.32	Low and top performance in reading, by gender
WEB	Table I.B1.4.33	Low and top performance in science, by gender
WEB	Table I.B1.4.34	Mathematics performance, by gender and socio-economic status
WEB	Table I.B1.4.35	Reading performance, by gender and socio-economic status
WEB	Table I.B1.4.36	Science performance, by gender and socio-economic status
WEB	Table I.B1.4.37	Low and top performance in mathematics, by gender and socio-economic status
WEB	Table I.B1.4.38	Low and top performance in reading, by gender and socio-economic status
WEB	Table I.B1.4.39	Low and top performance in science, by gender and socio-economic status
WEB	Table I.B1.4.40	Between- and within-school variation in students' socio-economic status
WEB	Table I.B1.4.41	Between- and within-school variation in students' socio-economic status (without modal grade restriction)
WEB	Table I.B1.4.42	Overlap of top performers in mathematics, reading and science
WEB	Table I.B1.4.43	Overlap of low performers in mathematics, reading and science
WEB	Table I.B1.4.44	Overlap of top performers in mathematics, reading and science among all 15-year-olds
WEB	Table I.B1.4.45	Overlap of low performers in mathematics, reading and science among all 15-year-olds
WEB	Table I.B1.4.46	How often did students not eat because there was not enough money to buy food, in the past 30 days

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Table I.B1.5. Changes in performance and equity in education and long term trends annex tables

WEB	Table I.B1.5.1	Percentage of low performers and top performers in mathematics, 2003 through 2022
WEB	Table I.B1.5.2	Percentage of low performers and top performers in reading, 2009 through 2022
WEB	Table I.B1.5.3	Percentage of low performers and top performers in science, 2006 through 2022
	Table I.B1.5.4	Mean mathematics performance, 2003 through 2022
	Table I.B1.5.5	Mean reading performance, 2000 through 2022
	Table I.B1.5.6	Mean science performance, 2006 through 2022
WEB	Table I.B1.5.7	Distribution of mathematics scores, 2003 through 2022
WEB	Table I.B1.5.8	Distribution of reading scores, 2000 through 2022

WEB	Table I.B1.5.9	Distribution of science scores, 2006 through 2022
WEB	Table I.B1.5.10	Variation in mathematics performance, 2003 through 2022
WEB	Table I.B1.5.11	Variation in reading performance, 2000 through 2022
WEB	Table I.B1.5.12	Variation in science performance, 2006 through 2022
WEB	Table I.B1.5.13	Percentage of low performers and top performers in mathematics among all 15-year-olds, 2012 through 2022
WEB	Table I.B1.5.14	Percentage of low performers and top performers in reading among all 15-year-olds, 2012 through 2022
WEB	Table I.B1.5.15	Percentage of low performers and top performers in science among all 15-year-olds, 2012 through 2022
WEB	Table I.B1.5.16	Distribution of mathematics scores among 15-year-olds, 2012 through 2022
WEB	Table I.B1.5.17	Distribution of reading scores among 15-year-olds, 2012 through 2022
WEB	Table I.B1.5.18	Distribution of science scores among 15-year-olds, 2012 through 2022
WEB	Table I.B1.5.19	Mathematics performance by national quarter of socio-economic status, 2012 through 2022
WEB	Table I.B1.5.20	Reading performance by national quarter of socio-economic status, 2012 through 2022
WEB	Table I.B1.5.21	Science performance by national quarter of socio-economic status, 2012 through 2022
WEB	Table I.B1.5.22	Strength of the relationship between mathematics performance and socio-economic status, 2012 through 2022
WEB	Table I.B1.5.23	Strength of the relationship between reading performance and socio-economic status, 2012 through 2022
WEB	Table I.B1.5.24	Strength of the relationship between science performance and socio-economic status, 2012 through 2022
WEB	Table I.B1.5.25	Low performance in mathematics, by quarter of socio-economic status, 2012 through 2022
WEB	Table I.B1.5.26	Low performance in reading, by quarter of socio-economic status, 2012 through 2022
WEB	Table I.B1.5.27	Top performance in mathematics, by quarter of socio-economic status, 2012 through 2022
WEB	Table I.B1.5.28	Top performance in reading, by quarter of socio-economic status, 2012 through 2022
WEB	Table I.B1.5.29	Distribution of mathematics scores among disadvantaged students, 2012 through 2022
WEB	Table I.B1.5.30	Distribution of mathematics scores among advantaged students, 2012 through 2022
WEB	Table I.B1.5.31	Socio-economic gaps at the top and bottom of the distribution of mathematics scores, 2012 through 2022
WEB	Table I.B1.5.32	Distribution of reading scores among disadvantaged students, 2012 through 2022
WEB	Table I.B1.5.33	Distribution of reading scores among advantaged students, 2012 through 2022
WEB	Table I.B1.5.34	Socio-economic gaps at the top and bottom of the distribution of reading scores, 2012 through 2022
WEB	Table I.B1.5.35	Distribution of science scores among disadvantaged students, 2012 through 2022
WEB	Table I.B1.5.36	Distribution of science scores among advantaged students, 2012 through 2022
WEB	Table I.B1.5.37	Socio-economic gaps at the top and bottom of the distribution of science scores, 2012 through 2022
WEB	Table I.B1.5.38	Boys' mathematics performance, 2012 through 2022
WEB	Table I.B1.5.39	Girls' mathematics performance, 2012 through 2022
WEB	Table I.B1.5.40	Gender differences in mathematics performance, 2012 through 2022
WEB	Table I.B1.5.41	Boys' reading performance, 2012 through 2022
WEB	Table I.B1.5.42	Girls' reading performance, 2012 through 2022
WEB	Table I.B1.5.43	Gender differences in reading performance, 2012 through 2022
WEB	Table I.B1.5.44	Boys' science performance, 2012 through 2022
WEB	Table I.B1.5.45	Girls' science performance, 2012 through 2022
WEB	Table I.B1.5.46	Gender differences in science performance, 2012 through 2022
WEB	Table I.B1.5.47	Low performance in mathematics among boys and girls, 2012 through 2022
WEB	Table I.B1.5.48	Low performance in reading among boys and girls, 2012 through 2022
WEB	Table I.B1.5.49	Top performance in mathematics among boys and girls, 2012 through 2022
WEB	Table I.B1.5.50	Top performance in reading among boys and girls, 2012 through 2022

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Table I.B1.7. Immigration background and student performance annex tables

	Table I.B1.7.1	Percentage of students with an immigrant background in PISA 2022
WEB	Table I.B1.7.2	Percentage of students with an immigrant background in PISA 2012, 2015 and 2018

WEB	Table I.B1.7.3	Change between 2018 and 2022 in the percentage of students with an immigrant background
WEB	Table I.B1.7.4	Change between 2012, 2015 and 2022 in the percentage of students with an immigrant background
WEB	Table I.B1.7.5	Socio-economic status, by immigrant background
WEB	Table I.B1.7.6	Socio-economic status, by immigrant background in PISA 2012, 2015 and 2018
WEB	Table I.B1.7.7	Change between 2022 and 2018 in socio-economic status, by immigrant background
WEB	Table I.B1.7.8	Change between 2012, 2015 and 2022 in socio-economic status, by immigrant background
WEB	Table I.B1.7.9	Language spoken at home by immigrant background, in PISA 2022
WEB	Table I.B1.7.10	Students who do not speak the language of assessment at home by immigrant background in PISA 2012, 2015 and 2018
WEB	Table I.B1.7.11	Change between 2018 and 2022 in language spoken at home by immigrant background
WEB	Table I.B1.7.12	Change between 2012, 2015 and 2022 in language spoken at home by immigrant background
WEB	Table I.B1.7.13	Age of arrival of immigrant students in 20221
WEB	Table I.B1.7.14	Age of arrival of immigrant students, 2012 through 2018
WEB	Table I.B1.7.15	Change between 2018 and 2022 in age of arrival of immigrant students
WEB	Table I.B1.7.16	Change between 2012, 2015 and 2022 in age of arrival of immigrant students
	Table I.B1.7.17	Mathematics performance of students with an immigrant background in PISA 2022
WEB	Table I.B1.7.18	Mathematics performance of students with an immigrant background in PISA 2012, 2015 and 2018
WEB	Table I.B1.7.19	Change between 2018 and 2022 in the mathematics performance of students with an immigrant background
WEB	Table I.B1.7.20	Change between 2012, 2015 and 2022 in the mathematics performance of students with an immigrant background
WEB	Table I.B1.7.21	Reading performance of students with an immigrant background in PISA 2022
WEB	Table I.B1.7.22	Reading performance of students with an immigrant background in PISA 2012, 2015 and 2018
WEB	Table I.B1.7.23	Change between 2018 and 2022 in the reading performance of students with an immigrant background
WEB	Table I.B1.7.24	Change between 2012, 2015 and 2022 in the reading performance of students with an immigrant background
WEB	Table I.B1.7.25	Science performance of students with an immigrant background in PISA 2022
WEB	Table I.B1.7.26	Science performance of students with an immigrant background in PISA 2012, 2015 and 2018
WEB	Table I.B1.7.27	Change between 2018 and 2022 in the science performance of students with an immigrant background
WEB	Table I.B1.7.28	Change between 2012, 2015 and 2022 in the science performance of students with an immigrant background
WEB	Table I.B1.7.29	Mathematics performance of students with an immigrant background by language spoken at home in PISA 2022
WEB	Table I.B1.7.30	Mathematics performance of students with an immigrant background by language spoken at home in PISA 2012, 2015 and 2018
WEB	Table I.B1.7.31	Change between 2018 and 2022 in the mathematics performance of students with an immigrant background by language spoken at home
WEB	Table I.B1.7.32	Change between 2012, 2015 and 2022 in the mathematics performance of students with an immigrant background by language spoken at home
WEB	Table I.B1.7.33	Reading performance of students with an immigrant background by language spoken at home in PISA 2022
WEB	Table I.B1.7.34	Reading performance of students with an immigrant background by language spoken at home in PISA 2012, 2015 and 2018
WEB	Table I.B1.7.35	Change between 2018 and 2022 in the reading performance of students with an immigrant background by language spoken at home
WEB	Table I.B1.7.36	Change between 2012, 2015 and 2022 in the reading performance of students with an immigrant background by language spoken at home
WEB	Table I.B1.7.37	Low performance in mathematics by immigrant background in PISA 2022
WEB	Table I.B1.7.38	Low performance in mathematics, by immigrant background in PISA 2012, 2015 and 2018
WEB	Table I.B1.7.39	Change between PISA 2018 and PISA 2022 in low performance in mathematics, by immigrant background
WEB	Table I.B1.7.40	Change between 2012, 2015 and 2022 in low performance in mathematics by immigrant background
WEB	Table I.B1.7.41	Low performance in reading by immigrant background in PISA 2022
WEB	Table I.B1.7.42	Low performance in reading by immigrant background in PISA 2012, 2015 and 2018
WEB	Table I.B1.7.43	Change between 2018 and 2022 in low performance in reading by immigrant background
WEB	Table I.B1.7.44	Change between 2012, 2015 and 2022 in low performance in reading by immigrant background
WEB	Table I.B1.7.45	Low performance in science by immigrant background in PISA 2022
WEB	Table I.B1.7.46	Low performance in science by immigrant background in PISA 2012, 2015 and 2018
WEB	Table I.B1.7.47	Change between 2018 and 2022 in low performance in science by immigrant background

WEB	Table I.B1.7.48	Change between 2012, 2015 and 2022 in low performance in science by immigrant background
WEB	Table I.B1.7.49	Inter-decile range in immigrant students' mathematics scores, 2012 through 2022
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WEB	Table I.B1.7.51	Differences in inter-decile range in mathematics performance by immigration background, 2012 through 2022
WEB	Table I.B1.7.52	Difference in mathematics performance, by immigrant background, after accounting for student socio-economic background and language spoken at home in PISA 2022
WEB	Table I.B1.7.53	Difference in mathematics performance, by immigrant background, after accounting for student socio-economic background and language spoken at home, 2012 through 2022
WEB	Table I.B1.7.54	Inter-decile range in immigrant students' reading scores, 2012 through 2022
WEB	Table I.B1.7.55	Inter-decile range in non-immigrant students' reading scores, 2012 through 2022
WEB	Table I.B1.7.56	Differences in inter-decile range in reading performance by immigrant background, 2012 through 2022
WEB	Table I.B1.7.57	Difference in reading performance, by immigrant background, after accounting for student socio-economic background and language spoken at home in PISA 2022
WEB	Table I.B1.7.58	Difference in reading performance, by immigrant background, after accounting for student socio-economic background and language spoken at home, 2012 through 2022

StatLink https://stat.link/qmuad8

Annex B2. Results for regions within countries

Table I.B2.1. Mean score and variation in mathematics performance [1/2]

		Mean score		Standard deviation		Percentiles											
						10th		25th		Median (50th)		75th		90th		Difference (90th - 10th)	
		Mean score	S.E.	S.D.	S.E.	Score	S.E.	Score	S.E.	Score	S.E.	Score	S.E.	Score	S.E.	Score dif.	S.E.
OECD	**Belgium**																
	Flemish community	501	(3.0)	99	(1.4)	367	(4.4)	430	(4.4)	506	(4.0)	574	(3.6)	627	(3.1)	**260**	(5.0)
	French community	474	(3.1)	91	(1.9)	352	(4.8)	410	(4.5)	476	(3.8)	538	(4.1)	590	(4.6)	**239**	(6.4)
	German-speaking community	483	(5.2)	82	(2.8)	373	(8.6)	427	(7.6)	487	(5.7)	542	(6.7)	591	(6.9)	**218**	(11.0)
	Canada																
	*Alberta**	504	(5.7)	98	(2.6)	376	(6.5)	432	(6.9)	502	(6.6)	571	(7.4)	633	(9.5)	**257**	(9.2)
	*British Columbia**	496	(4.4)	93	(1.9)	377	(6.5)	431	(5.5)	495	(5.5)	560	(5.0)	617	(5.2)	**240**	(6.8)
	*Manitoba**	470	(2.7)	86	(1.7)	360	(4.6)	411	(3.4)	470	(3.1)	530	(3.0)	582	(4.2)	**222**	(5.5)
	New Brunswick	468	(3.1)	90	(2.2)	355	(5.2)	404	(4.3)	466	(4.7)	529	(4.0)	585	(6.3)	**230**	(7.5)
	*Newfoundland and Labrador**	459	(5.5)	86	(2.4)	349	(7.3)	398	(7.2)	458	(6.5)	517	(7.2)	573	(8.0)	**224**	(8.8)
	*Nova Scotia**	470	(3.6)	91	(2.4)	355	(5.6)	403	(5.1)	467	(5.1)	533	(5.4)	590	(5.8)	**235**	(8.3)
	*Ontario**	495	(3.0)	93	(1.6)	376	(3.5)	431	(3.1)	493	(3.4)	556	(4.3)	616	(4.7)	**240**	(4.9)
	Prince Edward Island	478	(6.6)	88	(3.9)	363	(11.7)	412	(9.4)	478	(11.0)	542	(9.3)	591	(11.0)	**228**	(15.2)
	*Quebec**	514	(3.9)	94	(1.9)	390	(5.3)	450	(4.8)	517	(4.7)	581	(4.6)	631	(4.3)	**241**	(6.0)
	Saskatchewan	468	(2.6)	86	(1.9)	358	(4.8)	407	(3.9)	466	(3.0)	527	(4.3)	581	(5.2)	**223**	(6.7)
	Colombia																
	Bogotá	423	(5.0)	74	(3.3)	333	(5.8)	371	(5.2)	417	(4.8)	471	(6.7)	522	(9.1)	**189**	(9.7)
	Italy																
	Bolzano	482	(3.1)	83	(1.7)	374	(4.1)	424	(4.3)	480	(3.6)	538	(4.2)	591	(5.3)	**217**	(5.9)
	Trento	491	(1.9)	83	(1.5)	381	(4.0)	433	(3.3)	492	(3.2)	547	(3.5)	597	(5.0)	**217**	(6.4)
	Spain																
	Andalusia	457	(4.9)	87	(2.4)	343	(6.2)	398	(5.7)	457	(5.3)	516	(6.6)	569	(7.0)	**227**	(7.6)
	Aragon	487	(4.6)	85	(2.1)	373	(6.8)	429	(6.1)	491	(5.3)	546	(5.1)	595	(5.4)	**223**	(7.0)
	Asturias	495	(4.4)	86	(2.0)	378	(6.2)	437	(5.8)	498	(4.8)	554	(4.8)	604	(5.5)	**225**	(6.8)
	Balearic Islands	471	(3.8)	83	(2.2)	362	(6.0)	413	(5.2)	472	(4.2)	530	(4.5)	577	(5.5)	**215**	(6.7)
	Basque Country	482	(4.0)	83	(1.8)	372	(6.4)	427	(4.9)	485	(4.3)	541	(3.9)	587	(3.5)	**215**	(5.7)
	Canary Islands	447	(4.5)	81	(1.9)	342	(6.7)	392	(5.4)	447	(5.1)	502	(5.5)	552	(5.8)	**209**	(7.1)
	Cantabria	495	(4.6)	83	(1.8)	386	(7.9)	438	(5.7)	498	(5.8)	553	(4.4)	599	(5.8)	**213**	(7.7)
	Castile and Leon	499	(3.8)	84	(2.0)	390	(6.6)	443	(5.9)	503	(4.6)	558	(3.8)	604	(4.4)	**214**	(7.0)
	Castile-La Mancha	464	(3.4)	80	(1.6)	358	(5.2)	408	(4.3)	465	(4.4)	520	(4.4)	567	(4.5)	**209**	(5.6)
	Catalonia	469	(5.8)	88	(2.2)	355	(7.6)	408	(6.8)	470	(7.0)	531	(6.6)	584	(7.4)	**229**	(8.2)
	Ceuta	395	(6.3)	81	(4.4)	296	(9.8)	335	(10.3)	394	(9.2)	450	(10.7)	503	(10.8)	**206**	(15.9)
	Comunidad Valenciana	473	(3.9)	85	(1.7)	362	(5.2)	414	(4.9)	473	(4.8)	531	(4.6)	582	(5.2)	**221**	(5.8)
	Extremadura	469	(4.9)	84	(2.1)	361	(6.7)	412	(5.4)	467	(6.2)	527	(5.9)	578	(6.5)	**218**	(7.1)
	Galicia	486	(3.7)	80	(1.8)	378	(6.2)	433	(5.5)	490	(4.3)	543	(4.8)	588	(4.4)	**209**	(6.7)
	La Rioja	493	(4.1)	87	(1.9)	377	(5.6)	432	(5.8)	494	(5.1)	554	(5.8)	604	(6.5)	**228**	(7.6)
	Madrid	494	(3.6)	85	(2.2)	380	(6.3)	438	(5.2)	498	(3.9)	553	(4.1)	600	(4.4)	**221**	(6.9)
	Melilla	404	(6.0)	84	(4.7)	304	(12.0)	345	(8.4)	393	(9.8)	457	(10.4)	520	(12.6)	**216**	(17.2)
	Murcia	463	(4.4)	86	(1.7)	349	(5.6)	403	(6.5)	465	(5.3)	523	(5.0)	574	(5.4)	**225**	(6.6)
	Navarre	492	(4.2)	84	(1.8)	379	(5.7)	433	(5.1)	494	(5.0)	552	(5.3)	600	(4.4)	**221**	(6.4)
	United Kingdom																
	*England**	492	(2.6)	97	(1.5)	366	(4.1)	426	(3.3)	492	(3.0)	559	(3.4)	617	(4.4)	**252**	(5.5)
	*Northern Ireland**	475	(3.0)	92	(1.9)	354	(4.9)	410	(4.1)	476	(3.4)	538	(4.0)	597	(5.2)	**242**	(6.5)
	*Scotland**	471	(2.6)	94	(1.7)	352	(4.5)	404	(3.1)	469	(3.3)	536	(3.8)	595	(4.2)	**243**	(5.8)
	*Wales**	466	(3.2)	90	(1.7)	351	(4.8)	403	(3.9)	464	(3.7)	525	(3.9)	584	(5.0)	**233**	(6.1)

* Caution is required when interpreting estimates because one or more PISA sampling standards were not met (see Reader's Guide, Annexes A2 and A4).

Notes: Values that are statistically significant are indicated in bold (see Annex A3). PISA adjudicated region is shown in bold italic. See Table I.B1.2.1 for national data.

Table I.B2.1. Mean score and variation in mathematics performance [2/2]

		Mean score		Standard deviation		Percentiles									
						10th		25th		Median (50th)		75th		90th		Difference (90th - 10th)	
		Mean score	S.E.	S.D.	S.E.	Score	S.E.	Score	S.E.	Score	S.E.	Score	S.E.	Score	S.E.	Score dif.	S.E.
Partners	**Brazil**																
	North	357	(4.7)	67	(3.1)	277	(5.6)	312	(5.0)	352	(4.7)	396	(6.4)	445	(9.6)	**168**	(9.7)
	Northeast	363	(3.2)	73	(2.5)	277	(3.3)	312	(2.5)	354	(3.1)	404	(4.4)	460	(6.1)	**183**	(5.7)
	South	394	(3.5)	78	(2.3)	299	(4.6)	339	(3.6)	387	(4.2)	442	(5.1)	497	(6.8)	**198**	(7.2)
	Southeast	388	(2.8)	78	(1.9)	297	(2.9)	333	(2.5)	380	(2.9)	436	(4.2)	494	(5.6)	**197**	(5.7)
	Middle-West	384	(6.9)	76	(4.0)	292	(6.8)	329	(6.2)	377	(6.6)	431	(9.3)	485	(13.0)	**193**	(11.7)
	Kazakhstan																
	Akmola region	419	(5.6)	74	(2.9)	329	(5.7)	368	(4.9)	415	(5.9)	465	(7.2)	516	(10.4)	**187**	(9.7)
	Aktobe region	437	(4.1)	68	(2.3)	350	(7.5)	391	(5.2)	437	(4.7)	482	(5.5)	522	(6.1)	**172**	(9.4)
	Almaty	453	(6.5)	84	(3.1)	345	(7.7)	391	(8.5)	452	(8.6)	510	(7.1)	561	(8.5)	**216**	(9.6)
	Almaty region	412	(4.6)	72	(2.4)	323	(6.6)	364	(5.5)	409	(5.7)	459	(5.9)	507	(6.8)	**183**	(8.4)
	Astana	449	(7.3)	85	(4.3)	343	(6.8)	391	(6.8)	445	(6.6)	504	(10.3)	563	(15.4)	**220**	(14.6)
	Atyrau region	405	(6.0)	74	(3.0)	315	(5.5)	353	(5.9)	399	(6.7)	451	(9.1)	503	(10.1)	**188**	(9.8)
	East-Kazakhstan region	432	(7.3)	83	(3.4)	331	(8.1)	372	(6.9)	426	(7.5)	487	(9.7)	542	(13.5)	**211**	(12.9)
	Karagandy region	421	(4.3)	76	(2.2)	328	(6.1)	368	(5.5)	416	(5.3)	470	(5.4)	521	(5.9)	**193**	(7.1)
	Kostanay region	440	(8.3)	81	(3.7)	339	(6.5)	382	(7.2)	435	(9.1)	493	(11.8)	550	(15.7)	**211**	(13.8)
	Kyzyl-Orda region	414	(4.7)	68	(1.8)	329	(6.4)	367	(6.0)	410	(5.6)	458	(5.3)	503	(6.1)	**174**	(6.3)
	North-Kazakhstan region	441	(5.2)	76	(2.1)	345	(6.3)	386	(5.0)	437	(6.3)	493	(7.3)	543	(8.2)	**198**	(7.5)
	Pavlodar region	426	(4.9)	77	(2.6)	332	(5.2)	372	(5.5)	419	(5.4)	474	(6.6)	528	(9.8)	**196**	(9.5)
	Shymkent	407	(4.8)	74	(2.0)	316	(5.6)	357	(5.8)	402	(5.6)	453	(7.1)	503	(7.0)	**187**	(7.2)
	Turkestan region	389	(7.1)	71	(4.0)	302	(6.1)	340	(6.2)	386	(6.5)	434	(10.0)	486	(12.9)	**184**	(12.1)
	West-Kazakhstan region	424	(4.0)	68	(2.0)	341	(5.1)	377	(4.2)	420	(4.8)	466	(5.7)	513	(6.3)	**171**	(7.3)
	Zhambyl region	433	(5.6)	64	(2.8)	352	(8.5)	392	(6.5)	434	(6.1)	475	(6.1)	514	(7.9)	**162**	(9.0)
	Mongolia																
	Central	443	(3.3)	84	(2.1)	340	(3.0)	382	(3.0)	436	(3.6)	499	(4.5)	556	(6.1)	**216**	(5.7)
	Khangai	409	(6.0)	73	(3.0)	319	(5.2)	357	(5.4)	405	(6.4)	455	(8.1)	505	(9.6)	**186**	(8.4)
	Western	381	(4.9)	79	(3.0)	286	(6.5)	326	(6.3)	374	(5.7)	431	(6.2)	487	(7.7)	**201**	(8.9)
	Viet Nam																
	Central	461	(6.3)	83	(3.6)	355	(10.2)	407	(7.1)	461	(6.9)	517	(7.3)	567	(7.3)	**212**	(10.6)
	Northern	480	(6.7)	86	(4.2)	370	(11.8)	424	(8.6)	481	(6.6)	539	(6.6)	590	(7.6)	**220**	(12.6)
	Southern	463	(6.8)	86	(3.7)	355	(8.0)	404	(7.2)	461	(6.7)	521	(8.4)	578	(11.1)	**223**	(11.3)

* Caution is required when interpreting estimates because one or more PISA sampling standards were not met (see Reader's Guide, Annexes A2 and A4).

Notes: Values that are statistically significant are indicated in bold (see Annex A3). PISA adjudicated region is shown in bold italic. See Table I.B1.2.1 for national data.

Table I.B2.2. Mean score and variation in reading performance [1/2]

		Mean score		Standard deviation		Percentiles											
						10th		25th		Median (50th)		75th		90th		Difference (90th - 10th)	
		Mean score	S.E.	S.D.	S.E.	Score	S.E.	Score	S.E.	Score	S.E.	Score	S.E.	Score	S.E.	Score dif.	S.E.
OECD	**Belgium**																
	Flemish community	483	(3.5)	105	(1.9)	340	(4.8)	412	(4.6)	490	(4.6)	558	(3.7)	613	(4.5)	**273**	(6.0)
	French community	474	(3.7)	105	(2.2)	332	(6.7)	400	(4.7)	477	(4.3)	549	(4.5)	607	(5.1)	**275**	(8.1)
	German-speaking community	467	(9.3)	89	(3.1)	348	(11.4)	408	(9.6)	470	(11.4)	531	(11.0)	579	(12.3)	**231**	(10.3)
	Canada																
	*Alberta**	525	(6.3)	112	(3.8)	378	(8.9)	449	(8.0)	528	(7.4)	605	(7.2)	666	(9.7)	**288**	(11.7)
	*British Columbia**	511	(5.8)	107	(2.8)	370	(8.2)	439	(7.3)	514	(6.6)	587	(6.4)	646	(6.9)	**276**	(8.2)
	*Manitoba**	486	(3.8)	103	(2.5)	352	(6.7)	417	(5.1)	487	(4.4)	556	(4.2)	617	(5.6)	**265**	(7.9)
	New Brunswick	469	(4.0)	106	(2.7)	330	(8.2)	398	(6.6)	472	(5.6)	541	(5.3)	604	(6.8)	**274**	(10.6)
	*Newfoundland and Labrador**	478	(7.1)	103	(3.2)	347	(10.7)	406	(8.1)	478	(7.4)	549	(9.7)	612	(8.4)	**266**	(10.6)
	*Nova Scotia**	489	(6.2)	106	(2.4)	351	(8.8)	415	(7.9)	488	(7.6)	564	(7.4)	625	(8.5)	**274**	(8.3)
	*Ontario**	512	(3.8)	108	(2.1)	371	(4.6)	438	(4.7)	516	(5.0)	587	(5.3)	646	(5.0)	**276**	(6.0)
	Prince Edward Island	496	(10.3)	103	(5.5)	355	(17.8)	428	(13.8)	505	(11.9)	572	(14.5)	623	(20.8)	**268**	(24.1)
	*Quebec**	501	(4.6)	109	(2.3)	358	(6.7)	429	(5.5)	506	(5.3)	577	(5.2)	635	(5.8)	**277**	(7.2)
	Saskatchewan	484	(4.1)	101	(2.4)	353	(6.0)	416	(5.0)	488	(4.4)	554	(5.4)	611	(6.5)	**257**	(7.6)
	Colombia																
	Bogotá	462	(5.8)	89	(3.1)	347	(6.4)	399	(7.1)	461	(6.7)	525	(6.9)	578	(7.6)	**232**	(8.8)
	Italy																
	Bolzano	482	(6.1)	87	(1.9)	366	(6.0)	423	(6.1)	483	(5.9)	543	(7.4)	594	(8.5)	**228**	(6.9)
	Trento	494	(2.2)	86	(1.9)	377	(4.4)	437	(3.7)	501	(3.8)	555	(4.0)	598	(5.2)	**220**	(6.9)
	Spain																
	Andalusia	461	(5.2)	97	(2.3)	334	(6.7)	394	(6.3)	463	(6.4)	528	(6.3)	587	(7.1)	**253**	(7.8)
	Aragon	488	(5.4)	94	(2.5)	363	(7.3)	426	(6.4)	493	(5.8)	553	(6.0)	605	(7.1)	**243**	(8.2)
	Asturias	497	(5.6)	94	(2.3)	369	(9.3)	436	(7.0)	503	(5.9)	563	(5.7)	614	(5.5)	**245**	(8.4)
	Balearic Islands	472	(6.3)	93	(2.5)	351	(7.9)	408	(6.5)	474	(7.0)	537	(6.9)	590	(7.3)	**240**	(7.8)
	Basque Country	466	(4.7)	92	(2.4)	344	(6.8)	405	(5.9)	470	(5.4)	531	(5.7)	582	(5.5)	**239**	(7.7)
	Canary Islands	463	(5.7)	94	(2.3)	342	(7.1)	400	(6.6)	465	(6.0)	527	(6.5)	582	(7.1)	**240**	(6.9)
	Cantabria	494	(6.1)	91	(2.2)	375	(7.8)	435	(6.7)	498	(6.4)	557	(6.7)	607	(7.6)	**233**	(7.8)
	Castile and Leon	498	(4.4)	92	(2.0)	377	(7.0)	438	(5.6)	501	(5.2)	563	(4.4)	614	(5.6)	**237**	(7.2)
	Castile-La Mancha	468	(4.6)	90	(2.3)	351	(7.0)	407	(5.1)	469	(5.1)	529	(5.2)	582	(6.3)	**231**	(6.7)
	Catalonia	462	(6.4)	102	(2.7)	329	(9.1)	394	(7.6)	465	(7.4)	535	(7.4)	592	(7.2)	**263**	(9.3)
	Ceuta	404	(10.9)	89	(5.2)	289	(17.2)	343	(13.2)	402	(12.9)	468	(13.9)	522	(16.8)	**232**	(20.5)
	Comunidad Valenciana	482	(4.0)	95	(2.1)	358	(7.0)	419	(5.4)	485	(4.9)	548	(4.3)	599	(5.5)	**242**	(8.5)
	Extremadura	468	(6.4)	93	(2.5)	345	(8.6)	405	(7.5)	469	(7.2)	534	(7.7)	588	(8.4)	**243**	(9.2)
	Galicia	485	(4.8)	91	(2.6)	364	(7.9)	428	(6.0)	490	(4.7)	549	(5.0)	599	(5.7)	**235**	(8.6)
	La Rioja	487	(7.7)	97	(2.0)	357	(8.3)	421	(8.8)	490	(7.6)	555	(9.2)	609	(9.8)	**251**	(7.3)
	Madrid	496	(4.2)	95	(2.6)	370	(7.7)	435	(5.2)	502	(4.6)	562	(4.3)	614	(5.8)	**244**	(8.6)
	Melilla	405	(9.7)	100	(5.6)	288	(17.2)	335	(11.3)	394	(13.3)	471	(12.4)	540	(16.0)	**252**	(20.7)
	Murcia	468	(5.1)	96	(2.5)	341	(6.2)	403	(6.2)	471	(6.6)	536	(5.9)	592	(7.4)	**250**	(8.0)
	Navarre	478	(7.4)	94	(2.4)	354	(8.9)	412	(7.7)	479	(8.0)	545	(8.1)	599	(9.1)	**245**	(7.8)
	United Kingdom																
	*England**	496	(2.8)	105	(1.8)	359	(4.5)	427	(3.6)	499	(3.3)	569	(3.3)	628	(4.1)	**269**	(5.1)
	*Northern Ireland**	485	(3.4)	100	(2.3)	353	(5.9)	416	(4.6)	488	(4.6)	555	(3.9)	612	(4.8)	**259**	(7.7)
	*Scotland**	493	(3.4)	103	(1.8)	361	(5.1)	424	(4.2)	494	(4.0)	564	(4.3)	623	(5.7)	**263**	(6.7)
	*Wales**	466	(3.7)	100	(1.8)	334	(5.1)	395	(4.8)	466	(4.4)	536	(4.8)	597	(4.6)	**263**	(5.5)

* Caution is required when interpreting estimates because one or more PISA sampling standards were not met (see Reader's Guide, Annexes A2 and A4).

** Caution is required when comparing estimates based on PISA 2022 with other countries/economies as a strong linkage to the international PISA reading scale could not be established (see Reader's Guide and Annex A4).

Notes: Values that are statistically significant are indicated in bold (see Annex A3).

PISA adjudicated region is shown in bold italic.

See Table I.B1.2.2 for national data.

Table I.B2.2. Mean score and variation in reading performance [2/2]

		Mean score		Standard deviation		Percentiles											
						10th		25th		Median (50th)		75th		90th		Difference (90th - 10th)	
		Mean score	S.E.	S.D.	S.E.	Score	S.E.	Score	S.E.	Score	S.E.	Score	S.E.	Score	S.E.	Score dif.	S.E.
Partners	**Brazil**																
	North	382	(6.3)	95	(3.7)	261	(8.8)	317	(8.0)	380	(7.9)	446	(7.4)	506	(10.7)	**245**	(11.5)
	Northeast	392	(4.0)	97	(2.2)	271	(4.5)	322	(4.2)	387	(4.9)	458	(5.1)	524	(6.7)	**253**	(7.3)
	South	427	(4.3)	97	(2.6)	305	(6.2)	359	(5.5)	423	(5.4)	493	(6.7)	555	(7.6)	**250**	(9.5)
	Southeast	420	(3.5)	101	(2.2)	292	(4.2)	349	(3.8)	417	(4.3)	489	(4.8)	553	(6.1)	**261**	(6.9)
	Middle-West	424	(9.3)	100	(4.2)	297	(10.8)	354	(10.7)	422	(10.5)	493	(10.7)	558	(18.0)	**261**	(16.8)
	Kazakhstan																
	Akmola region	399	(7.0)	84	(3.5)	297	(6.9)	341	(6.7)	395	(7.7)	453	(10.2)	510	(12.1)	**213**	(11.8)
	Aktobe region	383	(4.0)	75	(2.6)	292	(6.3)	331	(5.7)	379	(4.2)	431	(5.7)	482	(5.9)	**189**	(7.1)
	Almaty	423	(5.8)	88	(3.1)	313	(7.2)	362	(6.7)	417	(6.7)	481	(7.9)	544	(9.6)	**231**	(10.1)
	Almaty region	375	(5.8)	75	(3.4)	283	(5.8)	323	(5.7)	372	(5.4)	422	(6.2)	470	(10.6)	**187**	(9.7)
	Astana	424	(7.1)	92	(4.1)	311	(8.2)	361	(5.8)	417	(7.0)	485	(11.4)	550	(13.1)	**239**	(13.0)
	Atyrau region	378	(6.1)	71	(3.9)	291	(6.1)	330	(5.1)	373	(6.6)	421	(7.8)	470	(11.9)	**179**	(11.6)
	East-Kazakhstan region	410	(7.4)	87	(5.2)	305	(8.3)	350	(6.5)	402	(6.7)	463	(10.6)	531	(17.9)	**226**	(18.0)
	Karagandy region	402	(4.6)	81	(2.8)	304	(5.5)	347	(5.3)	397	(6.2)	455	(5.9)	510	(8.2)	**206**	(8.9)
	Kostanay region	427	(8.3)	91	(3.7)	312	(7.2)	361	(6.1)	423	(10.0)	491	(12.5)	551	(13.4)	**239**	(12.4)
	Kyzyl-Orda region	364	(4.0)	61	(2.2)	288	(7.7)	324	(4.9)	362	(4.2)	403	(4.3)	441	(4.0)	**153**	(7.3)
	North-Kazakhstan region	417	(6.1)	83	(2.6)	311	(6.9)	356	(6.7)	413	(7.1)	474	(7.5)	527	(9.0)	**216**	(8.8)
	Pavlodar region	400	(6.3)	82	(3.1)	298	(6.3)	340	(6.2)	395	(7.1)	455	(9.2)	508	(10.8)	**210**	(10.4)
	Shymkent	366	(5.4)	74	(3.2)	277	(7.2)	317	(5.7)	362	(6.1)	410	(6.1)	458	(10.8)	**180**	(11.2)
	Turkestan region	347	(6.8)	69	(3.0)	260	(7.0)	301	(6.5)	345	(7.1)	392	(8.9)	433	(11.1)	**173**	(9.5)
	West-Kazakhstan region	387	(5.3)	72	(3.4)	301	(6.4)	339	(5.2)	382	(5.4)	429	(6.6)	483	(10.9)	**182**	(11.7)
	Zhambyl region	353	(5.2)	65	(2.9)	274	(5.8)	310	(5.7)	351	(5.5)	395	(6.1)	435	(8.4)	**160**	(8.4)
	Mongolia																
	Central	398	(3.0)	73	(1.3)	304	(3.8)	347	(3.2)	399	(3.2)	449	(3.7)	493	(4.0)	**189**	(4.1)
	Khangai	363	(5.2)	66	(1.7)	277	(7.0)	318	(5.9)	364	(5.6)	408	(5.3)	447	(7.0)	**169**	(6.4)
	Western	326	(4.2)	77	(2.5)	228	(6.5)	270	(5.7)	325	(5.0)	380	(5.4)	429	(7.2)	**201**	(9.0)
	Viet Nam																
	*Central***	452	(7.1)	77	(3.9)	351	(10.9)	403	(8.3)	456	(7.5)	504	(7.6)	547	(8.0)	**196**	(11.3)
	*Northern***	469	(6.4)	78	(4.0)	367	(11.5)	420	(8.1)	472	(6.5)	521	(6.1)	565	(8.2)	**197**	(12.5)
	*Southern***	461	(6.7)	76	(3.3)	362	(11.1)	412	(7.9)	463	(6.4)	514	(7.1)	557	(7.7)	**196**	(10.9)

* Caution is required when interpreting estimates because one or more PISA sampling standards were not met (see Reader's Guide, Annexes A2 and A4).

** Caution is required when comparing estimates based on PISA 2022 with other countries/economies as a strong linkage to the international PISA reading scale could not be established (see Reader's Guide and Annex A4).

Notes: Values that are statistically significant are indicated in bold (see Annex A3).

PISA adjudicated region is shown in bold italic.

See Table I.B1.2.2 for national data.

Table I.B2.3. Mean score and variation in science performance [1/2]

		Mean score		Standard deviation		Percentiles											
						10th		25th		Median (50th)		75th		90th		Difference (90th - 10th)	
		Mean score	S.E.	S.D.	S.E.	Score	S.E.	Score	S.E.	Score	S.E.	Score	S.E.	Score	S.E.	Score dif.	S.E.
OECD	**Belgium**																
	Flemish community	499	(3.3)	102	(1.7)	358	(5.0)	426	(5.1)	506	(4.1)	575	(3.7)	627	(3.6)	**269**	(5.5)
	French community	479	(3.5)	99	(2.2)	343	(6.1)	411	(4.9)	484	(3.8)	550	(4.6)	604	(5.3)	**261**	(8.0)
	German-speaking community	487	(8.8)	83	(2.4)	374	(8.2)	430	(8.3)	494	(9.4)	547	(11.5)	594	(11.9)	**220**	(10.1)
	Canada																
	*Alberta**	534	(6.8)	104	(2.9)	397	(9.5)	462	(8.9)	535	(8.2)	608	(8.4)	669	(9.2)	**273**	(11.7)
	*British Columbia**	519	(4.9)	100	(2.5)	389	(6.5)	450	(6.5)	520	(5.2)	588	(5.8)	645	(6.7)	**256**	(7.9)
	*Manitoba**	492	(4.0)	94	(1.9)	371	(6.5)	428	(5.7)	493	(4.3)	556	(4.2)	611	(4.7)	**241**	(6.4)
	New Brunswick	483	(4.3)	97	(3.3)	358	(6.2)	417	(4.6)	482	(5.4)	549	(6.4)	608	(7.5)	**250**	(9.1)
	*Newfoundland and Labrador**	491	(5.2)	95	(2.8)	367	(7.2)	423	(7.5)	493	(6.2)	556	(6.5)	614	(9.3)	**247**	(10.1)
	*Nova Scotia**	492	(3.9)	97	(2.2)	365	(6.5)	422	(5.4)	491	(5.1)	560	(5.1)	619	(7.1)	**253**	(7.9)
	*Ontario**	517	(3.7)	101	(1.8)	384	(4.3)	447	(4.4)	518	(4.2)	586	(4.7)	646	(5.1)	**261**	(5.0)
	Prince Edward Island	496	(13.4)	96	(5.0)	372	(15.9)	428	(14.5)	499	(13.3)	564	(16.2)	616	(18.9)	**244**	(16.4)
	*Quebec**	512	(4.2)	99	(2.0)	382	(6.0)	446	(4.8)	516	(5.3)	581	(4.9)	635	(5.7)	**254**	(6.9)
	Saskatchewan	494	(3.1)	92	(2.0)	377	(5.5)	430	(4.0)	494	(3.5)	557	(4.3)	611	(5.9)	**234**	(7.9)
	Colombia																
	Bogotá	459	(5.5)	85	(3.0)	350	(7.0)	399	(6.2)	458	(6.0)	517	(6.3)	571	(8.8)	**222**	(9.7)
	Italy																
	Bolzano	495	(4.6)	90	(1.8)	376	(6.6)	433	(4.8)	498	(5.7)	556	(5.4)	609	(5.8)	**233**	(7.0)
	Trento	495	(2.1)	85	(1.6)	380	(4.5)	438	(3.3)	499	(3.2)	554	(2.9)	602	(4.6)	**222**	(5.8)
	Spain																
	Andalusia	473	(4.9)	92	(2.1)	352	(5.6)	408	(6.3)	475	(6.2)	536	(5.8)	592	(6.6)	**240**	(7.9)
	Aragon	499	(5.4)	92	(2.5)	378	(7.6)	437	(6.6)	502	(6.8)	563	(5.7)	617	(8.2)	**239**	(7.9)
	Asturias	503	(6.3)	91	(2.1)	382	(8.2)	441	(7.5)	508	(6.4)	568	(7.0)	618	(8.1)	**236**	(8.4)
	Balearic Islands	480	(5.2)	91	(2.1)	360	(6.8)	416	(6.1)	482	(5.6)	544	(6.3)	595	(6.8)	**235**	(7.1)
	Basque Country	480	(4.6)	87	(1.7)	365	(6.2)	421	(5.3)	482	(4.3)	540	(4.9)	590	(5.1)	**224**	(5.8)
	Canary Islands	473	(4.9)	87	(1.9)	361	(6.7)	414	(6.2)	472	(5.5)	532	(5.9)	585	(6.6)	**224**	(7.8)
	Cantabria	504	(5.7)	87	(1.8)	389	(7.0)	445	(7.1)	508	(5.8)	566	(6.8)	613	(7.1)	**224**	(7.3)
	Castile and Leon	506	(4.3)	89	(1.9)	389	(6.6)	447	(5.8)	509	(5.2)	568	(4.7)	619	(5.5)	**230**	(7.5)
	Castile-La Mancha	475	(4.6)	85	(2.3)	365	(6.0)	417	(5.4)	478	(5.3)	534	(5.1)	583	(5.5)	**218**	(6.6)
	Catalonia	477	(6.0)	94	(2.6)	355	(7.8)	412	(7.3)	478	(7.0)	543	(6.7)	599	(7.4)	**244**	(8.7)
	Ceuta	410	(13.0)	88	(4.6)	299	(19.4)	348	(16.3)	410	(14.5)	468	(14.7)	525	(18.7)	**226**	(19.1)
	Comunidad Valenciana	483	(4.4)	92	(2.0)	361	(6.1)	419	(5.8)	484	(5.7)	548	(5.0)	601	(5.6)	**240**	(6.6)
	Extremadura	479	(6.5)	89	(2.0)	364	(8.1)	417	(6.9)	479	(7.3)	541	(6.7)	595	(9.2)	**231**	(7.8)
	Galicia	506	(4.9)	87	(2.1)	391	(6.8)	447	(6.4)	510	(4.9)	566	(4.9)	616	(7.0)	**225**	(6.8)
	La Rioja	500	(9.3)	91	(2.4)	380	(10.6)	436	(8.5)	502	(9.7)	564	(10.0)	616	(11.4)	**236**	(7.4)
	Madrid	502	(3.8)	89	(2.2)	384	(6.7)	444	(4.6)	505	(4.3)	563	(4.0)	613	(5.6)	**229**	(7.5)
	Melilla	414	(11.6)	92	(5.2)	302	(18.5)	349	(13.1)	406	(12.3)	475	(15.2)	541	(17.9)	**239**	(21.2)
	Murcia	482	(5.4)	93	(2.2)	359	(6.5)	417	(6.7)	484	(6.3)	546	(5.6)	601	(6.5)	**242**	(6.8)
	Navarre	489	(5.7)	89	(2.1)	372	(8.3)	426	(6.2)	491	(7.1)	553	(6.2)	605	(6.1)	**232**	(8.4)
	United Kingdom																
	*England**	503	(2.7)	104	(1.7)	365	(3.8)	430	(3.5)	504	(3.4)	576	(3.6)	637	(4.4)	**272**	(5.3)
	*Northern Ireland**	488	(3.2)	100	(2.1)	356	(4.6)	418	(4.3)	489	(3.8)	559	(4.6)	618	(5.6)	**262**	(6.9)
	*Scotland**	483	(3.1)	101	(2.1)	353	(4.8)	413	(4.3)	483	(3.9)	555	(3.8)	614	(5.1)	**261**	(5.8)
	*Wales**	473	(3.8)	98	(1.8)	348	(4.7)	403	(4.1)	469	(4.3)	539	(4.9)	603	(5.2)	**255**	(5.8)

* Caution is required when interpreting estimates because one or more PISA sampling standards were not met (see Reader's Guide, Annexes A2 and A4).

Notes: Values that are statistically significant are indicated in bold (see Annex A3).

PISA adjudicated region is shown in bold italic.

See Table I.B1.2.3 for national data.

Table I.B2.3. Mean score and variation in science performance [2/2]

		Mean score		Standard deviation		Percentiles											
						10th		25th		Median (50th)		75th		90th		Difference (90th - 10th)	
		Mean score	S.E.	S.D.	S.E.	Score	S.E.	Score	S.E.	Score	S.E.	Score	S.E.	Score	S.E.	Score dif.	S.E.
Partners	**Brazil**																
	North	380	(6.5)	87	(3.9)	272	(10.4)	322	(7.1)	374	(7.0)	436	(8.9)	495	(9.6)	**222**	(12.1)
	Northeast	386	(4.1)	92	(2.3)	275	(4.6)	321	(3.6)	378	(4.6)	444	(5.1)	509	(8.2)	**233**	(8.3)
	South	421	(4.5)	96	(2.8)	302	(5.4)	354	(5.3)	416	(5.3)	483	(6.2)	548	(7.9)	**246**	(8.6)
	Southeast	413	(3.3)	94	(2.0)	297	(4.1)	346	(3.4)	406	(3.8)	473	(4.9)	538	(5.9)	**241**	(6.4)
	Middle-West	411	(7.8)	93	(4.8)	294	(8.9)	345	(7.7)	407	(8.4)	470	(10.2)	533	(14.1)	**240**	(13.3)
	Kazakhstan																
	Akmola region	428	(6.5)	78	(3.1)	331	(6.2)	375	(6.4)	424	(6.8)	479	(9.6)	531	(11.0)	**199**	(10.5)
	Aktobe region	425	(4.5)	68	(2.6)	343	(5.4)	379	(5.2)	421	(5.3)	466	(6.0)	515	(7.6)	**173**	(8.4)
	Almaty	458	(6.1)	83	(2.4)	355	(7.7)	400	(7.8)	454	(7.5)	512	(7.8)	565	(6.8)	**210**	(7.7)
	Almaty region	414	(5.5)	77	(4.0)	321	(8.2)	365	(5.6)	413	(5.9)	462	(6.4)	512	(11.0)	**191**	(12.1)
	Astana	455	(7.5)	86	(4.5)	349	(10.3)	396	(6.9)	451	(7.5)	510	(9.5)	568	(15.3)	**219**	(16.2)
	Atyrau region	406	(5.8)	71	(3.4)	321	(5.9)	358	(5.8)	401	(6.6)	449	(8.0)	499	(10.1)	**178**	(10.2)
	East-Kazakhstan region	441	(7.3)	84	(4.8)	339	(8.5)	381	(6.7)	434	(7.3)	495	(10.6)	554	(15.1)	**215**	(15.9)
	Karagandy region	427	(4.4)	78	(2.9)	331	(7.2)	374	(5.9)	426	(5.6)	479	(5.3)	527	(6.3)	**196**	(8.7)
	Kostanay region	455	(8.6)	85	(4.2)	349	(8.7)	393	(7.9)	450	(9.0)	515	(12.5)	567	(13.3)	**218**	(13.0)
	Kyzyl-Orda region	402	(4.6)	61	(2.1)	327	(5.6)	361	(5.0)	401	(5.0)	443	(6.5)	481	(6.3)	**155**	(6.5)
	North-Kazakhstan region	450	(5.5)	80	(3.3)	348	(7.2)	395	(6.0)	446	(5.8)	504	(8.7)	555	(9.5)	**207**	(10.6)
	Pavlodar region	432	(6.1)	80	(3.6)	335	(5.1)	376	(6.2)	428	(6.7)	483	(7.8)	539	(11.9)	**204**	(11.7)
	Shymkent	407	(6.1)	73	(2.5)	317	(7.3)	357	(6.1)	404	(7.0)	453	(7.2)	500	(7.9)	**183**	(7.9)
	Turkestan region	389	(6.3)	67	(3.5)	308	(6.9)	344	(6.2)	388	(6.6)	432	(7.8)	473	(9.6)	**165**	(9.5)
	West-Kazakhstan region	424	(4.1)	66	(2.0)	343	(5.5)	378	(4.5)	420	(4.7)	465	(5.6)	511	(7.2)	**169**	(8.5)
	Zhambyl region	400	(5.0)	63	(2.5)	319	(6.8)	359	(5.8)	399	(5.5)	440	(5.9)	479	(8.2)	**161**	(9.1)
	Mongolia																
	Central	430	(2.6)	74	(1.5)	337	(3.0)	378	(2.8)	427	(3.2)	481	(3.9)	529	(4.2)	**192**	(4.4)
	Khangai	396	(5.7)	67	(2.7)	312	(6.2)	350	(5.4)	394	(5.8)	440	(7.2)	484	(8.9)	**172**	(8.7)
	Western	367	(4.4)	74	(3.0)	274	(6.1)	313	(5.2)	363	(4.6)	416	(5.3)	465	(6.4)	**192**	(8.7)
	Viet Nam																
	Central	463	(6.3)	77	(3.0)	364	(9.1)	411	(7.3)	464	(6.8)	515	(6.9)	560	(7.0)	**196**	(8.9)
	Northern	478	(5.9)	78	(3.3)	378	(8.7)	426	(7.0)	479	(6.1)	530	(5.6)	576	(7.0)	**199**	(9.5)
	Southern	474	(6.0)	79	(2.9)	374	(8.1)	420	(6.6)	474	(6.0)	527	(6.9)	575	(7.6)	**201**	(8.9)

* Caution is required when interpreting estimates because one or more PISA sampling standards were not met (see Reader's Guide, Annexes A2 and A4).
Notes: Values that are statistically significant are indicated in bold (see Annex A3).
PISA adjudicated region is shown in bold italic.
See Table I.B1.2.3 for national data.

Table I.B2.23. Students' socio-economic status [1/2]

		Students' socio-economic status measured by the PISA index of economic, social and cultural status (ESCS)																	
		All students		Variability in the index		Bottom quarter		Second quarter		Third quarter		Fourth quarter		Top - Bottom quarter		10th percentile		90th percentile		90th - 10th percentile	
		Mean index	S.E.	S.D.	S.E.	Mean index	S.E.	Mean index	S.E.	Mean index	S.E.	Mean index	S.E.	Dif.	S.E.	Mean index	S.E.	Mean index	S.E.	Dif.	S.E.
OECD	**Belgium**																				
	Flemish community	0.18	(0.02)	0.89	(0.01)	-1.05	(0.03)	-0.04	(0.03)	0.62	(0.03)	1.18	(0.02)	**2.23**	(0.03)	-1.03	(0.02)	1.20	(0.02)	**2.23**	(0.02)
	French community	-0.04	(0.04)	0.95	(0.02)	-1.34	(0.05)	-0.30	(0.05)	0.40	(0.04)	1.07	(0.03)	**2.41**	(0.05)	-1.32	(0.05)	1.10	(0.03)	**2.42**	(0.05)
	German-speaking community	0.16	(0.03)	0.84	(0.02)	-0.98	(0.05)	-0.10	(0.06)	0.60	(0.04)	1.15	(0.02)	**2.13**	(0.05)	-0.97	(0.04)	1.17	(0.03)	**2.14**	(0.04)
	Canada																				
	*Alberta**	0.40	(0.04)	0.76	(0.02)	-0.64	(0.06)	0.18	(0.06)	0.78	(0.04)	1.30	(0.03)	**1.94**	(0.05)	-0.66	(0.06)	1.32	(0.03)	**1.98**	(0.06)
	*British Columbia**	0.43	(0.04)	0.75	(0.02)	-0.60	(0.05)	0.24	(0.05)	0.81	(0.04)	1.28	(0.02)	**1.88**	(0.04)	-0.63	(0.06)	1.28	(0.02)	**1.91**	(0.06)
	*Manitoba**	0.18	(0.02)	0.84	(0.02)	-0.93	(0.03)	-0.08	(0.03)	0.55	(0.02)	1.17	(0.02)	**2.10**	(0.04)	-0.92	(0.05)	1.20	(0.03)	**2.12**	(0.05)
	New Brunswick	0.26	(0.02)	0.78	(0.01)	-0.79	(0.04)	0.02	(0.03)	0.61	(0.02)	1.20	(0.02)	**1.99**	(0.04)	-0.82	(0.03)	1.24	(0.03)	**2.06**	(0.05)
	*Newfoundland and Labrador**	0.24	(0.04)	0.81	(0.02)	-0.84	(0.04)	-0.03	(0.05)	0.61	(0.05)	1.23	(0.03)	**2.07**	(0.04)	-0.89	(0.05)	1.23	(0.03)	**2.12**	(0.05)
	*Nova Scotia**	0.27	(0.03)	0.77	(0.02)	-0.78	(0.04)	0.04	(0.04)	0.64	(0.03)	1.19	(0.02)	**1.97**	(0.04)	-0.80	(0.02)	1.20	(0.03)	**2.00**	(0.03)
	*Ontario**	0.42	(0.03)	0.74	(0.01)	-0.61	(0.03)	0.24	(0.04)	0.77	(0.02)	1.27	(0.02)	**1.88**	(0.03)	-0.61	(0.04)	1.27	(0.02)	**1.88**	(0.03)
	Prince Edward Island	0.33	(0.05)	0.80	(0.04)	-0.77	(0.09)	0.15	(0.08)	0.73	(0.06)	1.23	(0.05)	**2.00**	(0.10)	-0.82	(0.20)	1.25	(0.05)	**2.07**	(0.21)
	*Quebec**	0.36	(0.02)	0.73	(0.01)	-0.66	(0.03)	0.21	(0.03)	0.71	(0.02)	1.19	(0.01)	**1.85**	(0.03)	-0.68	(0.04)	1.20	(0.02)	**1.87**	(0.04)
	Saskatchewan	0.21	(0.02)	0.79	(0.02)	-0.84	(0.03)	-0.01	(0.03)	0.55	(0.03)	1.16	(0.02)	**2.00**	(0.04)	-0.83	(0.04)	1.19	(0.03)	**2.02**	(0.05)
	Colombia																				
	Bogotá	-0.43	(0.07)	1.07	(0.04)	-1.83	(0.07)	-0.82	(0.08)	0.02	(0.10)	0.91	(0.08)	**2.74**	(0.10)	-1.81	(0.07)	0.93	(0.07)	**2.74**	(0.09)
	Italy																				
	Bolzano	-0.03	(0.02)	0.84	(0.01)	-1.11	(0.02)	-0.33	(0.02)	0.27	(0.03)	1.06	(0.02)	**2.17**	(0.03)	-1.09	(0.03)	1.11	(0.03)	**2.20**	(0.04)
	Trento	-0.04	(0.02)	0.85	(0.01)	-1.13	(0.03)	-0.31	(0.02)	0.28	(0.03)	1.03	(0.03)	**2.16**	(0.04)	-1.13	(0.03)	1.10	(0.03)	**2.24**	(0.04)
	Spain																				
	Andalusia	-0.18	(0.05)	1.04	(0.03)	-1.62	(0.09)	-0.41	(0.06)	0.27	(0.07)	1.03	(0.04)	**2.65**	(0.08)	-1.67	(0.10)	1.06	(0.04)	**2.73**	(0.10)
	Aragon	0.00	(0.05)	0.97	(0.03)	-1.32	(0.08)	-0.22	(0.05)	0.44	(0.05)	1.10	(0.03)	**2.41**	(0.07)	-1.38	(0.08)	1.12	(0.02)	**2.51**	(0.07)
	Asturias	0.09	(0.05)	0.92	(0.03)	-1.14	(0.07)	-0.17	(0.05)	0.54	(0.06)	1.14	(0.03)	**2.28**	(0.07)	-1.16	(0.10)	1.15	(0.04)	**2.32**	(0.10)
	Balearic Islands	-0.05	(0.04)	0.97	(0.02)	-1.38	(0.07)	-0.26	(0.05)	0.37	(0.05)	1.06	(0.03)	**2.45**	(0.06)	-1.39	(0.06)	1.11	(0.04)	**2.51**	(0.07)
	Basque Country	0.18	(0.04)	0.87	(0.03)	-1.01	(0.08)	-0.02	(0.04)	0.62	(0.03)	1.11	(0.02)	**2.12**	(0.07)	-1.00	(0.09)	1.11	(0.02)	**2.11**	(0.09)
	Canary Islands	-0.21	(0.05)	0.97	(0.02)	-1.51	(0.05)	-0.47	(0.05)	0.21	(0.06)	0.95	(0.05)	**2.46**	(0.05)	-1.56	(0.06)	0.99	(0.05)	**2.55**	(0.06)
	Cantabria	0.03	(0.04)	0.89	(0.02)	-1.17	(0.05)	-0.22	(0.04)	0.44	(0.05)	1.09	(0.04)	**2.26**	(0.05)	-1.22	(0.06)	1.11	(0.04)	**2.33**	(0.06)
	Castile and Leon	0.08	(0.03)	0.92	(0.02)	-1.17	(0.05)	-0.16	(0.04)	0.53	(0.04)	1.14	(0.02)	**2.31**	(0.04)	-1.18	(0.06)	1.14	(0.02)	**2.32**	(0.06)
	Castile-La Mancha	-0.16	(0.04)	1.01	(0.02)	-1.54	(0.06)	-0.41	(0.05)	0.27	(0.05)	1.06	(0.03)	**2.60**	(0.06)	-1.57	(0.07)	1.11	(0.03)	**2.68**	(0.07)
	Catalonia	-0.02	(0.07)	1.04	(0.04)	-1.48	(0.12)	-0.19	(0.08)	0.50	(0.07)	1.10	(0.04)	**2.58**	(0.10)	-1.58	(0.10)	1.12	(0.03)	**2.70**	(0.08)
	Ceuta	-0.47	(0.07)	1.06	(0.05)	-1.90	(0.14)	-0.74	(0.07)	-0.05	(0.09)	0.80	(0.05)	**2.70**	(0.14)	-1.98	(0.12)	0.79	(0.06)	**2.77**	(0.13)
	Comunidad Valenciana	-0.10	(0.05)	0.98	(0.03)	-1.45	(0.08)	-0.34	(0.05)	0.34	(0.06)	1.05	(0.03)	**2.50**	(0.07)	-1.53	(0.07)	1.06	(0.04)	**2.59**	(0.07)
	Extremadura	-0.14	(0.04)	1.02	(0.02)	-1.55	(0.05)	-0.39	(0.05)	0.33	(0.06)	1.07	(0.04)	**2.62**	(0.04)	-1.66	(0.06)	1.09	(0.06)	**2.75**	(0.06)
	Galicia	0.07	(0.04)	0.92	(0.02)	-1.18	(0.06)	-0.19	(0.04)	0.48	(0.06)	1.16	(0.04)	**2.34**	(0.05)	-1.24	(0.10)	1.18	(0.04)	**2.42**	(0.09)
	La Rioja	-0.06	(0.03)	1.02	(0.03)	-1.46	(0.06)	-0.28	(0.03)	0.43	(0.03)	1.08	(0.02)	**2.54**	(0.06)	-1.48	(0.10)	1.11	(0.02)	**2.58**	(0.10)
	Madrid	0.25	(0.04)	0.95	(0.02)	-1.10	(0.05)	0.08	(0.06)	0.77	(0.04)	1.25	(0.03)	**2.34**	(0.05)	-1.14	(0.09)	1.26	(0.03)	**2.40**	(0.09)
	Melilla	-0.79	(0.09)	1.33	(0.05)	-2.65	(0.14)	-1.14	(0.15)	-0.17	(0.10)	0.81	(0.08)	**3.45**	(0.15)	-2.73	(0.11)	0.91	(0.04)	**3.64**	(0.11)
	Murcia	-0.24	(0.05)	1.13	(0.02)	-1.82	(0.06)	-0.54	(0.06)	0.30	(0.07)	1.07	(0.03)	**2.88**	(0.05)	-1.86	(0.07)	1.11	(0.04)	**2.97**	(0.07)
	Navarre	0.02	(0.04)	0.94	(0.02)	-1.27	(0.06)	-0.21	(0.05)	0.48	(0.05)	1.07	(0.02)	**2.34**	(0.06)	-1.27	(0.09)	1.09	(0.02)	**2.36**	(0.09)
	United Kingdom																				
	*England**	0.15	(0.03)	0.89	(0.02)	-1.04	(0.04)	-0.12	(0.03)	0.56	(0.03)	1.21	(0.02)	**2.26**	(0.03)	-1.05	(0.03)	1.23	(0.02)	**2.28**	(0.03)
	*Northern Ireland**	0.08	(0.02)	0.89	(0.02)	-1.08	(0.04)	-0.24	(0.03)	0.48	(0.03)	1.18	(0.02)	**2.26**	(0.04)	-1.10	(0.04)	1.21	(0.02)	**2.31**	(0.04)
	*Scotland**	0.02	(0.02)	0.90	(0.01)	-1.17	(0.03)	-0.28	(0.03)	0.40	(0.03)	1.15	(0.02)	**2.32**	(0.03)	-1.19	(0.03)	1.18	(0.02)	**2.37**	(0.03)

* Caution is required when interpreting estimates because one or more PISA sampling standards were not met (see Reader's Guide, Annexes A2 and A4).

Notes: Values that are statistically significant are indicated in bold (see Annex A3).

PISA adjudicated region is shown in bold italic.

See Table I.B1.4.2 for national data.

Table I.B2.23. Students' socio-economic status [2/2]

		Students' socio-economic status measured by the PISA index of economic, social and cultural status (ESCS)																	
		All students		Variability in the index		Bottom quarter		Second quarter		Third quarter		Fourth quarter		Top - Bottom quarter		10th percentile		90th percentile		90th - 10th percentile	
		Mean index	S.E.	S.D.	S.E.	Mean index	S.E.	Mean index	S.E.	Mean index	S.E.	Mean index	S.E.	Dif.	S.E.	Mean index	S.E.	Mean index	S.E.	Dif.	S.E.
Partners	**Brazil**																				
	North	-1.16	(0.07)	1.09	(0.03)	-2.60	(0.09)	-1.45	(0.08)	-0.79	(0.07)	0.19	(0.09)	**2.79**	(0.09)	-2.65	(0.12)	0.25	(0.11)	**2.90**	(0.12)
	Northeast	-1.34	(0.04)	1.13	(0.03)	-2.82	(0.05)	-1.69	(0.05)	-0.93	(0.04)	0.10	(0.06)	**2.92**	(0.07)	-2.86	(0.04)	0.15	(0.06)	**3.01**	(0.07)
	South	-0.86	(0.04)	1.12	(0.02)	-2.34	(0.04)	-1.22	(0.05)	-0.45	(0.05)	0.56	(0.04)	**2.90**	(0.05)	-2.43	(0.06)	0.65	(0.04)	**3.08**	(0.07)
	Southeast	-0.79	(0.03)	1.10	(0.02)	-2.23	(0.04)	-1.11	(0.03)	-0.38	(0.04)	0.58	(0.04)	**2.81**	(0.05)	-2.27	(0.05)	0.63	(0.05)	**2.90**	(0.06)
	Middle-West	-0.81	(0.09)	1.02	(0.03)	-2.16	(0.09)	-1.12	(0.08)	-0.42	(0.12)	0.45	(0.09)	**2.61**	(0.07)	-2.24	(0.17)	0.50	(0.09)	**2.74**	(0.15)
	Kazakhstan																				
	Akmola region	-0.41	(0.05)	0.81	(0.02)	-1.47	(0.05)	-0.66	(0.06)	-0.09	(0.05)	0.59	(0.05)	**2.05**	(0.04)	-1.49	(0.04)	0.59	(0.07)	**2.08**	(0.07)
	Aktobe region	-0.45	(0.03)	0.79	(0.01)	-1.49	(0.04)	-0.71	(0.05)	-0.13	(0.04)	0.55	(0.03)	**2.03**	(0.04)	-1.49	(0.04)	0.57	(0.02)	**2.06**	(0.04)
	Almaty	0.02	(0.07)	0.76	(0.03)	-1.05	(0.10)	-0.14	(0.09)	0.40	(0.06)	0.88	(0.04)	**1.93**	(0.09)	-1.08	(0.12)	0.88	(0.03)	**1.96**	(0.10)
	Almaty region	-0.57	(0.05)	0.83	(0.02)	-1.66	(0.05)	-0.89	(0.06)	-0.22	(0.06)	0.49	(0.05)	**2.15**	(0.05)	-1.65	(0.06)	0.53	(0.08)	**2.18**	(0.08)
	Astana	-0.05	(0.07)	0.79	(0.02)	-1.15	(0.07)	-0.27	(0.10)	0.32	(0.08)	0.87	(0.06)	**2.02**	(0.04)	-1.19	(0.05)	0.87	(0.06)	**2.07**	(0.05)
	Atyrau region	-0.30	(0.06)	0.79	(0.02)	-1.38	(0.07)	-0.54	(0.07)	0.07	(0.06)	0.65	(0.05)	**2.03**	(0.06)	-1.42	(0.05)	0.68	(0.05)	**2.11**	(0.05)
	East-Kazakhstan region	-0.41	(0.05)	0.81	(0.02)	-1.50	(0.06)	-0.68	(0.07)	-0.04	(0.07)	0.59	(0.04)	**2.08**	(0.06)	-1.53	(0.07)	0.61	(0.03)	**2.14**	(0.07)
	Karagandy region	-0.38	(0.05)	0.78	(0.03)	-1.40	(0.05)	-0.67	(0.06)	-0.06	(0.06)	0.59	(0.05)	**1.99**	(0.06)	-1.41	(0.07)	0.63	(0.05)	**2.04**	(0.08)
	Kostanay region	-0.37	(0.06)	0.78	(0.02)	-1.40	(0.06)	-0.64	(0.06)	-0.05	(0.07)	0.62	(0.05)	**2.02**	(0.06)	-1.43	(0.08)	0.65	(0.06)	**2.08**	(0.08)
	Kyzyl-Orda region	-0.56	(0.06)	0.84	(0.02)	-1.69	(0.06)	-0.85	(0.09)	-0.17	(0.07)	0.48	(0.04)	**2.16**	(0.05)	-1.74	(0.07)	0.53	(0.08)	**2.27**	(0.09)
	North-Kazakhstan region	-0.52	(0.04)	0.80	(0.01)	-1.54	(0.03)	-0.84	(0.06)	-0.21	(0.06)	0.52	(0.04)	**2.06**	(0.03)	-1.56	(0.02)	0.57	(0.04)	**2.13**	(0.04)
	Pavlodar region	-0.40	(0.05)	0.78	(0.02)	-1.42	(0.04)	-0.69	(0.07)	-0.09	(0.07)	0.59	(0.06)	**2.02**	(0.06)	-1.46	(0.03)	0.64	(0.05)	**2.10**	(0.05)
	Shymkent	-0.20	(0.05)	0.80	(0.03)	-1.31	(0.07)	-0.39	(0.05)	0.17	(0.04)	0.72	(0.06)	**2.04**	(0.07)	-1.35	(0.08)	0.73	(0.05)	**2.08**	(0.08)
	Turkestan region	-0.51	(0.05)	0.84	(0.02)	-1.64	(0.05)	-0.79	(0.06)	-0.13	(0.07)	0.51	(0.04)	**2.15**	(0.06)	-1.71	(0.07)	0.53	(0.06)	**2.23**	(0.07)
	West-Kazakhstan region	-0.50	(0.06)	0.82	(0.02)	-1.58	(0.05)	-0.83	(0.07)	-0.13	(0.08)	0.53	(0.05)	**2.11**	(0.05)	-1.64	(0.05)	0.55	(0.06)	**2.19**	(0.06)
	Zhambyl region	-0.52	(0.05)	0.86	(0.01)	-1.66	(0.05)	-0.84	(0.06)	-0.15	(0.06)	0.55	(0.03)	**2.22**	(0.03)	-1.71	(0.03)	0.59	(0.04)	**2.30**	(0.03)
	Mongolia																				
	Central	-0.42	(0.04)	0.96	(0.02)	-1.69	(0.04)	-0.73	(0.05)	0.02	(0.04)	0.74	(0.03)	**2.43**	(0.04)	-1.68	(0.05)	0.76	(0.04)	**2.44**	(0.05)
	Khangai	-1.18	(0.10)	1.06	(0.04)	-2.53	(0.05)	-1.56	(0.08)	-0.84	(0.14)	0.23	(0.14)	**2.76**	(0.11)	-2.58	(0.07)	0.31	(0.18)	**2.89**	(0.15)
	Western	-1.17	(0.08)	1.09	(0.03)	-2.57	(0.07)	-1.55	(0.09)	-0.81	(0.10)	0.24	(0.09)	**2.81**	(0.07)	-2.63	(0.09)	0.31	(0.09)	**2.94**	(0.09)
	Viet Nam																				
	Central	-1.47	(0.08)	1.12	(0.05)	-2.83	(0.10)	-1.86	(0.07)	-1.25	(0.10)	0.05	(0.12)	**2.88**	(0.14)	-2.87	(0.09)	0.20	(0.09)	**3.07**	(0.12)
	Northern	-1.09	(0.08)	1.13	(0.05)	-2.47	(0.14)	-1.51	(0.07)	-0.82	(0.10)	0.42	(0.09)	**2.90**	(0.14)	-2.43	(0.16)	0.53	(0.08)	**2.96**	(0.16)
	Southern	-1.36	(0.07)	1.18	(0.04)	-2.79	(0.06)	-1.82	(0.05)	-1.10	(0.08)	0.27	(0.12)	**3.06**	(0.12)	-2.84	(0.08)	0.44	(0.15)	**3.29**	(0.17)

* Caution is required when interpreting estimates because one or more PISA sampling standards were not met (see Reader's Guide, Annexes A2 and A4).
Notes: Values that are statistically significant are indicated in bold (see Annex A3).
PISA adjudicated region is shown in bold italic.
See Table I.B1.2.1 for national data.

Table I.B2.24. Socio-economic status and mathematics performance [1/2]

		Socio-economic gradient				Mathematics performance, by socio-economic status (ESCS[1])									
						National quarter of ESCS									
		Strength: Percentage of variance in mathematics performance explained by ESCS		Slope: Score-point difference in mathematics performance associated with a one-unit increase in ESCS		Bottom quarter of ESCS		Second quarter of ESCS		Third quarter of ESCS		Top quarter of ESCS		Top - Bottom quarter	
		%	S.E.	Score dif.	S.E.	Mean score	S.E.	Mean score	S.E.	Mean score	S.E.	Mean score	S.E.	Score dif.	S.E.
OECD	**Belgium**														
	Flemish community	18.8	(1.3)	**47**	(2.0)	447	(4.3)	484	(4.3)	521	(4.8)	558	(3.8)	**111**	(4.9)
	French community	24.6	(2.0)	**47**	(2.3)	421	(4.5)	450	(4.7)	494	(4.8)	539	(5.6)	**118**	(7.3)
	German-speaking community	13.8	(2.7)	**35**	(3.7)	450	(9.0)	470	(8.6)	499	(9.0)	526	(7.6)	**76**	(9.6)
	Canada														
	*Alberta**	12.8	(2.3)	**46**	(4.4)	457	(6.4)	490	(8.3)	520	(8.6)	550	(10.7)	**92**	(10.6)
	*British Columbia**	10.1	(1.8)	**40**	(3.5)	457	(7.1)	494	(5.6)	510	(5.5)	536	(6.5)	**80**	(8.7)
	*Manitoba**	8.4	(1.3)	**30**	(2.6)	439	(5.1)	462	(5.2)	483	(4.7)	502	(4.1)	**63**	(6.0)
	New Brunswick	10.9	(1.9)	**38**	(3.4)	435	(6.1)	457	(5.3)	476	(5.7)	511	(6.4)	**76**	(8.5)
	*Newfoundland and Labrador**	8.2	(2.6)	**31**	(4.7)	430	(9.8)	447	(8.0)	469	(8.3)	492	(7.6)	**62**	(11.0)
	*Nova Scotia**	9.0	(1.9)	**36**	(4.0)	439	(6.4)	454	(6.6)	481	(7.0)	516	(7.3)	**77**	(9.0)
	*Ontario**	8.4	(1.2)	**36**	(2.7)	463	(4.8)	487	(4.2)	507	(4.6)	534	(5.1)	**71**	(6.8)
	Prince Edward Island	11.6	(4.2)	**38**	(6.8)	440	(13.2)	474	(14.8)	505	(17.4)	518	(12.9)	**79**	(16.8)
	*Quebec**	11.9	(1.5)	**44**	(3.1)	473	(5.2)	503	(5.4)	531	(5.1)	555	(5.1)	**82**	(6.9)
	Saskatchewan	8.5	(1.5)	**32**	(2.9)	441	(5.4)	457	(4.4)	471	(5.2)	506	(5.1)	**65**	(6.7)
	Colombia														
	Bogotá	21.5	(4.4)	**32**	(3.8)	388	(5.9)	401	(5.5)	422	(6.9)	480	(11.8)	**91**	(13.5)
	Italy														
	Bolzano	8.3	(1.4)	**28**	(2.3)	452	(4.9)	480	(5.4)	482	(4.5)	515	(4.5)	**63**	(6.3)
	Trento	12.6	(1.6)	**35**	(2.3)	451	(4.0)	487	(3.6)	498	(4.0)	529	(3.5)	**78**	(5.3)
	Spain														
	Andalusia	12.8	(2.8)	**30**	(3.2)	422	(6.2)	440	(5.9)	469	(7.0)	500	(9.5)	**79**	(10.6)
	Aragon	13.2	(1.9)	**32**	(2.6)	448	(5.7)	477	(7.9)	503	(6.7)	526	(7.4)	**78**	(7.8)
	Asturias	17.7	(2.3)	**39**	(2.5)	450	(5.7)	478	(6.5)	512	(7.8)	544	(6.0)	**93**	(7.3)
	Balearic Islands	11.5	(1.7)	**29**	(2.3)	434	(5.5)	463	(5.1)	481	(5.9)	507	(6.3)	**73**	(7.6)
	Basque Country	15.9	(2.2)	**38**	(2.4)	437	(6.5)	472	(4.9)	506	(4.7)	519	(4.2)	**82**	(6.9)
	Canary Islands	11.8	(2.3)	**29**	(3.1)	413	(6.7)	434	(6.1)	456	(5.1)	490	(10.2)	**77**	(11.1)
	Cantabria	7.5	(1.8)	**25**	(3.1)	467	(6.3)	483	(5.7)	507	(6.5)	527	(6.9)	**60**	(8.7)
	Castile and Leon	11.1	(1.8)	**30**	(2.7)	463	(5.9)	494	(5.1)	509	(5.8)	539	(6.1)	**76**	(7.1)
	Castile-La Mancha	12.5	(1.9)	**28**	(2.1)	427	(6.0)	455	(5.0)	476	(5.5)	500	(5.3)	**73**	(7.1)
	Catalonia	15.4	(2.1)	**33**	(2.5)	426	(6.3)	458	(8.4)	477	(7.8)	521	(7.3)	**96**	(8.5)
	Ceuta	10.3	(3.9)	**25**	(5.0)	368	(11.7)	374	(12.7)	411	(11.8)	429	(10.6)	**61**	(14.6)
	Comunidad Valenciana	9.9	(2.2)	**27**	(2.8)	442	(5.9)	460	(6.1)	482	(5.7)	510	(6.9)	**69**	(8.9)
	Extremadura	13.1	(1.9)	**30**	(2.5)	437	(6.3)	450	(6.1)	477	(6.9)	514	(7.4)	**77**	(8.9)
	Galicia	9.3	(1.6)	**27**	(2.4)	454	(5.0)	477	(6.0)	495	(6.1)	521	(5.2)	**67**	(6.6)
	La Rioja	12.8	(2.0)	**30**	(2.6)	451	(5.5)	486	(6.5)	503	(6.7)	534	(6.3)	**83**	(7.8)
	Madrid	15.1	(2.1)	**35**	(2.9)	448	(6.5)	483	(5.9)	513	(6.3)	539	(3.7)	**91**	(7.6)
	Melilla	16.5	(3.9)	**26**	(3.6)	369	(9.5)	383	(14.0)	416	(14.8)	458	(13.4)	**89**	(15.0)
	Murcia	16.1	(2.0)	**30**	(1.9)	423	(7.0)	450	(5.9)	471	(6.2)	515	(5.7)	**93**	(7.4)
	Navarre	10.3	(1.8)	**28**	(2.7)	460	(5.9)	479	(6.2)	504	(5.7)	531	(5.9)	**71**	(7.1)
	United Kingdom														
	*England**	10.4	(1.5)	**36**	(2.9)	463	(4.1)	483	(4.2)	499	(3.8)	549	(6.0)	**86**	(7.3)
	*Northern Ireland**	11.9	(1.6)	**36**	(2.4)	441	(4.8)	460	(5.6)	489	(4.7)	522	(5.5)	**81**	(6.0)
	*Scotland**	15.9	(1.6)	**41**	(2.4)	428	(3.7)	460	(4.8)	480	(4.2)	526	(4.5)	**98**	(5.9)
	*Wales**	9.9	(1.5)	**33**	(2.7)	435	(4.7)	461	(6.2)	470	(4.9)	511	(5.5)	**76**	(6.4)

1. ESCS refers to the PISA index of economic, social and cultural status.

* Caution is required when interpreting estimates because one or more PISA sampling standards were not met (see Reader's Guide, Annexes A2 and A4).

Notes: Values that are statistically significant are indicated in bold (see Annex A3). PISA adjudicated region is shown in bold. See Table I.B1.4.3 for national data.

Table I.B2.24. Socio-economic status and mathematics performance [2/2]

		Socio-economic gradient				Mathematics performance, by socio-economic status (ESCS[1])									
						National quarter of ESCS									
		Strength: Percentage of variance in mathematics performance explained by ESCS		Slope: Score-point difference in mathematics performance associated with a one-unit increase in ESCS		Bottom quarter of ESCS		Second quarter of ESCS		Third quarter of ESCS		Top quarter of ESCS		Top - Bottom quarter	
		%	S.E.	Score dif.	S.E.	Mean score	S.E.	Mean score	S.E.	Mean score	S.E.	Mean score	S.E.	Score dif.	S.E.
Partners	**Brazil**														
	North	10.6	(3.4)	**20**	(3.6)	332	(5.7)	350	(4.9)	360	(7.1)	389	(10.0)	**57**	(10.4)
	Northeast	8.9	(2.1)	**19**	(2.5)	339	(2.9)	356	(3.3)	363	(4.2)	394	(8.2)	**55**	(7.7)
	South	16.0	(2.1)	**28**	(2.2)	362	(4.4)	378	(4.5)	396	(5.6)	442	(7.2)	**80**	(7.7)
	Southeast	16.2	(2.0)	**29**	(2.0)	356	(3.1)	374	(3.2)	390	(4.2)	440	(6.3)	**84**	(6.5)
	Middle-West	14.1	(3.3)	**28**	(4.0)	354	(6.5)	365	(7.7)	392	(9.0)	424	(12.7)	**71**	(12.3)
	Kazakhstan														
	Akmola region	1.6	(1.2)	**11**	(4.7)	408	(6.0)	414	(7.1)	421	(8.5)	434	(9.7)	**26**	(11.1)
	Aktobe region	1.5	(0.8)	**11**	(3.0)	431	(5.5)	429	(6.6)	436	(5.7)	451	(6.2)	**20**	(6.6)
	Almaty	8.1	(2.1)	**31**	(4.6)	424	(7.7)	439	(7.2)	463	(11.1)	485	(8.5)	**61**	(10.8)
	Almaty region	1.3	(1.1)	**10**	(4.1)	406	(6.7)	402	(5.7)	415	(6.7)	425	(7.6)	**19**	(8.9)
	Astana	10.3	(2.7)	**34**	(5.6)	416	(7.0)	438	(10.7)	455	(6.8)	488	(14.3)	**72**	(15.2)
	Atyrau region	5.2	(2.1)	**21**	(4.3)	384	(7.1)	400	(7.8)	402	(7.0)	434	(9.7)	**50**	(10.9)
	East-Kazakhstan region	6.4	(2.5)	**26**	(5.6)	407	(8.3)	421	(8.1)	437	(8.1)	464	(13.6)	**56**	(14.3)
	Karagandy region	2.8	(1.4)	**16**	(4.1)	407	(6.3)	415	(5.4)	426	(7.9)	436	(6.7)	**29**	(9.0)
	Kostanay region	3.5	(1.8)	**19**	(5.3)	424	(7.3)	426	(10.2)	450	(11.7)	460	(11.5)	**36**	(11.1)
	Kyzyl-Orda region	2.6	(1.1)	**13**	(2.6)	403	(7.1)	404	(5.7)	421	(7.3)	427	(7.4)	**24**	(7.3)
	North-Kazakhstan region	3.8	(1.7)	**19**	(4.4)	426	(6.7)	434	(5.9)	440	(7.3)	465	(9.1)	**38**	(8.8)
	Pavlodar region	5.2	(2.1)	**22**	(4.7)	404	(5.4)	424	(6.2)	425	(8.5)	454	(11.0)	**50**	(10.5)
	Shymkent	2.7	(1.2)	**15**	(3.0)	394	(6.2)	398	(8.5)	409	(6.6)	425	(6.9)	**31**	(8.2)
	Turkestan region	1.2	(1.4)	9	(5.8)	386	(5.9)	380	(8.4)	382	(9.0)	409	(14.3)	23	(14.8)
	West-Kazakhstan region	4.6	(1.6)	**18**	(3.1)	406	(4.5)	420	(6.5)	426	(6.0)	445	(6.1)	**39**	(6.9)
	Zhambyl region	1.4	(0.8)	**9**	(2.5)	426	(6.1)	428	(8.3)	437	(6.5)	443	(5.8)	**17**	(5.7)
	Mongolia														
	Central	17.5	(1.7)	**37**	(2.2)	403	(3.1)	425	(4.6)	447	(4.5)	496	(6.0)	**93**	(6.8)
	Khangai	13.1	(3.0)	**25**	(2.9)	382	(5.6)	391	(4.8)	416	(8.8)	447	(10.8)	**65**	(10.7)
	Western	9.7	(2.9)	**23**	(3.7)	357	(6.9)	368	(6.4)	380	(6.1)	420	(8.9)	**63**	(11.2)
	Viet Nam														
	Central	12.9	(3.0)	**27**	(3.4)	428	(10.1)	452	(7.9)	464	(6.0)	500	(10.1)	**72**	(12.5)
	Northern	12.7	(3.5)	**27**	(4.4)	445	(13.0)	473	(6.1)	480	(6.9)	523	(10.9)	**78**	(15.1)
	Southern	13.8	(3.8)	**27**	(4.0)	433	(7.5)	443	(7.3)	467	(9.3)	510	(12.8)	**77**	(13.9)

1. ESCS refers to the PISA index of economic, social and cultural status.

* Caution is required when interpreting estimates because one or more PISA sampling standards were not met (see Reader's Guide, Annexes A2 and A4).

Notes: Values that are statistically significant are indicated in bold (see Annex A3). PISA adjudicated region is shown in bold. See Table I.B1.4.3 for national data.

Table I.B2.36. Percentage of students with an immigrant background [1/2]

Based on students' reports

		Non-immigrant students		Immigrant students					
				All immigrant students		Second-generation immigrant students[1]		First-generation immigrant students[2]	
		%	S.E.	%	S.E.	%	S.E.	%	S.E.
OECD	**Belgium**								
	Flemish community	82.2	(1.1)	17.8	(1.1)	9.7	(0.7)	8.2	(0.6)
	French community	76.1	(2.0)	23.9	(2.0)	14.1	(1.3)	9.8	(1.0)
	German-speaking community	72.4	(1.5)	27.6	(1.5)	8.5	(1.1)	19.2	(1.4)
	Canada								
	*Alberta**	60.4	(3.7)	39.6	(3.7)	18.6	(2.0)	21.0	(2.1)
	*British Columbia**	63.6	(2.3)	36.4	(2.3)	17.2	(1.5)	19.1	(1.3)
	*Manitoba**	72.2	(1.4)	27.8	(1.4)	7.8	(0.6)	20.0	(1.2)
	New Brunswick	91.2	(0.8)	8.8	(0.8)	1.0	(0.3)	7.8	(0.7)
	*Newfoundland and Labrador**	95.5	(0.8)	4.5	(0.8)	0.7	(0.3)	3.9	(0.7)
	*Nova Scotia**	91.0	(1.1)	9.0	(1.1)	3.1	(0.6)	6.0	(0.9)
	*Ontario**	58.0	(2.2)	42.0	(2.2)	26.2	(1.8)	15.8	(1.0)
	Prince Edward Island	88.2	(2.0)	11.8	(2.0)	1.0	(0.7)	10.8	(1.9)
	*Quebec**	72.2	(2.5)	27.8	(2.5)	14.0	(1.5)	13.8	(1.3)
	Saskatchewan	78.4	(1.0)	21.6	(1.0)	5.1	(0.6)	16.5	(0.9)
	Colombia								
	Bogotá	97.0	(0.5)	3.0	(0.5)	0.4	(0.1)	2.6	(0.4)
	Italy								
	Bolzano	87.7	(0.7)	12.3	(0.7)	7.6	(0.5)	4.7	(0.5)
	Trento	84.7	(1.0)	15.3	(1.0)	11.4	(1.0)	4.0	(0.4)
	Spain								
	Andalusia	91.2	(1.3)	8.8	(1.3)	5.0	(0.9)	3.8	(0.6)
	Aragon	82.6	(1.8)	17.4	(1.8)	11.2	(1.3)	6.1	(0.9)
	Asturias	92.4	(0.9)	7.6	(0.9)	3.0	(0.4)	4.6	(0.6)
	Balearic Islands	78.6	(1.9)	21.4	(1.9)	13.3	(1.5)	8.1	(0.9)
	Basque Country	87.9	(1.7)	12.1	(1.7)	5.3	(0.7)	6.8	(1.2)
	Canary Islands	87.1	(2.0)	12.9	(2.0)	6.8	(1.2)	6.1	(0.9)
	Cantabria	90.8	(1.1)	9.2	(1.1)	4.2	(0.5)	5.1	(0.9)
	Castile and Leon	91.6	(0.8)	8.4	(0.8)	5.5	(0.6)	2.9	(0.5)
	Castile-La Mancha	84.7	(1.9)	15.3	(1.9)	9.8	(1.4)	5.5	(0.9)
	Catalonia	76.1	(2.8)	23.9	(2.8)	14.4	(1.6)	9.4	(1.4)
	Ceuta	91.1	(1.9)	8.9	(1.9)	8.7	(1.9)	0.2	(0.2)
	Comunidad Valenciana	82.9	(2.0)	17.1	(2.0)	9.2	(1.0)	7.9	(1.4)
	Extremadura	96.1	(0.5)	3.9	(0.5)	1.8	(0.3)	2.1	(0.4)
	Galicia	92.7	(1.1)	7.3	(1.1)	3.0	(0.6)	4.3	(0.7)
	La Rioja	81.2	(1.1)	18.8	(1.1)	11.8	(1.0)	7.0	(0.8)
	Madrid	80.4	(1.6)	19.6	(1.6)	11.4	(1.0)	8.2	(1.2)
	Melilla	73.6	(3.0)	26.4	(3.0)	23.0	(3.0)	3.4	(1.4)
	Murcia	81.4	(1.9)	18.6	(1.9)	13.0	(1.5)	5.5	(0.8)
	Navarre	79.8	(2.0)	20.2	(2.0)	11.8	(1.3)	8.4	(1.1)
	United Kingdom								
	*England**	78.2	(1.3)	21.8	(1.3)	12.4	(0.9)	9.4	(0.8)
	*Northern Ireland**	87.7	(0.9)	12.3	(0.9)	3.7	(0.5)	8.6	(0.7)
	*Scotland**	88.0	(1.0)	12.0	(1.0)	4.8	(0.4)	7.2	(0.7)
	*Wales**	89.6	(1.4)	10.4	(1.4)	5.9	(0.9)	4.4	(0.8)

* Caution is required when interpreting estimates because one or more PISA sampling standards were not met (see Reader's Guide, Annexes A2 and A4).

Notes: PISA adjudicated region is shown in bold.

See Table I.B1.7.1 for national data.

Table I.B2.36. Percentage of students with an immigrant background [2/2]

Based on students' reports

		Non-immigrant students		Immigrant students					
				All immigrant students		Second-generation immigrant students[1]		First-generation immigrant students[2]	
		%	S.E.	%	S.E.	%	S.E.	%	S.E.
Partners	**Brazil**								
	North	99.5	(0.2)	0.5	(0.2)	0.1	(0.1)	0.4	(0.2)
	Northeast	99.8	(0.1)	0.2	(0.1)	0.1	(0.1)	0.1	(0.1)
	South	99.0	(0.4)	1.0	(0.4)	0.4	(0.2)	0.5	(0.2)
	Southeast	99.5	(0.1)	0.5	(0.1)	0.3	(0.1)	0.2	(0.1)
	Middle-West	99.0	(0.4)	1.0	(0.4)	0.7	(0.3)	0.3	(0.2)
	Kazakhstan								
	Akmola region	92.9	(1.6)	7.1	(1.6)	5.3	(1.4)	1.8	(0.4)
	Aktobe region	96.8	(0.9)	3.2	(0.9)	2.0	(0.5)	1.2	(0.5)
	Almaty	94.2	(1.3)	5.8	(1.3)	3.8	(0.9)	2.0	(0.6)
	Almaty region	84.9	(2.2)	15.1	(2.2)	7.1	(0.9)	8.0	(1.5)
	Astana	95.1	(0.7)	4.9	(0.7)	2.5	(0.5)	2.5	(0.5)
	Atyrau region	99.1	(0.2)	0.9	(0.2)	0.5	(0.2)	0.4	(0.2)
	East-Kazakhstan region	98.3	(0.5)	1.7	(0.5)	0.8	(0.3)	0.9	(0.4)
	Karagandy region	90.0	(3.0)	10.0	(3.0)	7.4	(2.4)	2.6	(1.0)
	Kostanay region	92.9	(2.7)	7.1	(2.7)	4.0	(1.2)	3.1	(1.6)
	Kyzyl-Orda region	98.1	(0.6)	1.9	(0.6)	1.9	(0.6)	0.0	c
	North-Kazakhstan region	95.9	(0.9)	4.1	(0.9)	2.5	(0.5)	1.6	(0.7)
	Pavlodar region	96.1	(0.7)	3.9	(0.7)	2.7	(0.5)	1.2	(0.5)
	Shymkent	92.9	(1.6)	7.1	(1.6)	2.7	(0.7)	4.4	(1.1)
	Turkestan region	93.7	(1.6)	6.3	(1.6)	3.5	(1.0)	2.8	(0.7)
	West-Kazakhstan region	98.3	(0.4)	1.7	(0.4)	1.1	(0.2)	0.6	(0.4)
	Zhambyl region	91.7	(2.5)	8.3	(2.5)	4.8	(1.1)	3.5	(1.5)
	Mongolia								
	Central	99.8	(0.1)	0.2	(0.1)	0.2	(0.1)	0.0	(0.0)
	Khangai	99.8	(0.1)	0.2	(0.1)	0.1	(0.1)	0.1	(0.1)
	Western	98.8	(0.5)	1.2	(0.5)	0.4	(0.3)	0.7	(0.2)
	Viet Nam								
	Central	99.9	(0.1)	0.1	(0.1)	0.0	c	0.1	(0.1)
	Northern	99.9	(0.1)	0.1	(0.1)	0.0	(0.0)	0.1	(0.1)
	Southern	99.9	(0.1)	0.1	(0.1)	0.1	(0.1)	0.0	c

* Caution is required when interpreting estimates because one or more PISA sampling standards were not met (see Reader's Guide, Annexes A2 and A4).

Notes: PISA adjudicated region is shown in bold.

See Table I.B1.7.1 for national data.

Table I.B2.39. Mathematics performance of students with an immigrant background [1/2]

		Mathematics performance											
		All students		Non-immigrant students		Immigrant students						Difference between immigrant and non-immigrant students	
						All immigrant students		Second-generation immigrant students[1]		First-generation immigrant students[2]			
		Mean score	S.E.	Mean score	S.E.	Mean score	S.E.	Mean score	S.E.	Mean score	S.E.	Score dif.	S.E.
OECD	**Belgium**												
	Flemish community	501	(3.0)	514	(3.2)	454	(5.0)	461	(5.7)	445	(7.0)	**-61**	(5.6)
	French community	474	(3.1)	489	(3.4)	439	(5.3)	444	(5.7)	432	(8.2)	**-50**	(5.7)
	German-speaking community	483	(5.2)	499	(5.7)	447	(7.0)	436	(11.8)	452	(8.0)	**-52**	(6.8)
	Canada												
	*Alberta**	504	(5.7)	500	(5.4)	513	(10.8)	527	(13.2)	501	(11.1)	13	(10.8)
	*British Columbia**	496	(4.4)	491	(5.1)	519	(5.6)	520	(8.0)	519	(6.6)	**28**	(6.1)
	*Manitoba**	470	(2.7)	472	(3.5)	477	(4.6)	473	(8.4)	478	(5.9)	5	(5.9)
	New Brunswick	468	(3.1)	469	(3.4)	498	(12.6)	c	c	497	(13.7)	**29**	(13.2)
	*Newfoundland and Labrador**	459	(5.5)	460	(5.6)	462	(20.8)	c	c	458	(21.7)	2	(20.1)
	*Nova Scotia**	470	(3.6)	471	(3.9)	506	(13.0)	510	(18.8)	504	(17.1)	**35**	(12.9)
	*Ontario**	495	(3.0)	492	(3.2)	511	(4.6)	519	(5.0)	498	(6.5)	**19**	(5.0)
	Prince Edward Island	478	(6.6)	482	(7.9)	c	c	c	c	c	c	c	c
	*Quebec**	514	(3.9)	524	(3.8)	500	(5.7)	507	(7.1)	493	(6.8)	**-24**	(5.5)
	Saskatchewan	468	(2.6)	470	(3.0)	475	(5.1)	501	(12.7)	467	(5.7)	5	(5.6)
	Colombia												
	Bogotá	423	(5.0)	424	(4.8)	393	(13.4)	c	c	395	(14.4)	**-31**	(11.4)
	Italy												
	Bolzano	482	(3.1)	490	(3.5)	434	(5.8)	441	(8.0)	423	(7.9)	**-56**	(6.8)
	Trento	491	(1.9)	499	(2.1)	456	(5.6)	465	(6.6)	430	(8.8)	**-44**	(6.1)
	Spain												
	Andalusia	457	(4.9)	459	(4.8)	455	(10.0)	467	(14.9)	439	(10.5)	-4	(8.6)
	Aragon	487	(4.6)	499	(4.8)	445	(7.9)	454	(6.9)	429	(13.2)	**-54**	(9.1)
	Asturias	495	(4.4)	501	(4.5)	442	(9.9)	462	(12.8)	429	(12.9)	**-59**	(9.9)
	Balearic Islands	471	(3.8)	481	(4.6)	444	(5.6)	450	(8.5)	435	(7.9)	**-37**	(6.8)
	Basque Country	482	(4.0)	493	(3.4)	423	(7.5)	433	(7.6)	416	(10.5)	**-70**	(7.4)
	Canary Islands	447	(4.5)	450	(4.9)	446	(9.8)	457	(9.0)	433	(14.1)	-4	(8.7)
	Cantabria	495	(4.6)	499	(5.0)	468	(8.3)	480	(11.8)	458	(10.5)	**-31**	(9.1)
	Castile and Leon	499	(3.8)	506	(3.8)	459	(9.4)	472	(10.5)	435	(14.8)	**-47**	(10.5)
	Castile-La Mancha	464	(3.4)	472	(4.0)	432	(6.8)	440	(8.3)	419	(9.4)	**-40**	(7.4)
	Catalonia	469	(5.8)	484	(5.3)	441	(6.5)	451	(7.3)	426	(9.5)	**-43**	(5.7)
	Ceuta	395	(6.3)	401	(6.7)	c	c	c	c	c	c	c	c
	Comunidad Valenciana	473	(3.9)	479	(4.4)	457	(5.9)	471	(7.1)	441	(10.3)	**-22**	(7.0)
	Extremadura	469	(4.9)	472	(5.1)	436	(11.5)	c	c	456	(15.8)	**-36**	(12.1)
	Galicia	486	(3.7)	491	(3.7)	444	(6.4)	463	(10.5)	432	(9.8)	**-47**	(7.0)
	La Rioja	493	(4.1)	504	(4.7)	455	(6.3)	470	(8.0)	431	(10.4)	**-49**	(7.1)
	Madrid	494	(3.6)	504	(3.6)	462	(5.5)	477	(5.4)	442	(9.5)	**-42**	(6.0)
	Melilla	404	(6.0)	422	(7.6)	378	(10.5)	380	(10.1)	c	c	**-44**	(11.9)
	Murcia	463	(4.4)	476	(4.5)	424	(6.7)	435	(7.2)	398	(10.4)	**-53**	(6.5)
	Navarre	492	(4.2)	503	(4.8)	463	(5.7)	473	(6.9)	449	(9.3)	**-40**	(7.3)
	United Kingdom												
	*England**	492	(2.6)	499	(2.9)	498	(6.2)	509	(6.7)	485	(7.7)	-1	(6.2)
	*Northern Ireland**	475	(3.0)	481	(3.6)	463	(6.1)	480	(10.0)	455	(7.8)	**-18**	(6.4)
	*Scotland**	471	(2.6)	472	(2.8)	481	(5.6)	492	(8.2)	473	(8.2)	8	(5.8)
	*Wales**	466	(3.2)	468	(3.4)	481	(10.5)	481	(11.1)	481	(13.0)	13	(10.8)

* Caution is required when interpreting estimates because one or more PISA sampling standards were not met (see Reader's Guide, Annexes A2 and A4).

Notes: Values that are statistically significant are indicated in bold (see Annex A3).

PISA adjudicated region is shown in bold.

See Table I.B1.7.17 for national data.

Table I.B2.39. Mathematics performance of students with an immigrant background [2/2]

		Mathematics performance											
		All students		Non-immigrant students		Immigrant students						Difference between immigrant and non-immigrant students	
						All immigrant students		Second-generation immigrant students[1]		First-generation immigrant students[2]			
		Mean score	S.E.	Mean score	S.E.	Mean score	S.E.	Mean score	S.E.	Mean score	S.E.	Score dif.	S.E.
Partners	**Brazil**												
	North	357	(4.7)	362	(4.6)	c	c	c	c	c	c	c	c
	Northeast	363	(3.2)	368	(3.5)	c	c	c	c	c	c	c	c
	South	394	(3.5)	397	(3.8)	c	c	c	c	c	c	c	c
	Southeast	388	(2.8)	395	(2.9)	c	c	c	c	c	c	c	c
	Middle-West	384	(6.9)	389	(6.8)	c	c	c	c	c	c	c	c
	Kazakhstan												
	Akmola region	419	(5.6)	420	(6.0)	425	(8.5)	427	(8.2)	c	c	6	(9.3)
	Aktobe region	437	(4.1)	437	(4.2)	441	(16.3)	c	c	c	c	5	(17.0)
	Almaty	453	(6.5)	454	(6.8)	439	(9.2)	432	(10.4)	c	c	-15	(10.2)
	Almaty region	412	(4.6)	412	(4.7)	415	(8.1)	412	(14.5)	418	(8.8)	3	(7.8)
	Astana	449	(7.3)	450	(7.6)	452	(13.3)	448	(16.1)	c	c	2	(11.9)
	Atyrau region	405	(6.0)	405	(5.9)	c	c	c	c	c	c	c	c
	East-Kazakhstan region	432	(7.3)	433	(7.4)	c	c	c	c	c	c	c	c
	Karagandy region	421	(4.3)	423	(4.4)	413	(10.5)	412	(10.2)	c	c	-10	(10.5)
	Kostanay region	440	(8.3)	442	(8.8)	421	(13.6)	428	(17.5)	411	(17.7)	-21	(15.7)
	Kyzyl-Orda region	414	(4.7)	414	(4.7)	c	c	c	c	m	m	c	c
	North-Kazakhstan region	441	(5.2)	442	(5.1)	436	(14.7)	c	c	c	c	-6	(13.4)
	Pavlodar region	426	(4.9)	427	(5.0)	410	(12.2)	c	c	c	c	-18	(11.4)
	Shymkent	407	(4.8)	407	(5.2)	404	(8.1)	c	c	413	(12.8)	-3	(10.0)
	Turkestan region	389	(7.1)	390	(7.1)	384	(11.8)	363	(13.9)	c	c	-7	(10.2)
	West-Kazakhstan region	424	(4.0)	424	(3.9)	c	c	c	c	c	c	c	c
	Zhambyl region	433	(5.6)	433	(5.7)	437	(11.6)	436	(12.0)	438	(14.3)	3	(11.0)
	Mongolia												
	Central	443	(3.3)	444	(3.2)	c	c	c	c	c	c	c	c
	Khangai	409	(6.0)	411	(6.0)	c	c	c	c	c	c	c	c
	Western	381	(4.9)	387	(4.2)	c	c	c	c	c	c	c	c
	Viet Nam												
	Central	461	(6.3)	463	(6.2)	c	c	m	m	c	c	c	c
	Northern	480	(6.7)	482	(6.4)	c	c	c	c	c	c	c	c
	Southern	463	(6.8)	464	(6.7)	c	c	c	c	m	m	c	c

* Caution is required when interpreting estimates because one or more PISA sampling standards were not met (see Reader's Guide, Annexes A2 and A4).
Notes: Values that are statistically significant are indicated in bold (see Annex A3).
PISA adjudicated region is shown in bold.
See Table I.B1.7.17 for national data.

Table I.B2.45. Results for regions within countries

	Table I.B2.1	Mean score and variation in mathematics performance
	Table I.B2.2	Mean score and variation in reading performance
	Table I.B2.3	Mean score and variation in science performance
WEB	Table I.B2.4	Mean score and variation in student performance on the mathematics process subscale formulating
WEB	Table I.B2.5	Mean score and variation in student performance on the mathematics process subscale employing
WEB	Table I.B2.6	Mean score and variation in student performance on the mathematics process subscale interpreting
WEB	Table I.B2.7	Mean score and variation in student performance on the mathematics process subscale reasoning
WEB	Table I.B2.8	Mean score and variation in student performance on the mathematics content subscale change and relationships
WEB	Table I.B2.9	Mean score and variation in student performance on the mathematics content subscale quantity
WEB	Table I.B2.10	Mean score and variation in student performance on the mathematics content subscale space and shape
WEB	Table I.B2.11	Mean score and variation in student performance on the mathematics content subscale uncertainty and data
WEB	Table I.B2.12	Percentage of students at each proficiency level in mathematics
WEB	Table I.B2.13	Percentage of students at each proficiency level in reading
WEB	Table I.B2.14	Percentage of students at each proficiency level in science
WEB	Table I.B2.15	Percentage of students at each proficiency level on the mathematics process subscale formulating
WEB	Table I.B2.16	Percentage of students at each proficiency level on the mathematics process subscale employing
WEB	Table I.B2.17	Percentage of students at each proficiency level on the mathematics process subscale reasoning
WEB	Table I.B2.18	Percentage of students at each proficiency level on the mathematics process subscale interpreting
WEB	Table I.B2.19	Percentage of students at each proficiency level on the mathematics content subscale change and relationships
WEB	Table I.B2.20	Percentage of students at each proficiency level on the mathematics content subscale quantity
WEB	Table I.B2.21	Percentage of students at each proficiency level on the mathematics content subscale space and shape
WEB	Table I.B2.22	Percentage of students at each proficiency level on the mathematics content subscale uncertainty and data
	Table I.B2.23	Students' socio-economic status
	Table I.B2.24	Socio-economic status and mathematics performance
WEB	Table I.B2.25	Socio-economic status and reading performance
WEB	Table I.B2.26	Socio-economic status and science performance
WEB	Table I.B2.27	Low and top performance in mathematics, by students' socio-economic status
WEB	Table I.B2.28	Low and top performance in reading, by students' socio-economic status
WEB	Table I.B2.29	Low and top performance in science, by students' socio-economic status
WEB	Table I.B2.30	Mathematics performance, by gender
WEB	Table I.B2.31	Reading performance, by gender
WEB	Table I.B2.32	Science performance, by gender
WEB	Table I.B2.33	Low and top performance in mathematics, by gender
WEB	Table I.B2.34	Low and top performance in reading, by gender
WEB	Table I.B2.35	Low and top performance in science, by gender
	Table I.B2.36	Percentage of students with an immigrant background
WEB	Table I.B2.37	Socio-economic status, by immigrant background
WEB	Table I.B2.38	Language spoken at home by immigrant background
	Table I.B2.39	Mathematics performance of students with an immigrant background
WEB	Table I.B2.40	Reading performance of students with an immigrant background
WEB	Table I.B2.41	Science performance of students with an immigrant background
WEB	Table I.B2.42	Low performance in mathematics by immigrant background
WEB	Table I.B2.43	Low performance in reading by immigrant background
WEB	Table I.B2.44	Low performance in science by immigrant background

StatLink https://stat.link/ax46rt

Annex B3. PISA 2022 system-level indicators

System-level data that are not derived from the PISA 2022 student or school questionnaire are extracted from the OECD's annual publication Education at a Glance for those countries and economies that participate in that periodic data collection. For other countries and economies, a special system-level data collection was conducted in collaboration with PISA Governing Board members and National Project Managers.

For further information see: System-level data collection for PISA 2022: Sources, comments and technical notes at https://webfs.oecd.org/pisa2022/PISA2022IR_AnnexB3_TechnicalDocument_v2.docx.

The following tables are available on line. Please click on the StatLink below to access them.

Table I.B3.1 PISA 2022 system-level data collection

Table	Title	Topic
Table B3.1.1	Structure of compulsory education, theoretical age and theoretical duration of each cycle of education (2022)	Information on education system applied to the PISA 2022 participating students
Table B3.1.2	Theoretical age and theoretical duration of each cycle of education (2022)	
Table B3.1.3	Date of the first school day in public institutions on the school year of PISA 2022 administration (2021 or 2022)	
Table B3.1.4	Age of stratification and educational tracks (2022)	
Table B3.1.5	List of educational tracks (2022)	
Table B3.2.1	Gross domestic product (GDP) per capita (2021)	GDP per capita and total education expenditure
Table B3.2.2	Total education expenditure on educational institutions per student (2019)	
Table B3.3.1	Tracking students' absence during the pandemic in lower secondary education (2020 to 2022)	Impact of COVID-19 on education system in lower secondary education
Table B3.3.2	Policies to bring in digitalisation into education in lower secondary education (2022)	
Table B3.3.3	Assessment of impact of COVID-19 crisis on lower secondary education (2021 to 2022)	
Table B3.3.4	Changes in education policies/regulations to mitigate the impact of learning loss/disruption and student well-being in lower secondary education (2021 and 2022)	
Table B3.4.1	Regulations regarding grade repetition in primary education (2022)	Regulations on grade repetition
Table B3.4.2	Regulations regarding grade repetition in lower secondary general programmes (2022)	
Table B3.4.3	Regulations regarding grade repetition in lower secondary vocational programmes (2022)	
Table B3.5.1	Regulations regarding teacher allocation in socio-economically disadvantage public schools at lower secondary level (2022)	Regulations regarding teacher allocation in socio-economically disadvantaged public schools
Table B3.5.2	Regulations regarding teacher allocation in socio-economically disadvantage public schools at upper secondary level (2022)	
Table B3.6.1	Regulations regarding home-schooling in compulsory secondary general programmes (2022)	Regulations on home-schooling

StatLink https://stat.link/q39f6p

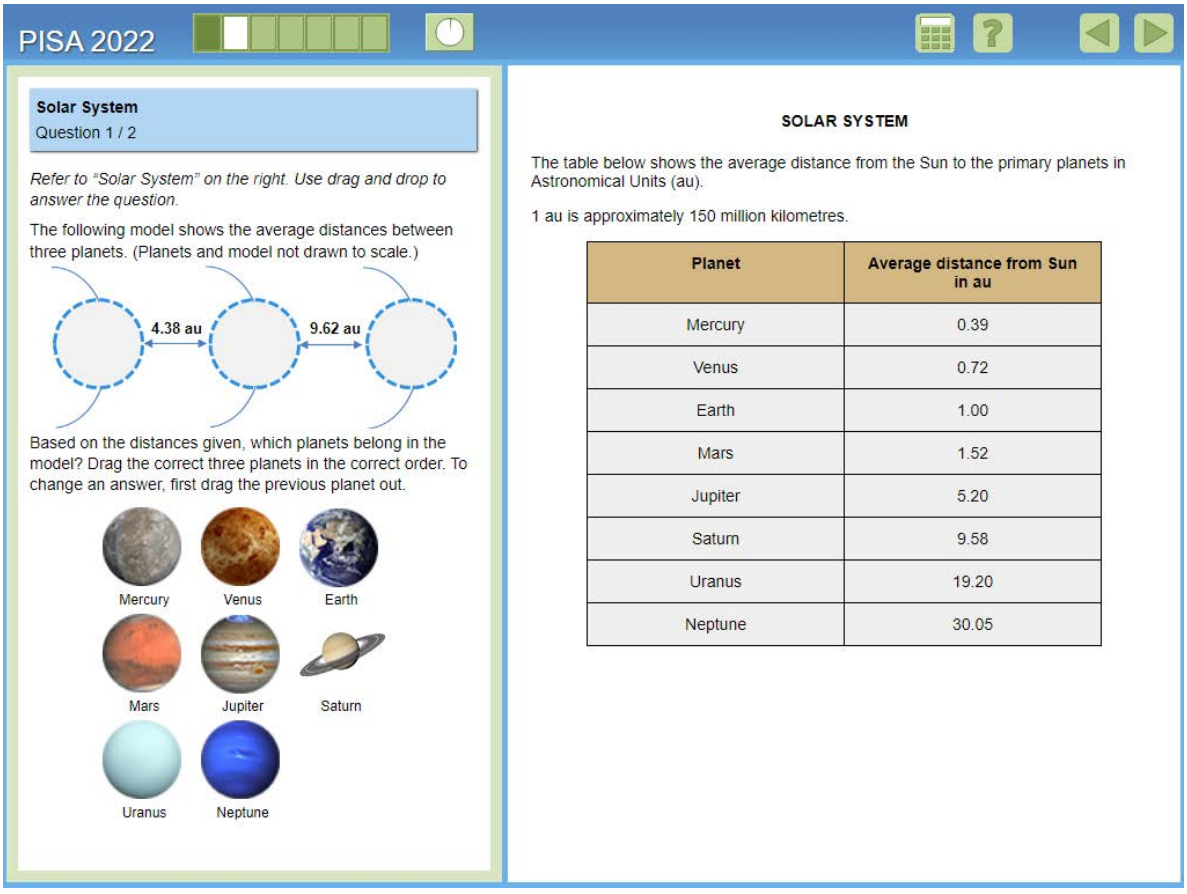
Annex C. Released items from the PISA 2022 computer-based mathematics assessment

Four new mathematics units were released from the main survey of the PISA 2022 assessment; the ten items from these four units are presented in this annex.

Screenshots of the interface used in PISA 2022 are shown to give readers an understanding of how students interacted with the assessment and its items. Interactive versions of all of these units are also available at www.oecd.org/pisa.

Unit CMA123 – Solar System

Solar system, released item #1 (CMA123Q01)

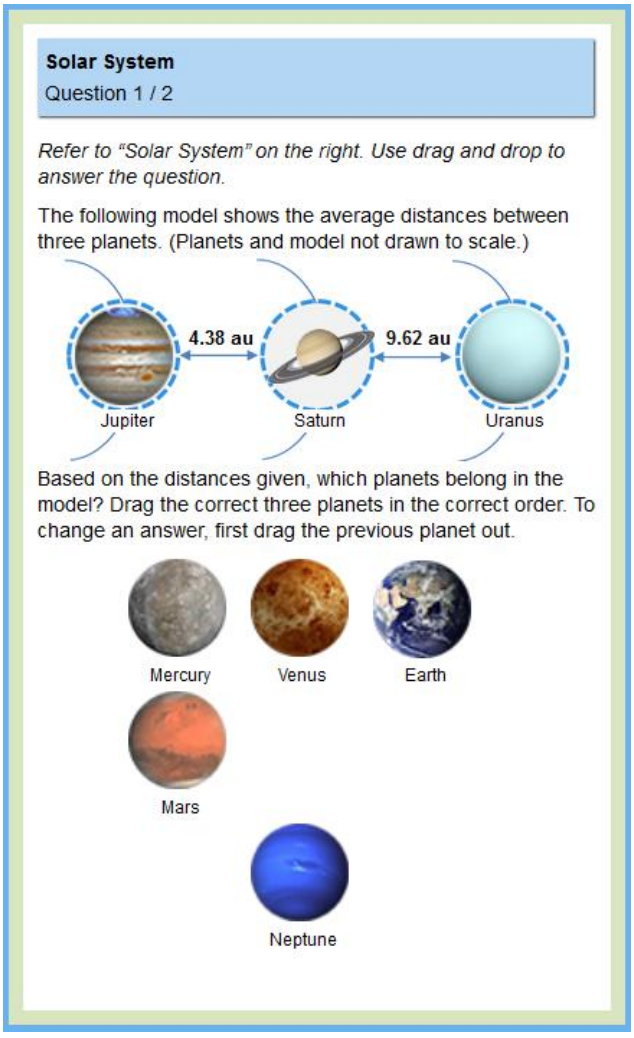


This is the first item in the unit *Solar System*. There is no introduction screen for this unit. For this task, students need to determine which three planets have the average distances, in Astronomical Units (au), between them that are

shown in the model. To do this, students need to use the table in the stimulus that gives each planet's average distance from the Sun, in au. The correct answer, from left to right, is Jupiter, Saturn, Uranus.

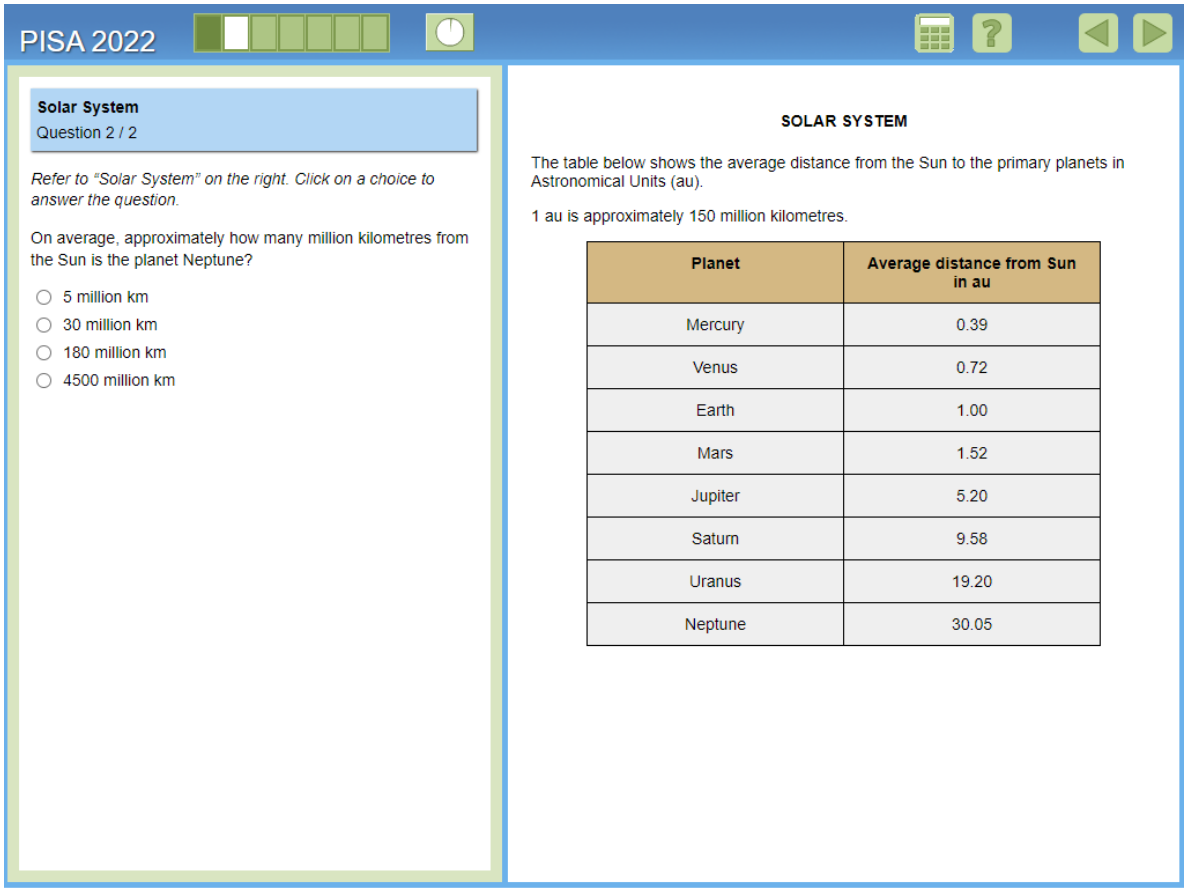
To respond to the question, students have to drag-and-drop the planets into the model (see below for an image of the planets placed in the model). There is no introduction or practice screen before this item but instructions for how to respond and change a response are given explicitly in the question stem. A full-credit response was given for correctly placing all three planets, and partial credit was given for correctly placing any two planets. This is a moderately difficult item with both full and partial credit being at Level 3 on the proficiency scale.

Below is an image of what the question stem and response area look like after the student has dragged-and-dropped the planets into their respective locations in the model.



Unit Name – Item #	Solar System – CMA123Q01
Content Area	Quantity
Process	Interpret/Evaluate
Context	Scientific
Item Format	Complex Multiple Choice - Computer Scored
Answers	Full Credit: All three planets are correctly placed (from left to right: Jupiter, Saturn, Uranus) Partial Credit: Any two planets are correctly placed (other planet is incorrect or missing)
Proficiency Levels	3 (full credit) 3 (partial credit)

Solar system, released item #2 (CMA123Q02)

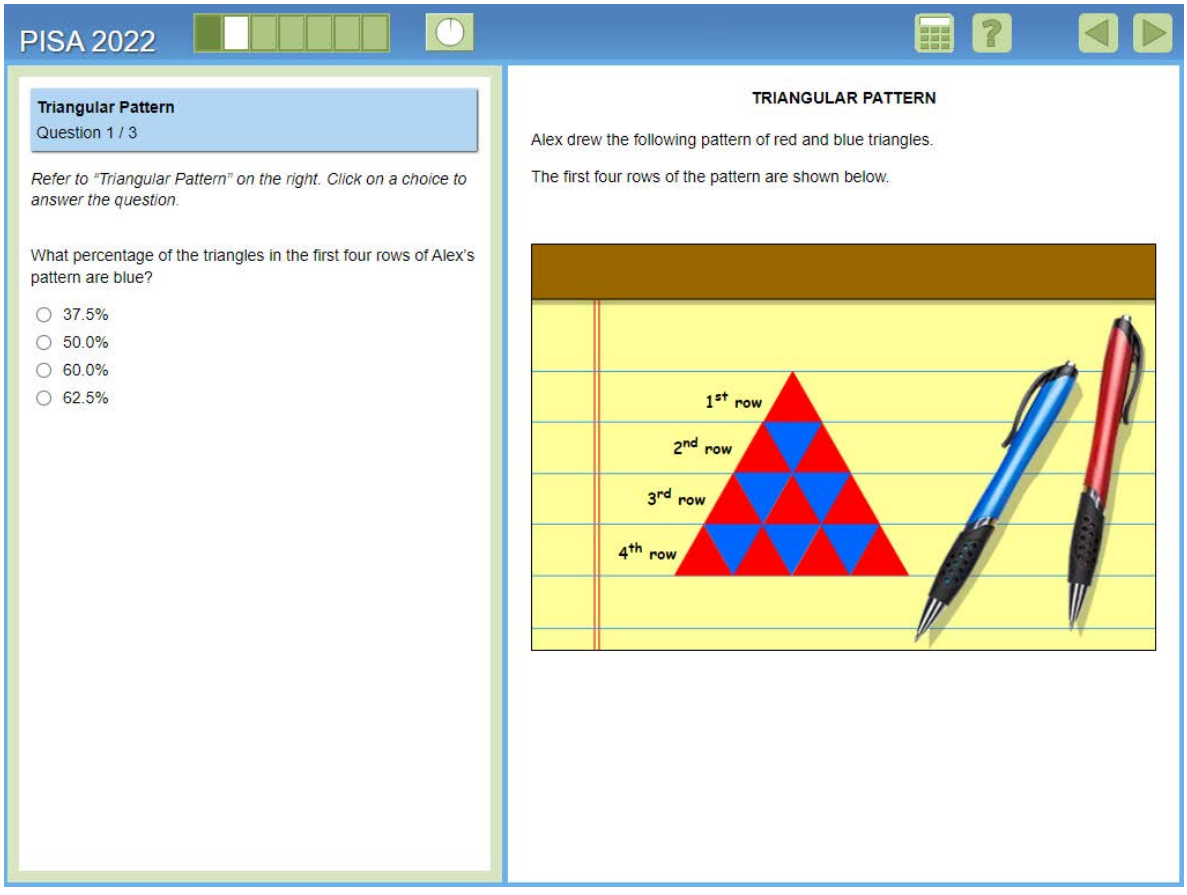


For the second item in this unit, students have to determine approximately how many million kilometres the planet Neptune is from the Sun, a process that requires converting Astronomical Units to millions of kilometres. From the stimulus, students are given the conversion that 1 au is approximately 150 million kilometres, and they can read from the table that Neptune has an average distance from the sun of 30.05 au. To determine Neptune's approximate distance in million kilometres, students need to multiply 30.05 times 150. This gives a result of 4,507.5, which rounds to 4500 (million km). This is a Level 2 (easier) item for students that only requires employing a process for converting units based on the given information.

Unit Name – Item #	Solar System – CMA123Q02
Content Area	Quantity
Process	Employ
Context	Scientific
Item Format	Simple Multiple Choice - Computer Scored
Answer	4500 million km
Proficiency Level	2

Unit CMA150 – Triangular Pattern

Triangular Pattern, released item #1 (CMA150Q01)

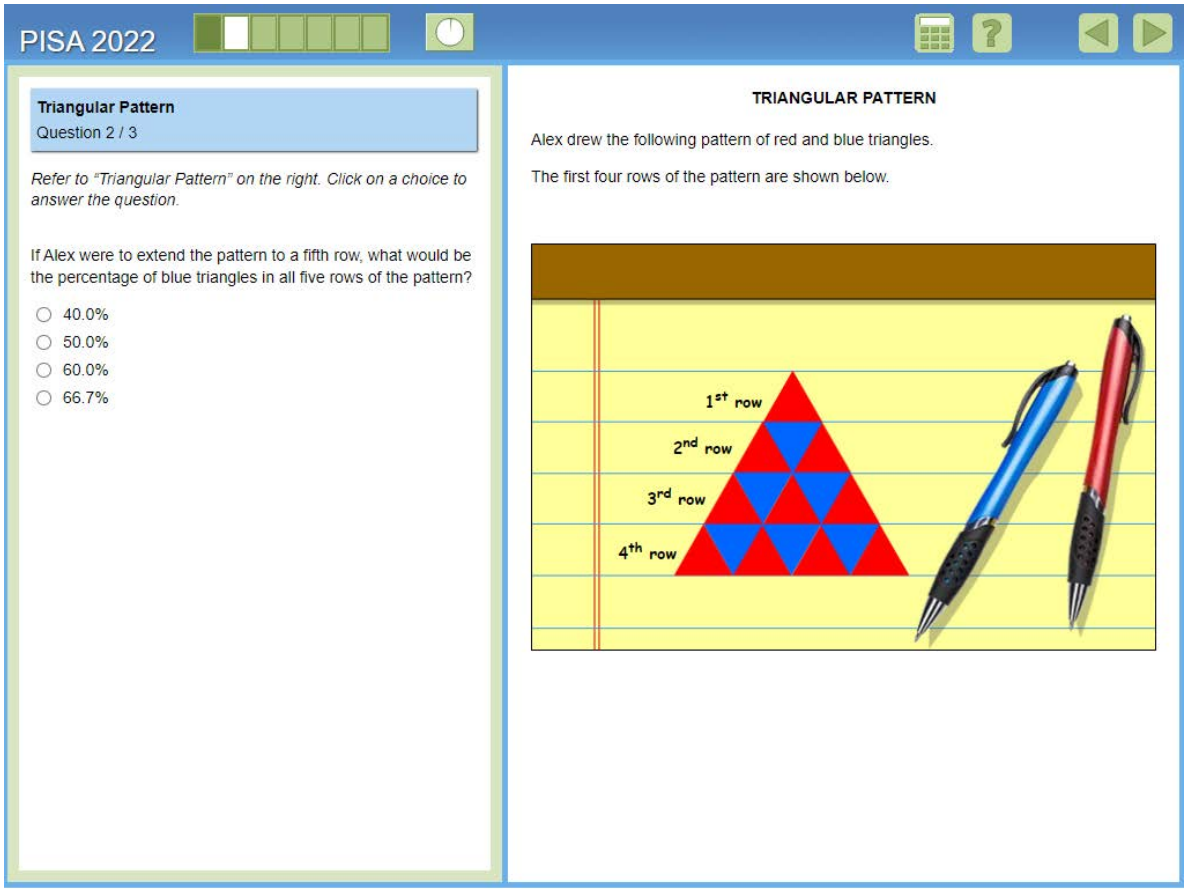


This is the first item in the unit *Triangular Pattern* and there is no introduction screen. For this unit, students are presented with a series of items related to a drawing a person has made of rows using alternating red and blue triangles. The stimulus shows the first four rows of the pattern, and this same image is repeated in the stimulus of all three items in the unit.

For the first item, students are asked to compute the percentage of blue triangles shown in the first four rows of the pattern. There are six blue triangles and 16 total triangles, so the percentage of blue triangles is 37.5% (6 ÷ 16 = 0.375). This is an easy item (Level 1a) and is intended to get students thinking about the pattern by employing a simple algorithm with all information shown.

Unit Name – Item #	Triangular Pattern – CMA150Q01
Content Area	Quantity
Process	Employ
Context	Scientific
Item Format	Simple Multiple Choice - Computer Scored
Answer	37.5%
Proficiency Level	1a

Triangular Pattern, released item #2 (CMA150Q02)

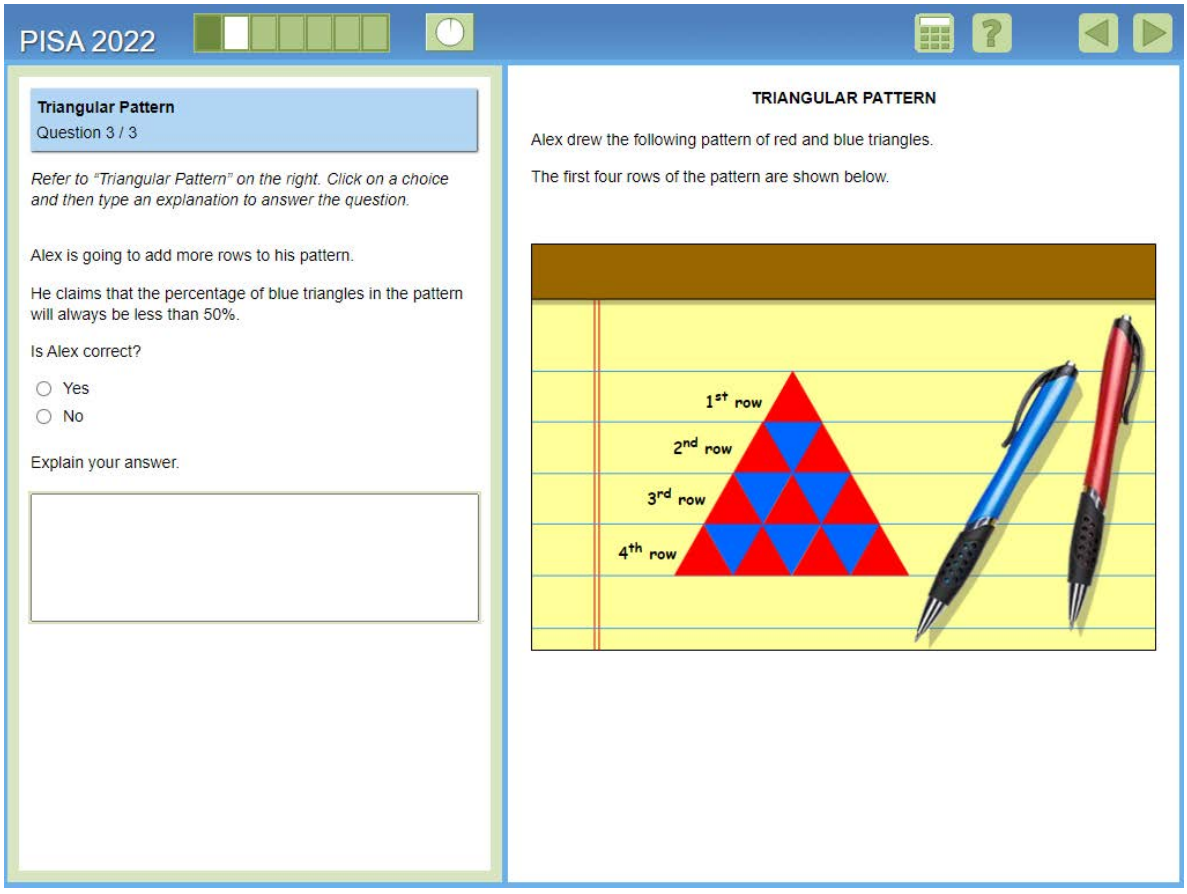


The second item in the unit builds off the first item by again asking students to compute the percentage of blue triangles, but this time it is based on five rows of the pattern. Since the fifth row is not shown, students have to extend the pattern by one row to determine new values for the number of blue triangles and the total number of triangles. With five rows, the percentage of blue triangles is 40.0% (10 blue triangles ÷ 25 total triangles).

This item is intended to be easy and to get students thinking about extending the pattern beyond what is shown, but not extending the pattern so that it requires generalising. This is a Level 2 item, so it is slightly more difficult than the first item in the unit, possibly because it requires working with a part of the pattern that is not shown but is still an overall easy item for students.

Unit Name – Item #	Triangular Pattern – CMA150Q02
Content Area	Change and relationships
Process	Formulate
Context	Scientific
Item Format	Simple Multiple Choice - Computer Scored
Answer	40.0%
Proficiency Level	2

Triangular Pattern, released item #3 (CMA150Q03)



This is the final item in this unit, and it builds off the previous two items to now generalise with the pattern. The task for the students is to evaluate a claim that the percentage of blue triangles in the pattern will always be less than 50% as more rows are added. Students have to select either "Yes" or "No" to indicate if the claim is or is not true, but then they also have to provide an explanation to support their selection. This is a reasoning item that requires students to analyse the pattern to recognise a relationship between the number of red and the number of blue triangles in each row, and then use that relationship to support their selection.

The correct selection is "Yes," that the claim is true, and an acceptable explanation recognises that the number of red triangles in each row will always be greater than the number of blue triangles in each row. Note that students can phrase their response in terms of either the number of blue triangles being fewer or the number of red triangles being greater, as long as there is some language indicating that this relationship is true for every row. Partial-credit responses to this item generally either focus on just the first row, which contains only a red triangle, or do not clearly communicate that the relationship between the number of each color triangle applies to every row.

This is a human-coded item (the coding rubric is shown below) that is difficult (Level 5) for students to provide a full-credit response. There is partial credit available, but that is still moderately difficult (Level 4) for students. Note that the coding rubric does not contain an exhaustive list of responses at any credit level. However, the sample responses in the rubric are representative of how students typically respond to this item.

Unit Name – Item #	Triangular Pattern – CMA150Q03
Content Area	Change and relationships
Process	Reasoning
Context	Scientific
Item Format	Open Response - Human Coded
Answer	Refer to rubric below
Proficiency Levels	5 (full credit) 4 (partial credit)

Full Credit

Code 2: Selects Yes and provides an acceptable explanation for why there will always be more red (or fewer blue) triangles. [*An acceptable explanation must state "in each row" (or use similar wording for that concept)*.]

- He is correct because there is always one more red triangle than blue triangle in each row. [*Selection of "Yes" is implied here*.]
- [Yes] There will always be one less blue triangle in each row.
- [Yes] There is one more red triangle than blue in each row. [*Benefit of the doubt given for not specifying "always" in the response since it is already stated in the question stem*.]
- [Yes] Because red triangles are on the outside of each row and inside it alternates red and blue triangles. [*Acceptable explanation that establishes there are more red than blue in each row*.]

Partial Credit

Code 1: Selects Yes and explanation is partially correct but incomplete.

- [Yes] Because the first row has only a red triangle.
- [Yes] There are no blue triangles in the first row.
- [Yes] There is one more red triangle than blue triangle. [*Response does not specify "in each row". Compare to Code 2, dot point 3*.]
- [Yes] Because red triangles are on the outside of each row and the blue triangles stay inside. [*Explanation is incomplete because the red triangles in the interior are not addressed. Compare to Code 2, dot point 4*.]

No Credit

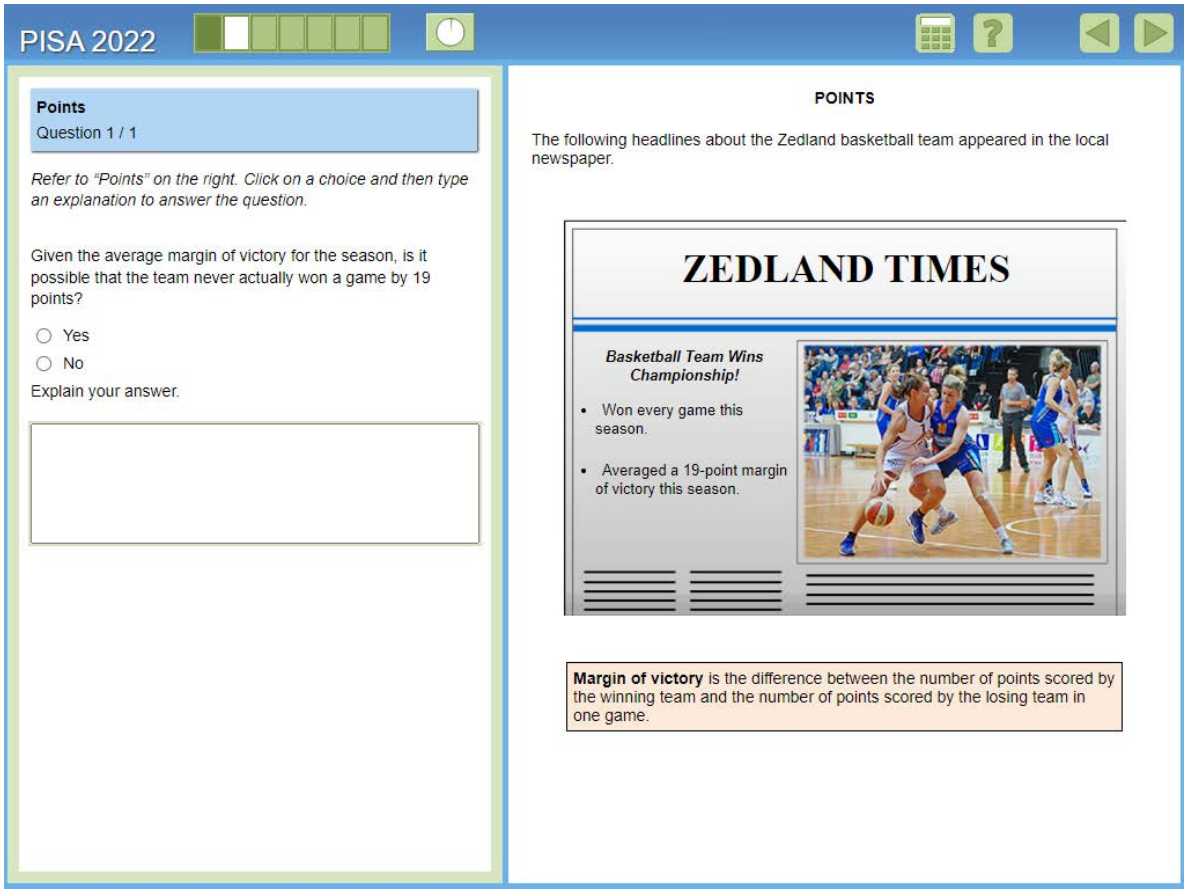
Code 0: Other responses, including selecting Yes but giving an incorrect explanation or without giving an explanation OR selecting No with or without an explanation.

- [Yes] red = 62.5% and blue = 37.5%. [Percentage of each colour triangle in the first four rows.]
- [Yes].

Code 9: Missing

Unit CMA156 – Points

Points, released item #1 (CMA156Q01)



This is the unit *Points* and it is another single-item unit with no introduction screen. For this item, students are presented with a newspaper headline about a local basketball team, which notes that the team won every game this season, and that they averaged a 19-point margin of victory this season. The definition of margin of victory is also given in the stimulus in cases students are not familiar with the term. The question asks is if it is possible that the team never actually won a game by 19 points given that the average margin of victory for the season is 19 points. This is an abstract reasoning item that requires students to evaluate a conjecture based on their conceptual understanding of an average (i.e., an arithmetic mean). They have to select either “Yes” or “No” and provide an explanation to support their selection.

The correct selection is “Yes” that it is possible that the team never actually won a game by 19 points, even though 19 is the average margin of victory. Students can respond by recognising that the mean does not have to be a member of the data set, or they can provide an example data set that has a mean of 19 but which does not contain 19 in the data set. Note that for this latter approach, students can also provide a counterexample based on a value other than 19 because it still represents an appropriate line of reasoning in this context. For example, the arithmetic mean of the data set 6, 9, and 15 is 10, even though 10 is not a member of the data set. Partial-credit responses address the idea that some values in the data set must be greater and some values in the data set must be less than the mean, but do not explicitly mention that the mean does not have to be a member of the data set.

This is also a human-coded item (the coding rubric is shown below) that is very difficult for students to provide a full-credit response to (Level 6 on the proficiency scale). There is partial credit available, but that is also difficult (Level 5 on the scale). The abstract nature of this task may have contributed to the difficulty. That is, students do not have numerical values they can manipulate to know what really happened, so they are forced to reason based on their understanding of a concept in order to devise a way to explain this with respect to the context. Note that the coding rubric does not contain an exhaustive list of responses at any credit level. However, the sample responses in the rubric are representative of how students typically respond to this item.

Unit Name – Item #	Points – CMA156Q01
Content Area	Uncertainty and data
Process	Reasoning
Context	Societal
Item Format	Open Response - Human Coded
Answer	Refer to rubric below
Proficiency Levels	6 (full credit) 5 (partial credit)

Full Credit

Code 2: Selects Yes and explanation states or shows that the average does not have to be a member of the data set.

- It is possible because the average does not actually have to be one of the values in your data set. [*Selection of “Yes” is implied here*.]
- [Yes] If the margins of victory create an average of 19, there doesn't necessarily have to be a 19-point margin of victory in any of them. [*Full credit for, “…there doesn't necessarily have to be a 19-point margin of victory in any of them”*.]
- [Yes] If one difference was 16 points and another was 22 points, then the average difference would be 19 points, but 19 was not one of the differences.
- [Yes] The mean of the numbers 2, 4, and 9 is 5 but 5 is not one of the numbers.

Partial Credit

Code 1: Selects Yes and explanation is partially correct but incomplete.

- [Yes] It is an average difference, so some games were won by more than 19 points and some games were won by fewer than 19 points. [*Incomplete; does not explicitly state that 19 does not need to be one of the values. For a response like this to receive partial credit, winning by both more and by less than 19 points must be explicitly stated in the response*.]

No Credit

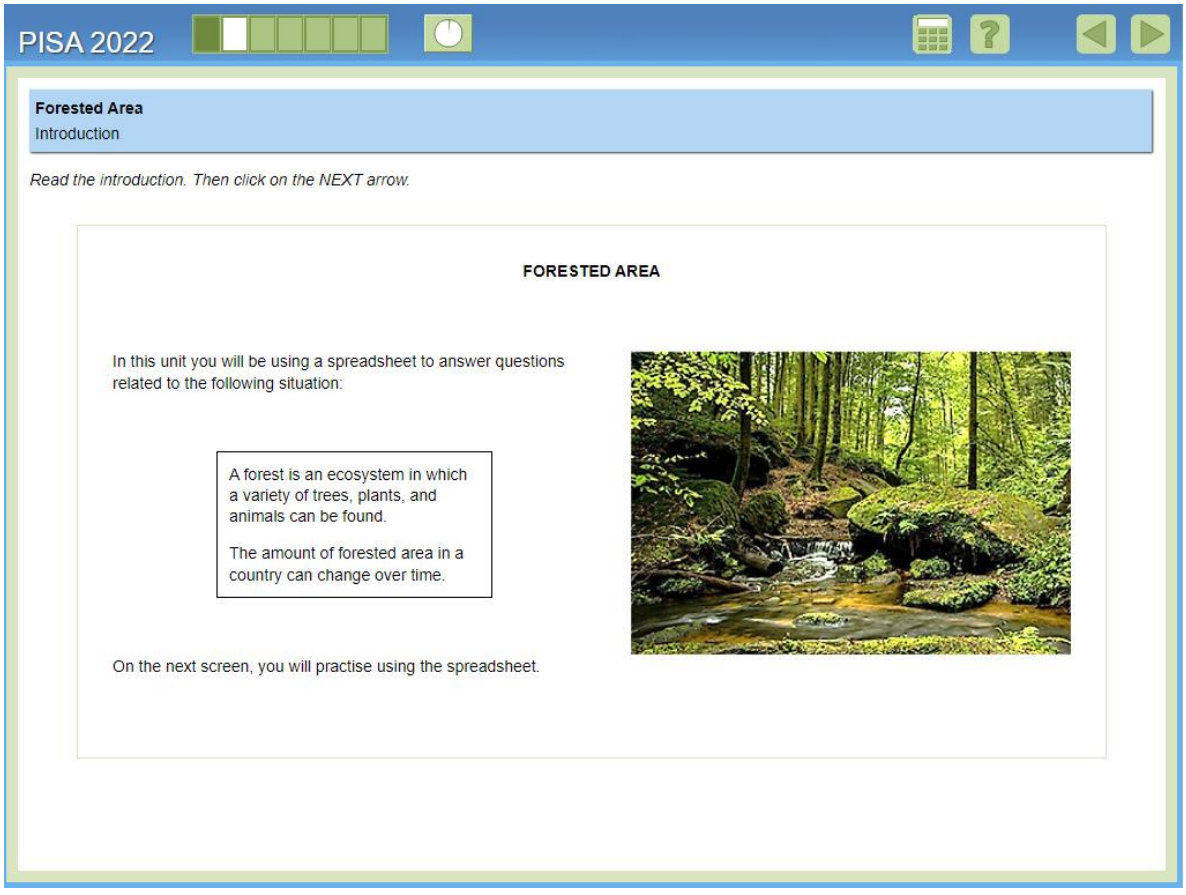
Code 0: Other responses, including selecting Yes but giving an incorrect explanation or without giving an explanation OR selecting No with or without an explanation.

- [No] They need to have won at least one game by 19 points.
- [Yes].
- [Yes] Because the average is all of their margins of victory for the season added together then divided by the number of games they played that season. [*Unacceptable explanation that only describes how to compute a mean*.]
- [Yes] Because it is just an average. [*No reason given for why an average means it is possible they never actually won a game by 19 points*.]
- [Yes] It is an average difference, so some games were won by more than 19 points. [*Unacceptable because winning by less than 19 points was not also explicitly stated in the response*.]

Code 9: Missing

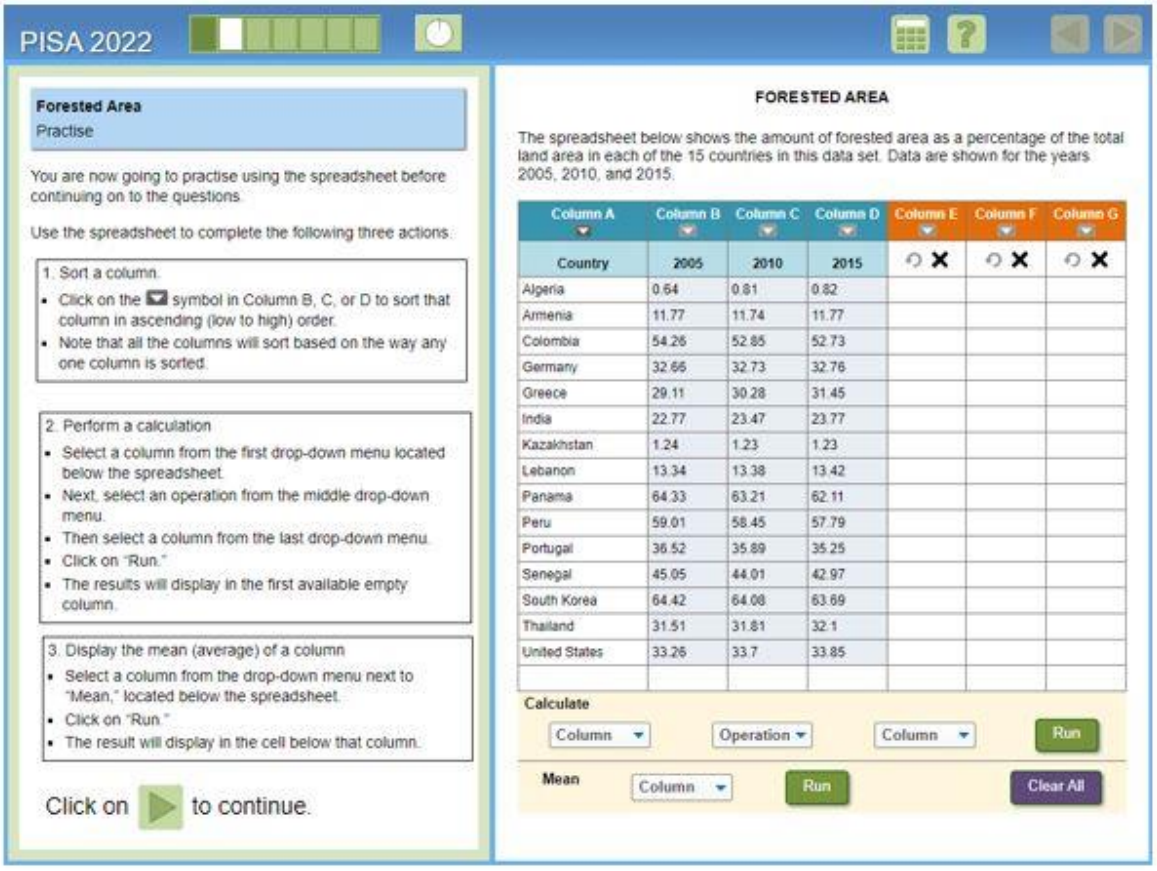
Unit CMA161 – Forested Area

Introduction



This is the introduction to the unit *Forested Area*, which provides students with some background information about the context of the unit – that the amount of forested area in a country can change over time – and lets them know that they will be using a spreadsheet tool to assist with answering the questions.

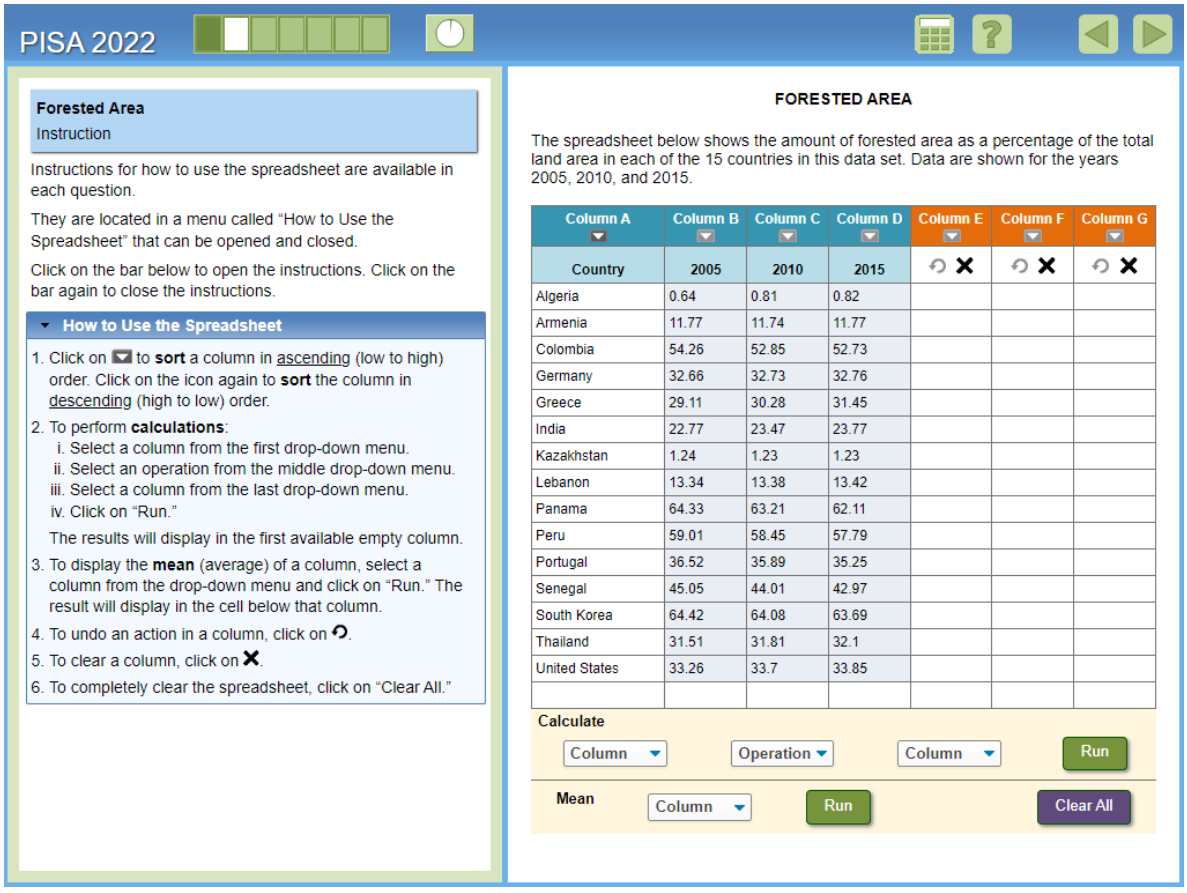
Practice



After the introduction screen, students come to a practice screen where they must perform several actions to familiarise themselves with the functionality of the spreadsheet. The actions include sorting any column, performing a calculation (adding, subtracting, multiplying, or dividing) with the data in any two columns, and generating the mean of any column. Each action comes with instructions for how to use the tool to complete that action, and each action must be completed before the next action is shown (for convenience, they are all shown in this image). The arrow to advance to the next screen only becomes active once all three actions have been completed. Note that the data that students are using in the practice screen is the same data that is used in the unit.

If students get confused about what to do on this screen and are inactive for a certain amount of time, a pop-up message appears to remind them of the action that they need to perform. If another period of inactivity elapses after the pop-up message appears, then an animation shows how to perform each action. Once all of the animations have run, the students can advance to the next screen.

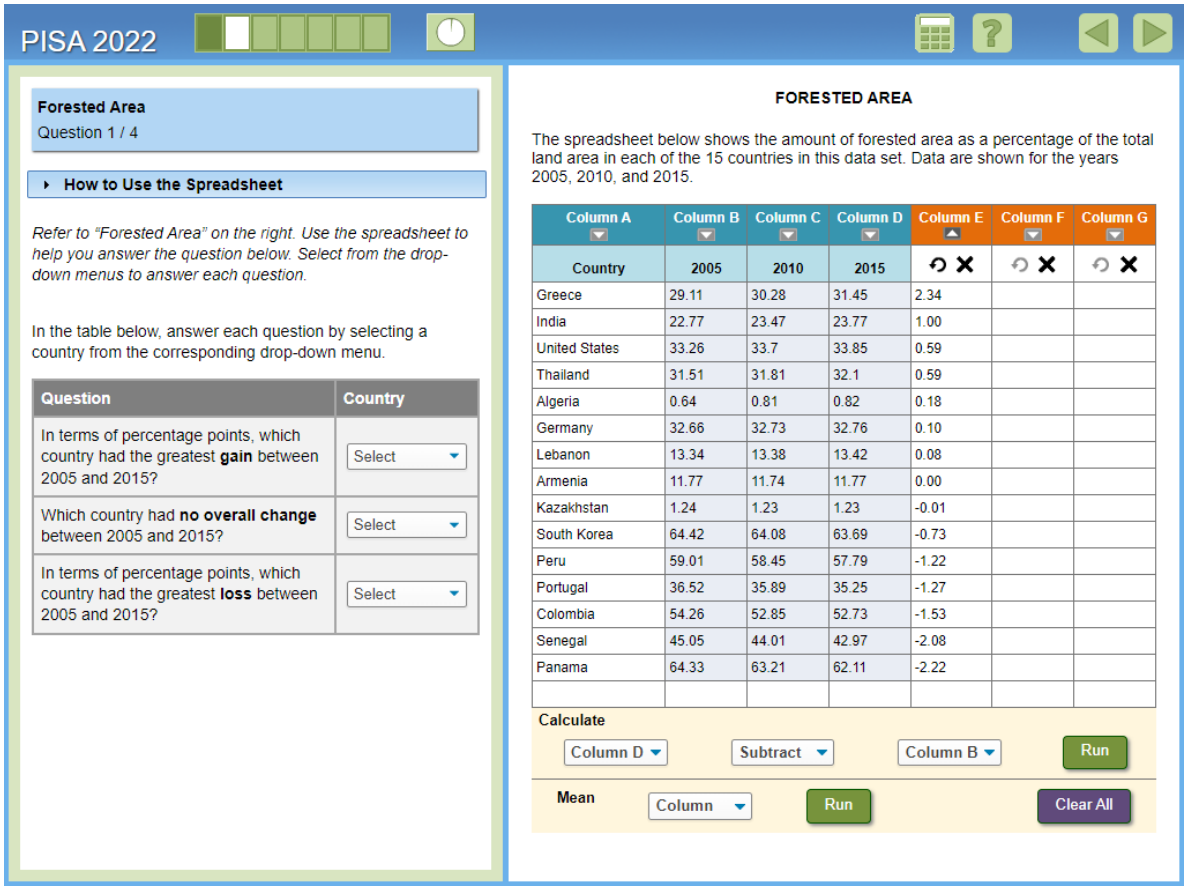
Instruction



After the practice screen, students come to an instruction screen, which is just to let them know that instructions for using the spreadsheet are available in each item and can always be accessed by clicking on the bar with the text, "How to Use the Spreadsheet". Clicking on this bar opens the list of instructions, as shown above. Clicking on the bar again closes the list of instructions.

As with the practice screen, students are not allowed to advance past this screen until they have performed the action (i.e., opened the instructions). Again, if there is a period of inactivity, then a pop-up message reminds students of the action they need to perform. If they still do not perform the action, then after another short period of time, an animation plays. After the animation plays, students can advance to the first item in the unit.

Forested area, released item #1 (CMA161Q01)



The data used for all items in this unit are the amount of forested area as a percentage of the total land area for 15 countries for the years 2005, 2010, and 2015, and those data are always in columns B, C, and D, respectively. Columns E, F, and G are always empty when the students first navigate to each item, and the default ordering of the countries is alphabetical, based on how the country names are translated in each language. Note that in the image above, the data has been manipulated already to correspond to the description of the solution that follows.

The first item in the unit asks the students to identify, in terms of percentage points, the three countries that between 2005 and 2015 had: the greatest gain in its percentage of forested area, no overall change in its percentage of forested area, and the greatest loss in its percentage of forested area. Responses are entered in each row of the table via drop-down menus that contain the name of all 15 countries.

One possible solution method, which is reflected in the image above, is to use the spreadsheet to perform the following calculation: "Column D subtract Column B," which subtracts the percentage of forested area in 2005 from the percentage of forested area in 2015 for each country. The results of that operation are shown in column E. Next, a student may choose to sort the data in Column E to make it easier to identify each country.

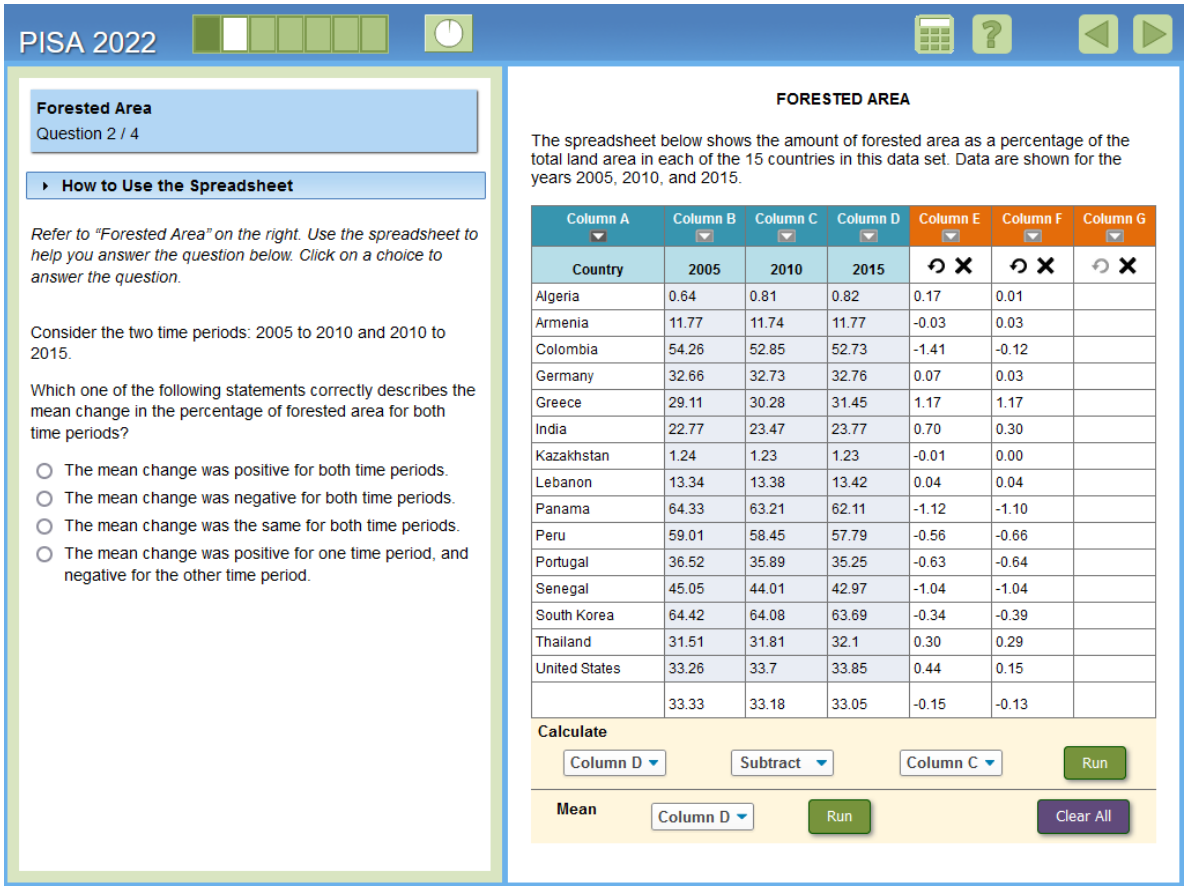
The country with the greatest gain is the country with the largest positive result, which is Greece at 2.34 percentage points; the country with no overall change is the country with a difference of 0.00, which is Armenia; and the country with the greatest loss is the country with the smallest negative result, which is Panama at -2.22 percentage points.

A full-credit response is correctly identifying all three countries and scaled at Level 5, meaning it was a difficult task for students. Partial credit was given for correctly identifying any two countries, and that was still a moderately difficult task that scaled at Level 4, which is not surprising given that partial credit still requires doing the same work as a full-credit response. That is, to identify any two or three countries correctly, students need to determine what calculation(s) to perform, how to use the spreadsheet to perform them, and lastly interpret the results with respect to the context.

Also, depending on the order that the student performs the calculation, identifying the countries could be more difficult. For example, if the student calculates “Column B subtract Column D” (instead of “Column D subtract Column B”), then the sign of each result that appears in column E will be reversed (e.g., Greece = -2.34 and Panama = +2.22). However, based on these data, the percentage of forested area for Greece actually increased for each year shown, and the percentage of forested area for Panama actually decreased for each year shown.

Unit Name – Item #	**Forested Area – CMA161Q01**
Content Area	Uncertainty and data
Process	Formulate
Context	Societal
Item Format	Complex Multiple Choice - Computer Scored
Answers	Full Credit: All three countries are correctly identified (from top to bottom: Gained = Greece; No overall change = Armenia; Loss = Panama) Partial Credit: Any two countries are correctly identified (other country is incorrect or missing)
Proficiency Levels	5 (full credit) 4 (partial credit)

Forested area, released item #2 (CMA161Q02)



In the second item in this unit, students are told to consider the data in terms of two time periods, 2005 to 2010 and 2010 to 2015, and then asked to identify the statement that correctly describes the mean change in the percentage of forested area for each time period.

One possible solution method is to have the spreadsheet compute the mean of Columns B, C, and D and just notice that it decreased from 2005 to 2010 (from 33.33 down to 33.18) and that it also decreased from 2010 to 2015 (from 33.18 down to 33.05). Since the mean change decreased in each time period, the correct answer is that "The mean change was negative for both time periods."

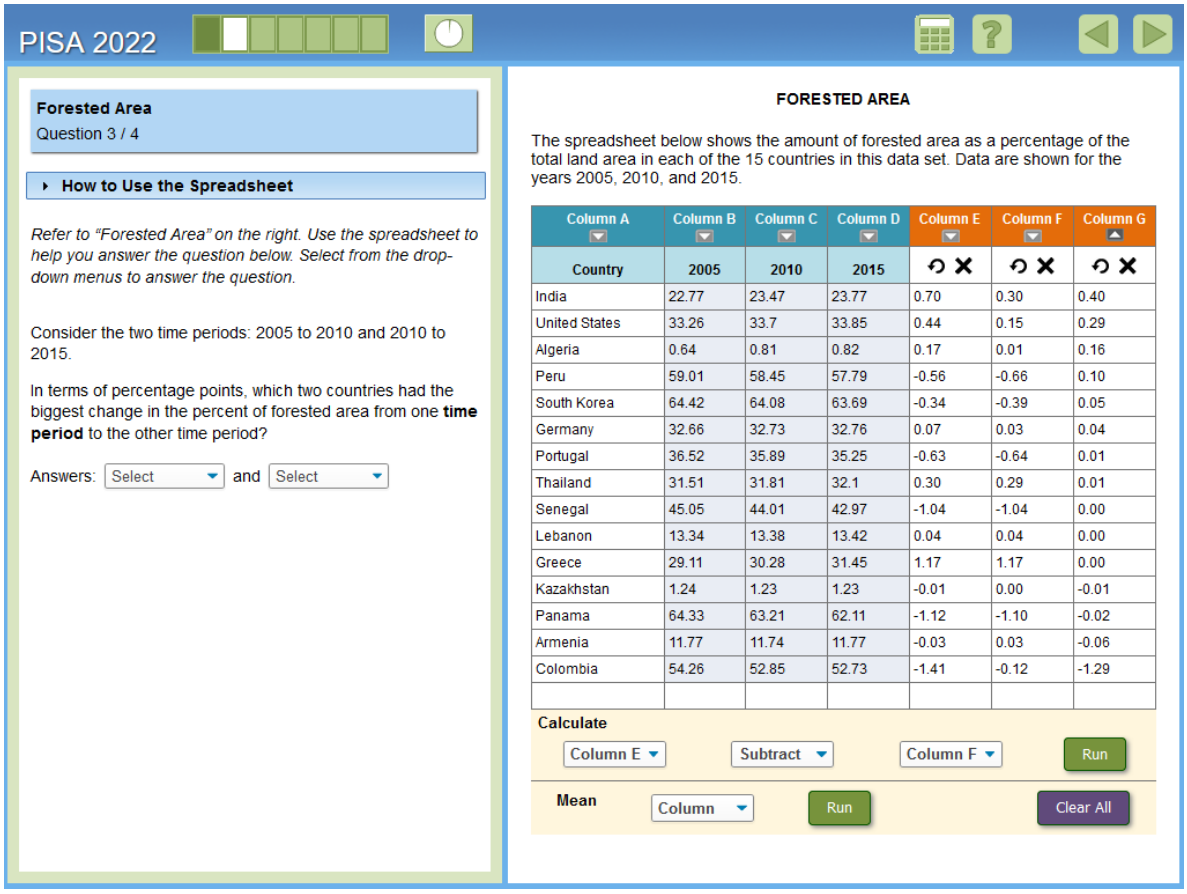
Students may also choose to perform a sequence of operations, such as:

- "Column C subtract Column B" (the results of that operation are shown in Column E), which represents the change in the percentage of forested area for the time period 2005 to 2010.
- "Column D subtract Column C" (the results of that operation are shown in Column F), which represents the change in the percentage of forested area for the time period 2010 to 2015.
- Compute the mean of Columns E and F.

This is a difficult item that scaled at Level 5 on the proficiency scale. Students again have to devise a strategy for using the spreadsheet but this time there is more flexibility in how the spreadsheet can be used before having to interpret the results. Possibly contributing to the difficulty of this item is having to correctly interpret "change" in the context of the problem, when the results can be either positive or negative depending on what operations the student performs, and the order in which they perform them.

Unit Name – Item #	Forested Area – CMA161Q02
Content Area	Uncertainty and data
Process	Interpret/Evaluate
Context	Societal
Item Format	Simple Multiple Choice - Computer Scored
Answer	The mean change was negative for both time periods.
Proficiency Level	5

Forested area, released item #3 (CMA161Q03)



In the third item in this unit, students are again told to consider the data in terms of the two time periods, 2005 to 2010 and 2010 to 2015, but this time they are asked to identify the two countries that had biggest change in their percentage of forested area from one time period to the other time period. Answers are given by selecting the country name from a drop-down menu. The order that the countries are given in the response does not matter.

One possible solution method, which is reflected in the image above, is to perform the following sequence of operations using the spreadsheet (Note that these two calculations are the same two calculations that could also be performed in the second item in the unit):

- "Column C subtract Column B" (the results of that operation are shown in Column E), which represents the change in the percentage of forested area for the time period 2005 to 2010.
- "Column D subtract Column C" (the results of that operation are shown in Column F), which represents the change in the percentage of forested area for the time period 2010 to 2015.

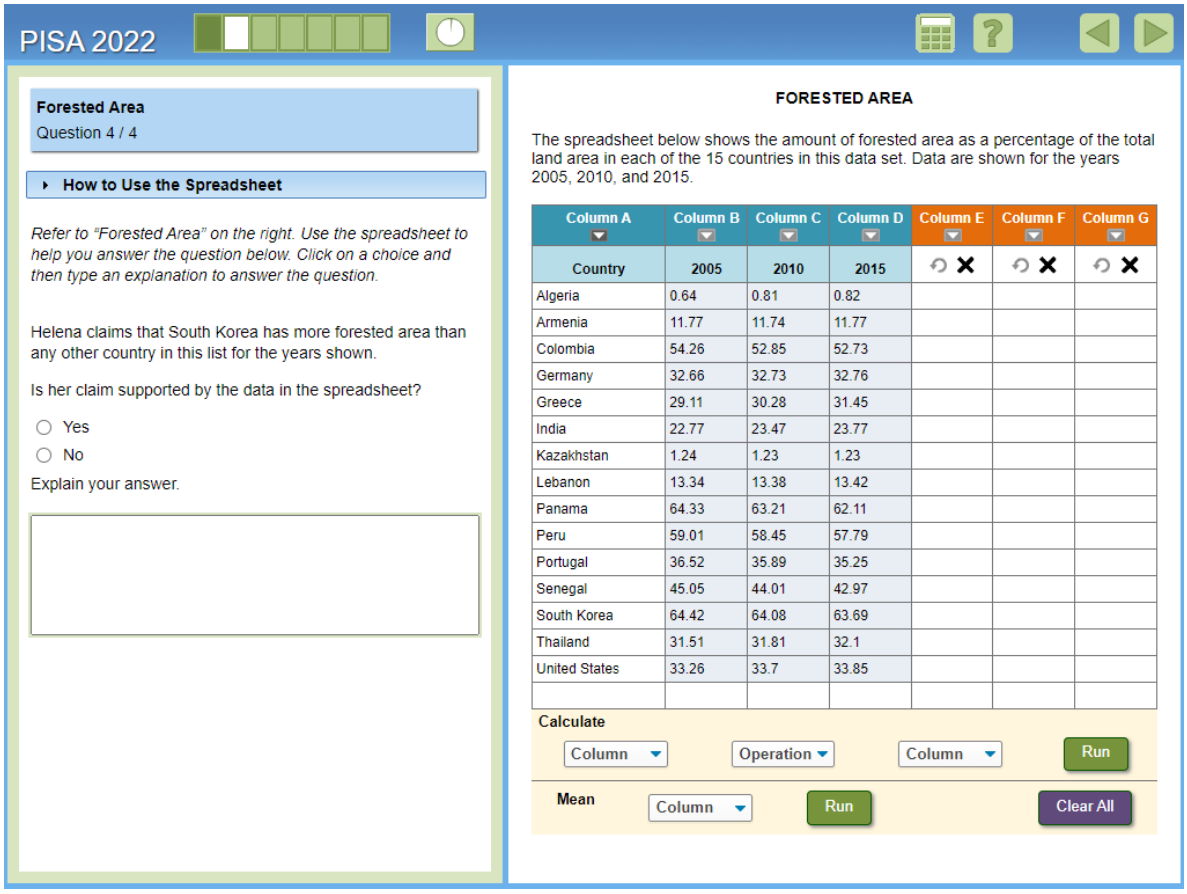
Once the students have calculated the change in the percent of forested area for each time period, they need to compute the change between the two time periods by performing a calculation such as "Column E subtract Column F" (the results of that operation are shown in Column G). Students may also find it helpful to sort the results in Column G.

The two countries with the biggest change between time periods are India (0.40 percentage points) and Colombia (-1.29 percentage points). Full credit is given for correctly identifying both countries, and partial credit is given for correctly identifying one country.

This is a very difficult item that scaled at Level 6 on the proficiency scale. Partial credit was also difficult at Level 5, and similar to the first item in the unit, requires doing the same work that is needed for a full-credit response. Students again have to devise a strategy for using the spreadsheet, which this time requires performing multiple operations, before being able to evaluate the results with respect to the context. Possibly contributing to the difficulty of this item is recognising that "biggest change" in this context does not just mean an increase, and in fact, one of the correct answers is the country with the biggest decrease in its percentage of forested area between time periods. However, unlike previous items in this unit, the correct countries can still be identified even if the signs of the results are reversed (due to the order that operations are performed) because students are looking for change in term of the absolute value, and not interpreting the results specifically as increases or decreases.

Unit Name – Item #	**Forested Area – CMA161Q03**
Content Area	Uncertainty and data
Process	Interpret/Evaluate
Context	Societal
Item Format	Complex Multiple Choice - Computer Scored
Answers	Full Credit: India and Colombia [in any order] Partial Credit: Only one selection is correct (other selection is incorrect or missing)
Proficiency Levels	6 (full credit) 5 (partial credit)

Forested area, released item #4 (CMA161Q04)



This the final item in this unit. Students are presented with a claim that South Korea has more forested area than the other 15 countries on the list for the years shown, and they have to determine if the claim is supported by the data in the spreadsheet. As with some other human-coded items, students need to select either "Yes" or "No," and then provide an explanation to support their selection. Unlike the previous items in the unit, this item does not actually require manipulating the data in the spreadsheet to answer; however, all the functionality of the spreadsheet is still available.

Even though South Korea is the country in this list with the highest percentage of forested area for each of the three years, the correct answer is "No," the claim is not supported by the data in the spreadsheet. It is not possible to conclude anything about the actual amount of forested area in these countries from the data shown because the data shown are only the percentage of forested area. The total land area of each country is not also given in the spreadsheet, and this "missing" information is necessary for determining the actual amount of forested area in each country. That is, because the data shown are percentages of different quantities (i.e., different land areas, which are not included in the spreadsheet) they do not support the claim.

This is a reasoning item that requires students to evaluate a claim by understanding the limits of what can be inferred from the available data. That is, students do not have to determine if the specific claim about South Korea is actually true or not; they have to determine if the claim is supported by the available data. It is a very difficult item that scaled at Level 6. There is no partial credit response for this item. The coding rubric is shown below. Note that the coding rubric does not contain an exhaustive list of responses. However, the sample responses in the rubric are representative of how students typically respond to this item.

Unit Name – Item #	Forested Area – CMA161Q04
Content Area	Uncertainty and data
Process	Reasoning
Context	Societal
Item Format	Open Response - Human Coded
Answer	Refer to rubric below
Proficiency Level	6

Full Credit

Code 1: Selects No and explains that the spreadsheet only shows the percentage of forested area OR that the spreadsheet does not show the total land area for each country OR that the areas of the countries are different.

- [No] This is not true because the spreadsheet only shows the values as a percentage.
- Her claim is not supported by the data in the spreadsheet because we do not know the total area for each of the countries listed. [*Selection of "No" is implied here.*]
- [No] Because the total area of each country is different.
- [No] Each country does not have the same area.

No Credit

Code 0: Other responses, including selecting No but giving an incorrect explanation or without giving an explanation OR selecting Yes with or without an explanation.

- [No].
- [No] Because it is different.
- [Yes] South Korea has the greatest amount for each year shown.

Code 9: Missing

Annex D. Overview of Performance Trends

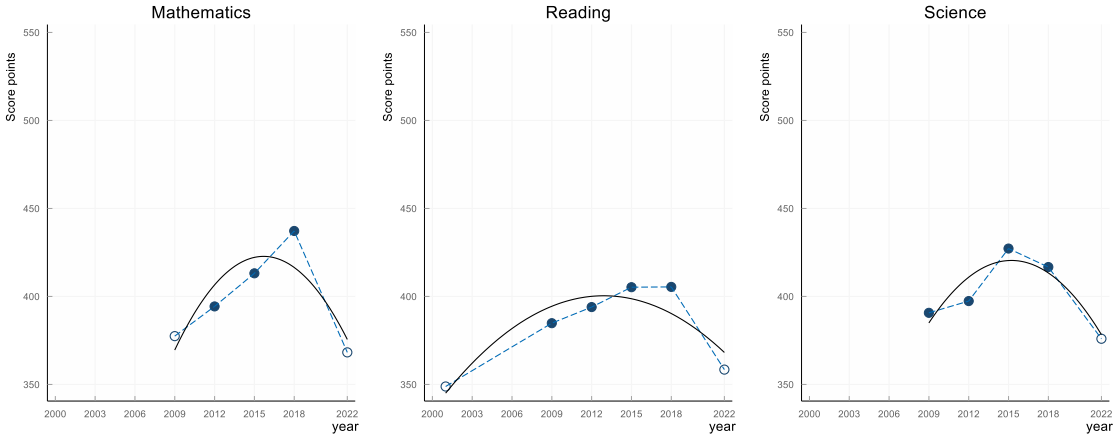
Table I.D.1. Overview of trends in mathematics, reading and science performance

Albania	Estonia	Latvia	Qatar
Argentina	Finland	Lithuania	Romania
Australia	France	Macao (China)	Saudi Arabia
Austria	Georgia	Malaysia	Serbia
Baku (Azerbaijan)	Germany	Malta	Singapore
Belgium	Greece	Mexico	Slovak Republic
Brazil	Guatemala	Moldova	Slovenia
Brunei Darussalam	Hong Kong (China)	Montenegro	Spain
Bulgaria	Hungary	Morocco	Sweden
Cambodia	Iceland	Netherlands	Switzerland
Canada	Indonesia	New Zealand	Chinese Taipei
Chile	Ireland	North Macedonia	Thailand
Colombia	Israel	Norway	Türkiye
Costa Rica	Italy	Panama	United Arab Emirates
Croatia	Japan	Paraguay	United Kingdom
Cyprus	Jordan	Peru	United States
Czech Republic	Kazakhstan	Philippines	Uruguay
Denmark	Korea	Poland	
Dominican Republic	Kosovo	Portugal	

StatLink https://stat.link/ygbp7i

Overview of performance trends in Albania

Trends in mathematics, reading and science performance in Albania



Note: White dots indicate mean-performance estimates that are not statistically significantly above/below PISA 2022 estimates. Black lines indicate the best-fitting trend.
Source: OECD, PISA 2022 Database, Tables I.B1.5.4, I.B1.5.5 and I.B1.5.6.

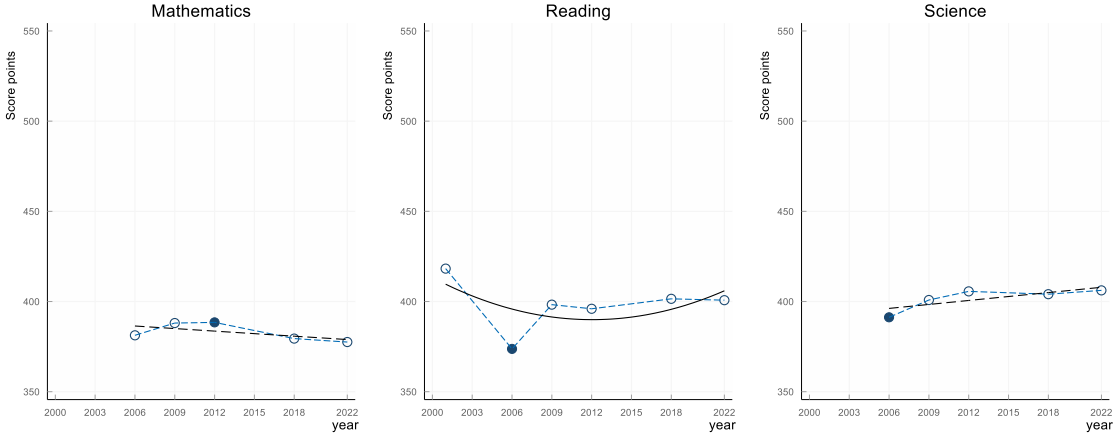
Snapshot of mathematics, reading and science results for Albania

Mean performance	Mathematics	Reading	Science
PISA 2000		349	
PISA 2003	m	m	
PISA 2006	m	m	m
PISA 2009	377	385*	391*
PISA 2012	394*	394*	397*
PISA 2015	413*	405*	427*
PISA 2018	437*	405*	417*
PISA 2022	368	358	376
Average 10-year trend in mean performance (2012 to 2022)	-21.1*	-35.1*	-25.6*
Short-term change in mean performance (2018 to 2022)	-69.0*	-47.0*	-40.8*
Proficiency levels: Change between 2012 and 2022			
Percentage-point change in the share of top-performing students (Level 5 or 6)	-0.1	-1.1*	-0.2
Percentage-point change in the share of low-performing students (below Level 2)	+13.3*	+21.4*	+14.3*
Variation in performance: Change between 2018 and 2022			
Average change among high-achieving students (90th percentile)	-62.1*	-45.2*	-28.7*
Average change among low-achieving students (10th percentile)	-66.8*	-43.4*	-48.2*
Gap in learning outcomes between high- and low-achieving students	stable gap	stable gap	widening gap
Trends by quarter of socio-economic status (ESCS): 2018-22 / average 10-year trend			
Performance among advantaged students (top quarter of ESCS)	-56.7* / m	-51.3* / m	-37.1* / m
Performance among disadvantaged students (bottom quarter of ESCS)	-68.3* / m	-34.6* / m	-36.4* / m
Performance gap (top – bottom quarter)	stable / m	narrowing / m	stable / m

Note: * indicates statistically significant trends and changes or mean-performance estimates that are significantly above or below PISA 2022 estimates.
Source: PISA 2022 Database, Tables I.B1.5.1-12, I.B1.5.19, I.B1.5.20 and I.B1.5.21.

Overview of performance trends in Argentina

Trends in mathematics, reading and science performance in Argentina



Note: White dots indicate mean-performance estimates that are not statistically significantly above/below PISA 2022 estimates. Black lines indicate the best-fitting trend.
Source: OECD, PISA 2022 Database, Tables I.B1.5.4, I.B1.5.5 and I.B1.5.6.

Snapshot of mathematics, reading and science results for Argentina

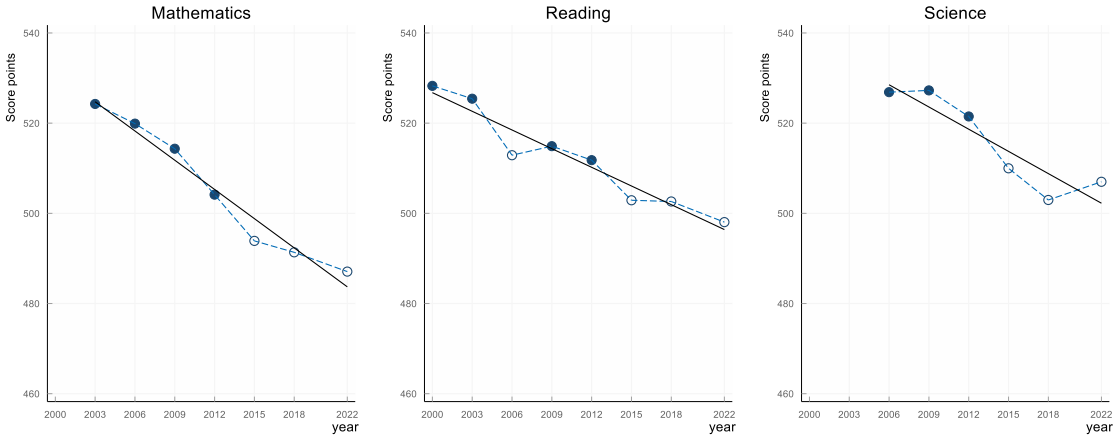
Mean performance	Mathematics	Reading	Science
PISA 2000		418	
PISA 2003	m	m	
PISA 2006	381	374*	391*
PISA 2009	388	398	401
PISA 2012	388*	396	406
PISA 2015	m	m	m
PISA 2018	379	402	404
PISA 2022	378	401	406
Average 10-year trend in mean performance (2012 to 2022)	-11.2*	+5.2	-0.0
Short-term change in mean performance (2018 to 2022)	-1.9	-0.8	+2.1
Proficiency levels: Change between 2012 and 2022			
Percentage-point change in the share of top-performing students (Level 5 or 6)	+0.0	+0.4	+0.3
Percentage-point change in the share of low-performing students (below Level 2)	+6.4*	+0.9	+3.1
Variation in performance: Change between 2018 and 2022			
Average change among high-achieving students (90th percentile)	-12.2*	-6.0	-1.5
Average change among low-achieving students (10th percentile)	+14.4*	+10.5*	+9.7
Gap in learning outcomes between high- and low-achieving students	narrowing gap	narrowing gap	stable gap
Trends by quarter of socio-economic status (ESCS): 2018-22 / average 10-year trend			
Performance among advantaged students (top quarter of ESCS)	-9.5 / -14.5*	-6.4 / +4.3	-6.1 / -5.8
Performance among disadvantaged students (bottom quarter of ESCS)	+11.8* / -10.2*	+10.0 / +5.9	+16.9* / +4.4
Performance gap (top – bottom quarter)	narrowing / stable	narrowing / stable	narrowing / stable

Note: * indicates statistically significant trends and changes or mean-performance estimates that are significantly above or below PISA 2022 estimates.
Source: PISA 2022 Database, Tables I.B1.5.1-12, I.B1.5.19, I.B1.5.20 and I.B1.5.21.

> *Note: Argentina switched from paper to computer assessment in 2022.*

Overview of performance trends in Australia

Trends in mathematics, reading and science performance in Australia



Note: White dots indicate mean-performance estimates that are not statistically significantly above/below PISA 2022 estimates. Black lines indicate the best-fitting trend.
Source: OECD, PISA 2022 Database, Tables I.B1.5.4, I.B1.5.5 and I.B1.5.6.

Snapshot of mathematics, reading and science results for Australia

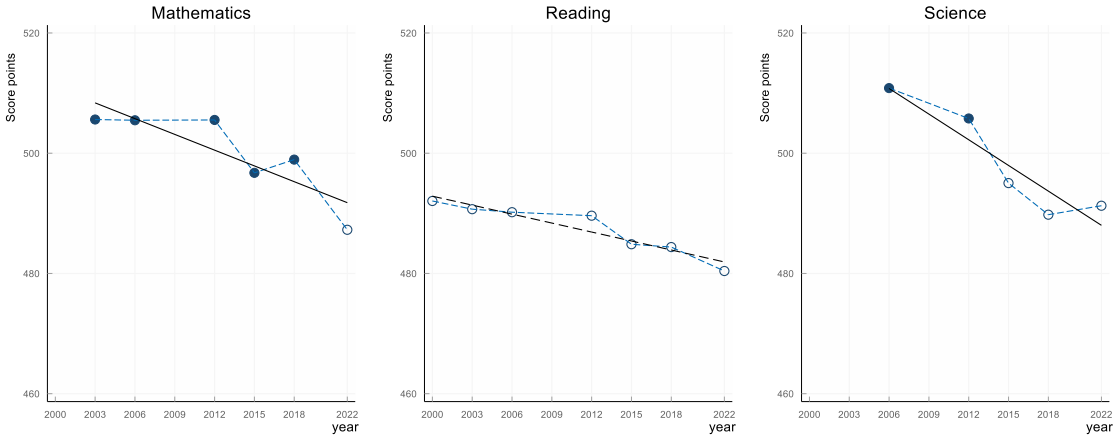
Mean performance	Mathematics	Reading	Science
PISA 2000		528*	
PISA 2003	524*	525*	
PISA 2006	520*	513	527*
PISA 2009	514*	515*	527*
PISA 2012	504*	512*	521*
PISA 2015	494	503	510
PISA 2018	491	503	503
PISA 2022	487	498	507
Average 10-year trend in mean performance (2012 to 2022)	-15.8*	-12.5	-14.4*
Short-term change in mean performance (2018 to 2022)	-4.3	-4.6	+4.0
Proficiency levels: Change between 2012 and 2022			
Percentage-point change in the share of top-performing students (Level 5 or 6)	-2.5*	+0.6	-0.9
Percentage-point change in the share of low-performing students (below Level 2)	+6.7*	+7.0*	+5.9*
Variation in performance: Change between 2018 and 2022			
Average change among high-achieving students (90th percentile)	+9.8*	-2.2	+16.8*
Average change among low-achieving students (10th percentile)	-13.0*	-6.1	-4.5
Gap in learning outcomes between high- and low-achieving students	widening gap	stable gap	widening gap
Trends by quarter of socio-economic status (ESCS): 2018-22 / average 10-year trend			
Performance among advantaged students (top quarter of ESCS)	+7.2 / -14.2*	-1.3 / -12.9*	+16.2* / -12.7*
Performance among disadvantaged students (bottom quarter of ESCS)	-12.5* / -19.9*	-7.1 / -13.5*	-3.5 / -15.8*
Performance gap (top – bottom quarter)	widening / stable	stable / stable	widening / stable

Note: * indicates statistically significant trends and changes or mean-performance estimates that are significantly above or below PISA 2022 estimates.
Source: PISA 2022 Database, Tables I.B1.5.1-12, I.B1.5.19, I.B1.5.20 and I.B1.5.21.

> *Note: In 2022, student response rates decreased with respect to PISA 2018. A technically sound non-response bias analysis was submitted; however, the strength of the evidence was limited by the fact that no external student-level achievement variables could be used in the analysis. Based on the available evidence and experience of other countries participating in PISA, a small residual upward bias could not be excluded even though non-response adjustments likely limited its severity.*

Overview of performance trends in Austria

Trends in mathematics, reading and science performance in Austria



Note: White dots indicate mean-performance estimates that are not statistically significantly above/below PISA 2022 estimates. Black lines indicate the best-fitting trend.
Source: OECD, PISA 2022 Database, Tables I.B1.5.4, I.B1.5.5 and I.B1.5.6.

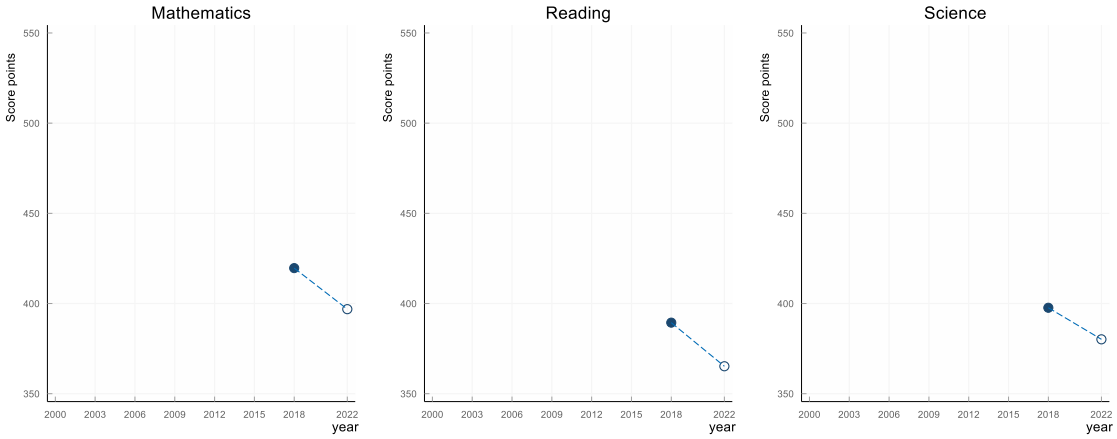
Snapshot of mathematics, reading and science results for Austria

Mean performance	Mathematics	Reading	Science
PISA 2000		492	
PISA 2003	506*	491	
PISA 2006	505*	490	511*
PISA 2009	m	m	m
PISA 2012	506*	490	506*
PISA 2015	497*	485	495
PISA 2018	499*	484	490
PISA 2022	487	480	491
Average 10-year trend in mean performance (2012 to 2022)	-16.1*	-8.5	-14.3*
Short-term change in mean performance (2018 to 2022)	-11.7*	-4.0	+1.5
Proficiency levels: Change between 2012 and 2022			
Percentage-point change in the share of top-performing students (Level 5 or 6)	-4.0*	+2.2	+0.0
Percentage-point change in the share of low-performing students (below Level 2)	+6.2*	+5.8*	+6.9*
Variation in performance: Change between 2018 and 2022			
Average change among high-achieving students (90th percentile)	-9.2	+0.9	+7.9
Average change among low-achieving students (10th percentile)	-11.4	-10.3	-5.6
Gap in learning outcomes between high- and low-achieving students	stable gap	stable gap	widening gap
Trends by quarter of socio-economic status (ESCS): 2018-22 / average 10-year trend			
Performance among advantaged students (top quarter of ESCS)	-5.5 / -8.4	+5.3 / +1.8	+13.7* / -3.8
Performance among disadvantaged students (bottom quarter of ESCS)	-20.0* / -18.1*	-14.9* / -13.9*	-15.0* / -23.8*
Performance gap (top – bottom quarter)	widening / stable	widening / widening	widening / widening

Note: * indicates statistically significant trends and changes or mean-performance estimates that are significantly above or below PISA 2022 estimates.
Source: PISA 2022 Database, Tables I.B1.5.1-12, I.B1.5.19, I.B1.5.20 and I.B1.5.21.

Overview of performance trends in Baku (Azerbaijan)

Trends in mathematics, reading and science performance in Baku (Azerbaijan)



Note: White dots indicate mean-performance estimates that are not statistically significantly above/below PISA 2022 estimates.
Source: OECD, PISA 2022 Database, Tables I.B1.5.4, I.B1.5.5 and I.B1.5.6.

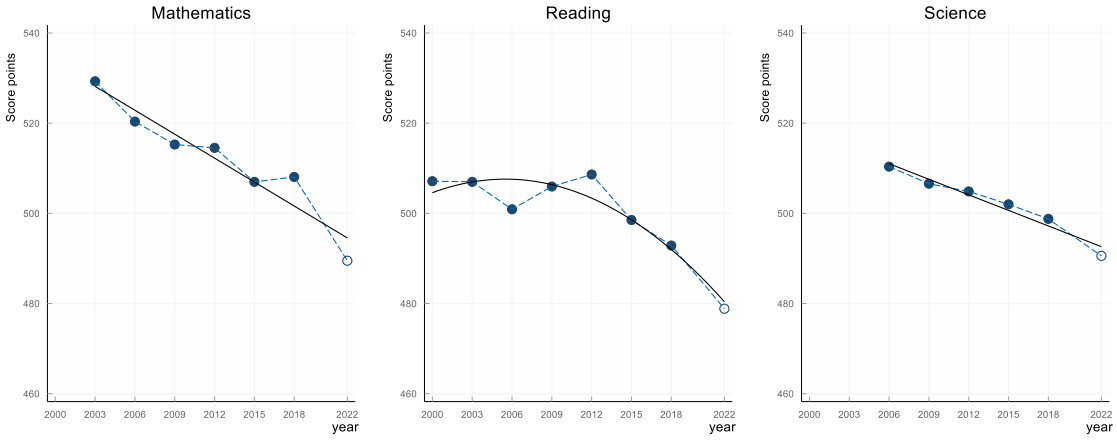
Snapshot of mathematics, reading and science results for Baku (Azerbaijan)

Mean performance	Mathematics	Reading	Science
PISA 2000		m	
PISA 2003	m	m	
PISA 2006	m	m	m
PISA 2009	m	m	m
PISA 2012	m	m	m
PISA 2015	m	m	m
PISA 2018	420*	389*	398*
PISA 2022	397	365	380
Average 10-year trend in mean performance (2012 to 2022)	m	m	m
Short-term change in mean performance (2018 to 2022)	-22.8*	-24.2*	-17.5*
Proficiency levels: Change between 2018 and 2022			
Percentage-point change in the share of top-performing students (Level 5 or 6)	-1.1*	-0.0	-0.0
Percentage-point change in the share of low-performing students (below Level 2)	+11.1*	+8.7*	+8.0*
Variation in performance: Change between 2018 and 2022			
Average change among high-achieving students (90th percentile)	-24.0*	-6.9	-10.0
Average change among low-achieving students (10th percentile)	-15.7*	-37.4*	-22.2*
Gap in learning outcomes between high- and low-achieving students	stable gap	widening gap	widening gap
Trends by quarter of socio-economic status (ESCS): 2018-22 / average 10-year trend			
Performance among advantaged students (top quarter of ESCS)	-24.5* / m	-18.0* / m	-11.7 / m
Performance among disadvantaged students (bottom quarter of ESCS)	-25.1* / m	-28.7* / m	-25.0* / m
Performance gap (top – bottom quarter)	stable / m	stable / m	stable / m

Note: * indicates statistically significant trends and changes or mean-performance estimates that are significantly above or below PISA 2022 estimates.
Source: PISA 2022 Database, Tables I.B1.5.1-12, I.B1.5.19, I.B1.5.20 and I.B1.5.21.

Overview of performance trends in Belgium

Trends in mathematics, reading and science performance in Belgium



Note: White dots indicate mean-performance estimates that are not statistically significantly above/below PISA 2022 estimates. Black lines indicate the best-fitting trend.
Source: OECD, PISA 2022 Database, Tables I.B1.5.4, I.B1.5.5 and I.B1.5.6.

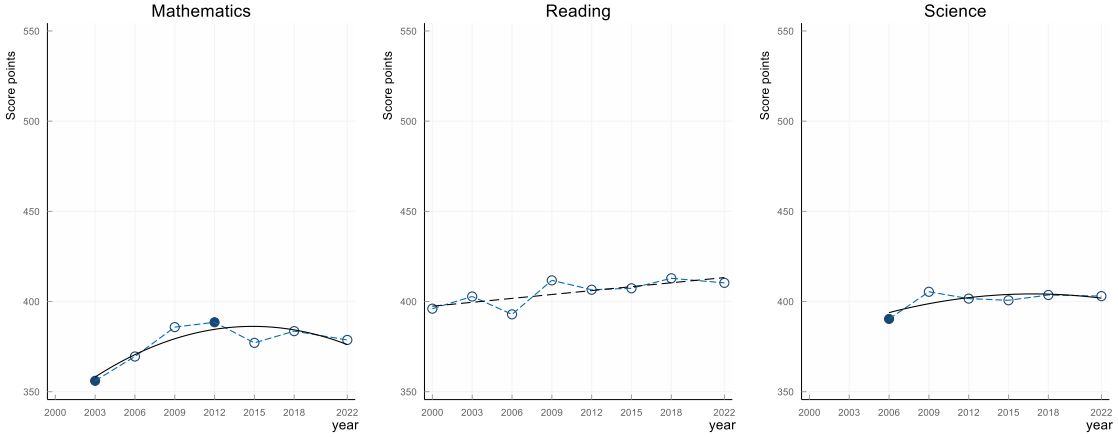
Snapshot of mathematics, reading and science results for Belgium

Mean performance	Mathematics	Reading	Science
PISA 2000		507*	
PISA 2003	529*	507*	
PISA 2006	520*	501*	510*
PISA 2009	515*	506*	507*
PISA 2012	515*	509*	505*
PISA 2015	507*	499*	502*
PISA 2018	508*	493*	499*
PISA 2022	489	479	491
Average 10-year trend in mean performance (2012 to 2022)	-23.0*	-29.3*	-14.2*
Short-term change in mean performance (2018 to 2022)	-18.6*	-14.0*	-8.2*
Proficiency levels: Change between 2012 and 2022			
Percentage-point change in the share of top-performing students (Level 5 or 6)	-8.1*	-4.4*	-1.9
Percentage-point change in the share of low-performing students (below Level 2)	+6.0*	+9.2*	+4.7*
Variation in performance: Change between 2018 and 2022			
Average change among high-achieving students (90th percentile)	-14.7*	-13.0*	-5.4
Average change among low-achieving students (10th percentile)	-17.0*	-15.6*	-10.4
Gap in learning outcomes between high- and low-achieving students	stable gap	stable gap	stable gap
Trends by quarter of socio-economic status (ESCS): 2018-22 / average 10-year trend			
Performance among advantaged students (top quarter of ESCS)	-17.9* / -19.6*	-11.7* / -24.2*	-6.1 / -10.2*
Performance among disadvantaged students (bottom quarter of ESCS)	-18.8* / -24.4*	-15.1* / -30.9*	-10.3* / -17.4*
Performance gap (top – bottom quarter)	stable / stable	stable / stable	stable / stable

Note: * indicates statistically significant trends and changes or mean-performance estimates that are significantly above or below PISA 2022 estimates.
Source: PISA 2022 Database, Tables I.B1.5.1-12, I.B1.5.19, I.B1.5.20 and I.B1.5.21.

Overview of performance trends in Brazil

Trends in mathematics, reading and science performance in Brazil



Note: White dots indicate mean-performance estimates that are not statistically significantly above/below PISA 2022 estimates. Black lines indicate the best-fitting trend.
Source: OECD, PISA 2022 Database, Tables I.B1.5.4, I.B1.5.5 and I.B1.5.6.

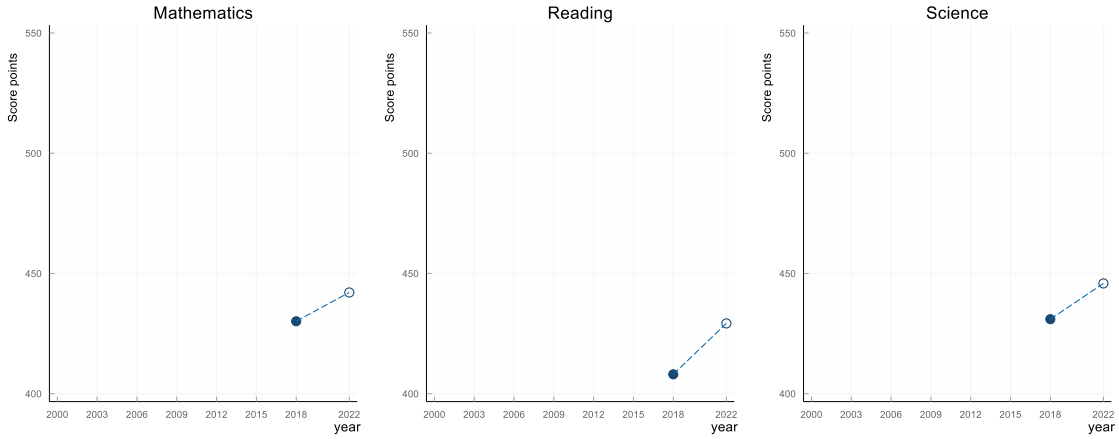
Snapshot of mathematics, reading and science results for Brazil

Mean performance	Mathematics	Reading	Science
PISA 2000		396	
PISA 2003	356*	403	
PISA 2006	370	393	390*
PISA 2009	386	412	405
PISA 2012	389*	407	402
PISA 2015	377	407	401
PISA 2018	384	413	404
PISA 2022	379	410	403
Average 10-year trend in mean performance (2012 to 2022)	-7.1	+5.0	+1.9
Short-term change in mean performance (2018 to 2022)	-4.9	-2.5	-0.6
Proficiency levels: Change between 2012 and 2022			
Percentage-point change in the share of top-performing students (Level 5 or 6)	-0.1	+1.3*	+0.9*
Percentage-point change in the share of low-performing students (below Level 2)	+5.1*	-0.4	+0.2
Variation in performance: Change between 2018 and 2022			
Average change among high-achieving students (90th percentile)	-18.7*	-4.6	+2.3
Average change among low-achieving students (10th percentile)	+11.8*	-1.9	-4.2
Gap in learning outcomes between high- and low-achieving students	narrowing gap	stable gap	stable gap
Trends by quarter of socio-economic status (ESCS): 2018-22 / average 10-year trend			
Performance among advantaged students (top quarter of ESCS)	-13.0* / -7.5	-7.1 / +13.9*	-3.2 / +11.9*
Performance among disadvantaged students (bottom quarter of ESCS)	-0.0 / -2.7	+1.1 / +2.1	-1.3 / -2.5
Performance gap (top – bottom quarter)	stable / stable	stable / stable	stable / widening

Note: * indicates statistically significant trends and changes or mean-performance estimates that are significantly above or below PISA 2022 estimates.
Source: PISA 2022 Database, Tables I.B1.5.1-12, I.B1.5.19, I.B1.5.20 and I.B1.5.21.

Overview of performance trends in Brunei Darussalam

Trends in mathematics, reading and science performance in Brunei Darussalam



Note: White dots indicate mean-performance estimates that are not statistically significantly above/below PISA 2022 estimates.
Source: OECD, PISA 2022 Database, Tables I.B1.5.4, I.B1.5.5 and I.B1.5.6.

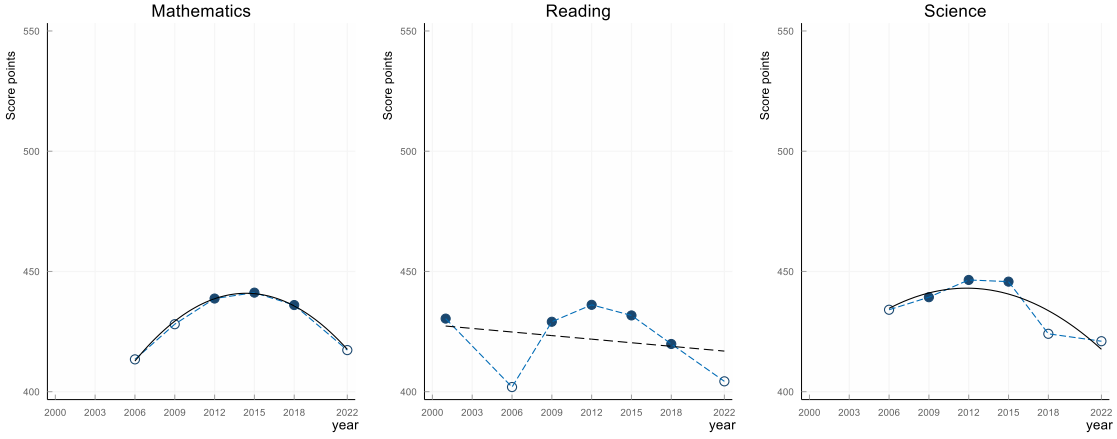
Snapshot of mathematics, reading and science results for Brunei Darussalam

Mean performance	Mathematics	Reading	Science
PISA 2000		m	
PISA 2003	m	m	
PISA 2006	m	m	m
PISA 2009	m	m	m
PISA 2012	m	m	m
PISA 2015	m	m	m
PISA 2018	430*	408*	431*
PISA 2022	442	429	446
Average 10-year trend in mean performance (2012 to 2022)	m	m	m
Short-term change in mean performance (2018 to 2022)	+12.0*	+21.2*	+14.9*
Proficiency levels: Change between 2018 and 2022			
Percentage-point change in the share of top-performing students (Level 5 or 6)	+0.0	+0.7*	+0.1
Percentage-point change in the share of low-performing students (below Level 2)	-6.0*	-9.6*	-8.6*
Variation in performance: Change between 2018 and 2022			
Average change among high-achieving students (90th percentile)	+0.6	+19.0*	+4.9
Average change among low-achieving students (10th percentile)	+21.1*	+15.8*	+11.8*
Gap in learning outcomes between high- and low-achieving students	narrowing gap	stable gap	stable gap
Trends by quarter of socio-economic status (ESCS): 2018-22 / average 10-year trend			
Performance among advantaged students (top quarter of ESCS)	+13.6* / m	+26.1* / m	+16.6* / m
Performance among disadvantaged students (bottom quarter of ESCS)	+13.1* / m	+19.2* / m	+15.7* / m
Performance gap (top – bottom quarter)	stable / m	stable / m	stable / m

Note: * indicates statistically significant trends and changes or mean-performance estimates that are significantly above or below PISA 2022 estimates.
Source: PISA 2022 Database, Tables I.B1.5.1-12, I.B1.5.19, I.B1.5.20 and I.B1.5.21.

Overview of performance trends in Bulgaria

Trends in mathematics, reading and science performance in Bulgaria



Note: White dots indicate mean-performance estimates that are not statistically significantly above/below PISA 2022 estimates. Black lines indicate the best-fitting trend.
Source: OECD, PISA 2022 Database, Tables I.B1.5.4, I.B1.5.5 and I.B1.5.6.

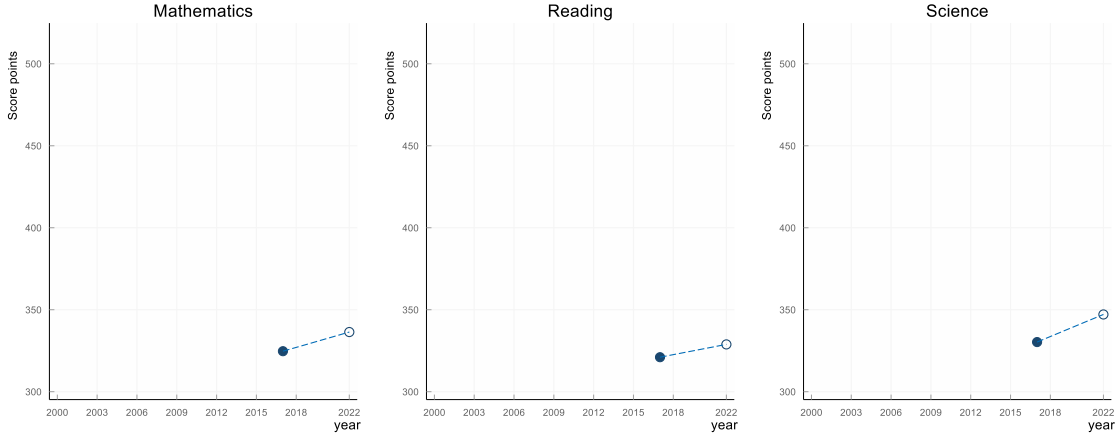
Snapshot of mathematics, reading and science results for Bulgaria

Mean performance	Mathematics	Reading	Science
PISA 2000		430*	
PISA 2003	m	m	
PISA 2006	413	402	434
PISA 2009	428	429*	439*
PISA 2012	439*	436*	446*
PISA 2015	441*	432*	446*
PISA 2018	436*	420*	424
PISA 2022	417	404	421
Average 10-year trend in mean performance (2012 to 2022)	-21.8*	-32.8*	-29.6*
Short-term change in mean performance (2018 to 2022)	-18.7*	-15.5*	-3.1
Proficiency levels: Change between 2012 and 2022			
Percentage-point change in the share of top-performing students (Level 5 or 6)	-0.9	-2.1*	-1.6*
Percentage-point change in the share of low-performing students (below Level 2)	+9.8*	+13.5*	+11.1*
Variation in performance: Change between 2018 and 2022			
Average change among high-achieving students (90th percentile)	-14.1	-7.4	-3.4
Average change among low-achieving students (10th percentile)	-13.6*	-22.1*	-3.3
Gap in learning outcomes between high- and low-achieving students	stable gap	stable gap	stable gap
Trends by quarter of socio-economic status (ESCS): 2018-22 / average 10-year trend			
Performance among advantaged students (top quarter of ESCS)	-15.6 / -26.6*	-9.2 / -43.9*	-1.6 / -40.5*
Performance among disadvantaged students (bottom quarter of ESCS)	-20.9* / -18.6*	-23.8* / -21.8*	-6.9 / -20.9*
Performance gap (top – bottom quarter)	stable / stable	stable / narrowing	stable / narrowing

Note: * indicates statistically significant trends and changes or mean-performance estimates that are significantly above or below PISA 2022 estimates.
Source: PISA 2022 Database, Tables I.B1.5.1-12, I.B1.5.19, I.B1.5.20 and I.B1.5.21.

Overview of performance trends in Cambodia

Trends in mathematics, reading and science performance in Cambodia



Note: White dots indicate mean-performance estimates that are not statistically significantly above/below PISA 2022 estimates.
Source: OECD, PISA 2022 Database, Tables I.B1.5.4, I.B1.5.5 and I.B1.5.6.

Snapshot of mathematics, reading and science results for Cambodia

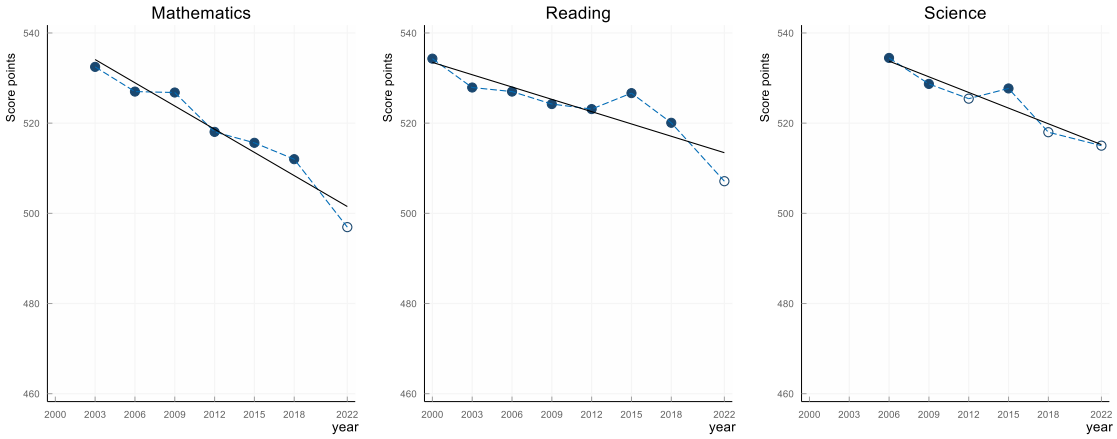
Mean performance	Mathematics	Reading	Science
PISA 2000		m	
PISA 2003	m	m	
PISA 2006	m	m	m
PISA 2009	m	m	m
PISA 2012	m	m	m
PISA 2015	m	m	m
PISA 2018	325*	321*	330*
PISA 2022	336	329	347
Average 10-year trend in mean performance (2012 to 2022)	m	m	m
Short-term change in mean performance (2018 to 2022)	+11.7*	+7.8*	+16.8*
Proficiency levels: Change between 2017 and 2022			
Percentage-point change in the share of top-performing students (Level 5 or 6)	m	m	m
Percentage-point change in the share of low-performing students (below Level 2)	m	m	m
Variation in performance: Change between 2018 and 2022			
Average change among high-achieving students (90th percentile)	+8.6	+2.0	+17.5*
Average change among low-achieving students (10th percentile)	+15.4*	+17.0*	+17.0*
Gap in learning outcomes between high- and low-achieving students	stable gap	narrowing gap	stable gap
Trends by quarter of socio-economic status (ESCS): 2018-22 / average 10-year trend			
Performance among advantaged students (top quarter of ESCS)	m / m	m / m	m / m
Performance among disadvantaged students (bottom quarter of ESCS)	m / m	m / m	m / m
Performance gap (top – bottom quarter)	m / m	m / m	m / m

Note: * indicates statistically significant trends and changes or mean-performance estimates that are significantly above or below PISA 2022 estimates.
Source: PISA 2022 Database, Tables I.B1.5.1-12, I.B1.5.19, I.B1.5.20 and I.B1.5.21.

> *Note: Results for 2018 refer to the results of the PISA for Development assessment, in 2017. The testing period (previously around December) was moved toaround June in 2022.*

Overview of performance trends in Canada

Trends in mathematics, reading and science performance in Canada



Note: White dots indicate mean-performance estimates that are not statistically significantly above/below PISA 2022 estimates. Black lines indicate the best-fitting trend.
Source: OECD, PISA 2022 Database, Tables I.B1.5.4, I.B1.5.5 and I.B1.5.6.

Snapshot of mathematics, reading and science results for Canada

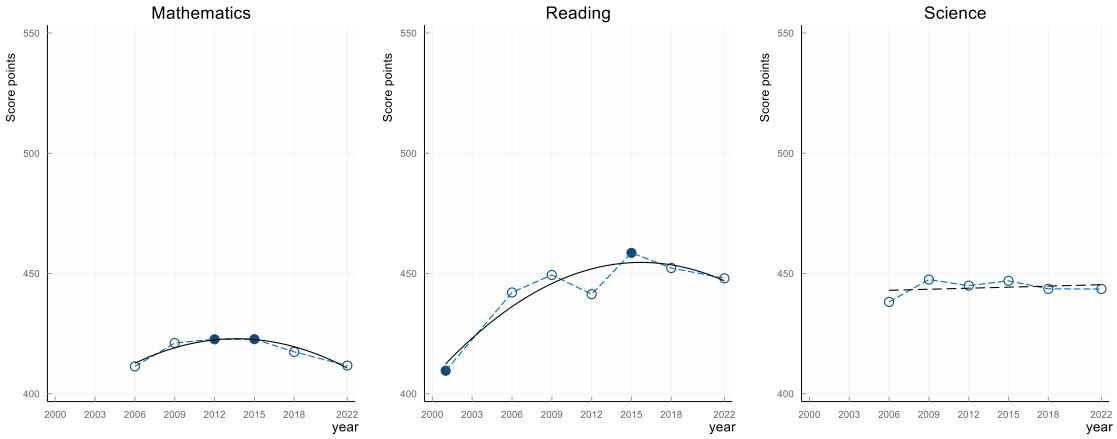
Mean performance	Mathematics	Reading	Science
PISA 2000		534*	
PISA 2003	532*	528*	
PISA 2006	527*	527*	534*
PISA 2009	527*	524*	529*
PISA 2012	518*	523*	525
PISA 2015	516*	527*	528*
PISA 2018	512*	520*	518
PISA 2022	497	507	515
Average 10-year trend in mean performance (2012 to 2022)	-20.6*	-17.0*	-12.8*
Short-term change in mean performance (2018 to 2022)	-15.1*	-13.0*	-3.0
Proficiency levels: Change between 2012 and 2022			
Percentage-point change in the share of top-performing students (Level 5 or 6)	-3.9*	+0.7	+0.6
Percentage-point change in the share of low-performing students (below Level 2)	+7.8*	+7.2*	+4.8*
Variation in performance: Change between 2018 and 2022			
Average change among high-achieving students (90th percentile)	-10.3*	-3.1	+3.6
Average change among low-achieving students (10th percentile)	-16.6*	-22.3*	-9.3*
Gap in learning outcomes between high- and low-achieving students	stable gap	widening gap	widening gap
Trends by quarter of socio-economic status (ESCS): 2018-22 / average 10-year trend			
Performance among advantaged students (top quarter of ESCS)	-11.0* / -23.3*	-9.3* / -19.0*	+2.0 / -15.4*
Performance among disadvantaged students (bottom quarter of ESCS)	-18.0* / -23.6*	-12.9* / -19.7*	-5.6 / -16.2*
Performance gap (top – bottom quarter)	stable / stable	stable / stable	stable / stable

Note: * indicates statistically significant trends and changes or mean-performance estimates that are significantly above or below PISA 2022 estimates.
Source: PISA 2022 Database, Tables I.B1.5.1-12, I.B1.5.19, I.B1.5.20 and I.B1.5.21.

> *Note: In 2022, student response rates decreased with respect to PISA 2018, and fell short of the target in 7 out of 10 provinces (all but New Brunswick, Prince Edward Island and Saskatchewan). School response rates also fell short of the target. The analyses clearly indicate that school non-response has not led to any appreciable bias, but student non-response has given rise to a small upwards bias. For more information, see the Reader's Guide in this Volume.*

Overview of performance trends in Chile

Trends in mathematics, reading and science performance in Chile



Note: White dots indicate mean-performance estimates that are not statistically significantly above/below PISA 2022 estimates. Black lines indicate the best-fitting trend.
Source: OECD, PISA 2022 Database, Tables I.B1.5.4, I.B1.5.5 and I.B1.5.6.

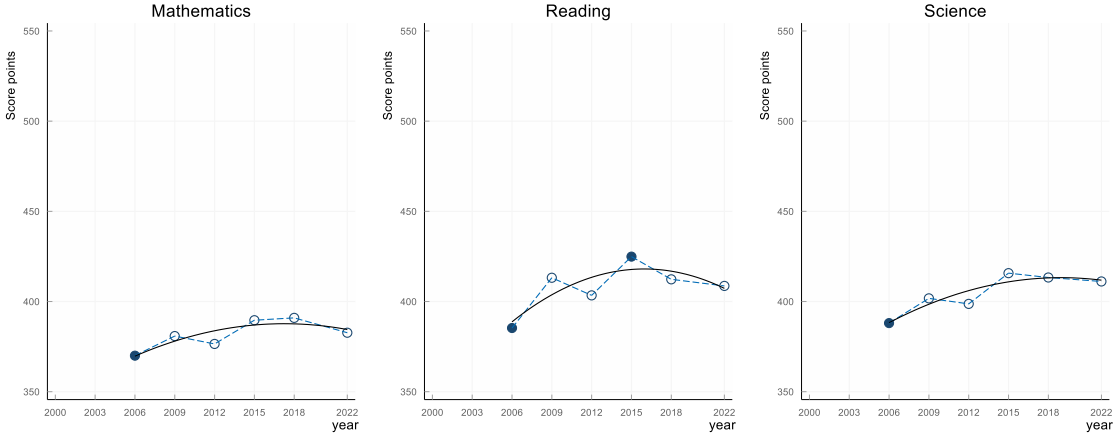
Snapshot of mathematics, reading and science results for Chile

Mean performance	Mathematics	Reading	Science
PISA 2000		410*	
PISA 2003	m	m	
PISA 2006	411	442	438
PISA 2009	421	449	447
PISA 2012	423*	441	445
PISA 2015	423*	459*	447
PISA 2018	417	452	444
PISA 2022	412	448	444
Average 10-year trend in mean performance (2012 to 2022)	-11.7*	+3.7	-1.8
Short-term change in mean performance (2018 to 2022)	-5.7	-4.3	-0.0
Proficiency levels: Change between 2012 and 2022			
Percentage-point change in the share of top-performing students (Level 5 or 6)	-0.9*	+1.9*	+0.8*
Percentage-point change in the share of low-performing students (below Level 2)	+4.2	+0.7	+1.9
Variation in performance: Change between 2018 and 2022			
Average change among high-achieving students (90th percentile)	-14.8*	-4.0	+10.3*
Average change among low-achieving students (10th percentile)	+4.4	-2.4	-9.9*
Gap in learning outcomes between high- and low-achieving students	narrowing gap	stable gap	widening gap
Trends by quarter of socio-economic status (ESCS): 2018-22 / average 10-year trend			
Performance among advantaged students (top quarter of ESCS)	-14.2* / -25.7*	-12.7* / -2.7	-1.3 / -8.0
Performance among disadvantaged students (bottom quarter of ESCS)	+6.7 / +6.4	-1.4 / +14.0*	+1.1 / +8.9
Performance gap (top – bottom quarter)	narrowing / narrowing	stable / narrowing	stable / narrowing

Note: * indicates statistically significant trends and changes or mean-performance estimates that are significantly above or below PISA 2022 estimates.
Source: PISA 2022 Database, Tables I.B1.5.1-12, I.B1.5.19, I.B1.5.20 and I.B1.5.21.

Overview of performance trends in Colombia

Trends in mathematics, reading and science performance in Colombia



Note: White dots indicate mean-performance estimates that are not statistically significantly above/below PISA 2022 estimates. Black lines indicate the best-fitting trend.
Source: OECD, PISA 2022 Database, Tables I.B1.5.4, I.B1.5.5 and I.B1.5.6.

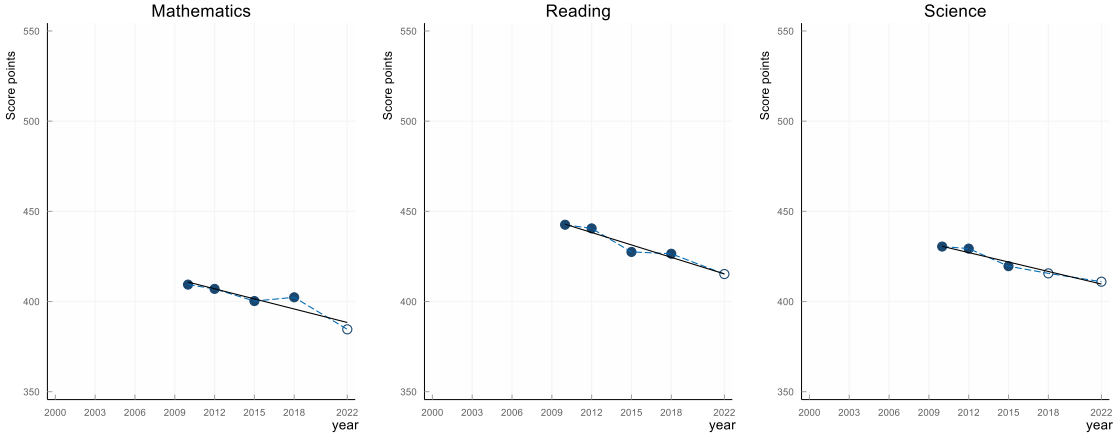
Snapshot of mathematics, reading and science results for Colombia

Mean performance	Mathematics	Reading	Science
PISA 2000		m	
PISA 2003	m	m	
PISA 2006	370*	385*	388*
PISA 2009	381	413	402
PISA 2012	376	403	399
PISA 2015	390	425*	416
PISA 2018	391	412	413
PISA 2022	383	409	411
Average 10-year trend in mean performance (2012 to 2022)	+4.7	+0.1	+10.0
Short-term change in mean performance (2018 to 2022)	-8.2	-3.6	-2.2
Proficiency levels: Change between 2012 and 2022			
Percentage-point change in the share of top-performing students (Level 5 or 6)	-0.0	+0.8*	+0.5*
Percentage-point change in the share of low-performing students (below Level 2)	-2.6	-0.1	-4.7
Variation in performance: Change between 2018 and 2022			
Average change among high-achieving students (90th percentile)	-18.2*	+2.5	+3.9
Average change among low-achieving students (10th percentile)	+3.2	-9.3	-7.4
Gap in learning outcomes between high- and low-achieving students	narrowing gap	stable gap	stable gap
Trends by quarter of socio-economic status (ESCS): 2018-22 / average 10-year trend			
Performance among advantaged students (top quarter of ESCS)	-4.7 / +10.7	+9.0 / +12.3	+9.9 / +22.9*
Performance among disadvantaged students (bottom quarter of ESCS)	-7.0 / +6.1	-6.5 / -4.5	-6.2 / +5.7
Performance gap (top – bottom quarter)	stable / stable	stable / widening	stable / widening

Note: * indicates statistically significant trends and changes or mean-performance estimates that are significantly above or below PISA 2022 estimates.
Source: PISA 2022 Database, Tables I.B1.5.1-12, I.B1.5.19, I.B1.5.20 and I.B1.5.21.

Overview of performance trends in Costa Rica

Trends in mathematics, reading and science performance in Costa Rica



Note: White dots indicate mean-performance estimates that are not statistically significantly above/below PISA 2022 estimates. Black lines indicate the best-fitting trend.
Source: OECD, PISA 2022 Database, Tables I.B1.5.4, I.B1.5.5 and I.B1.5.6.

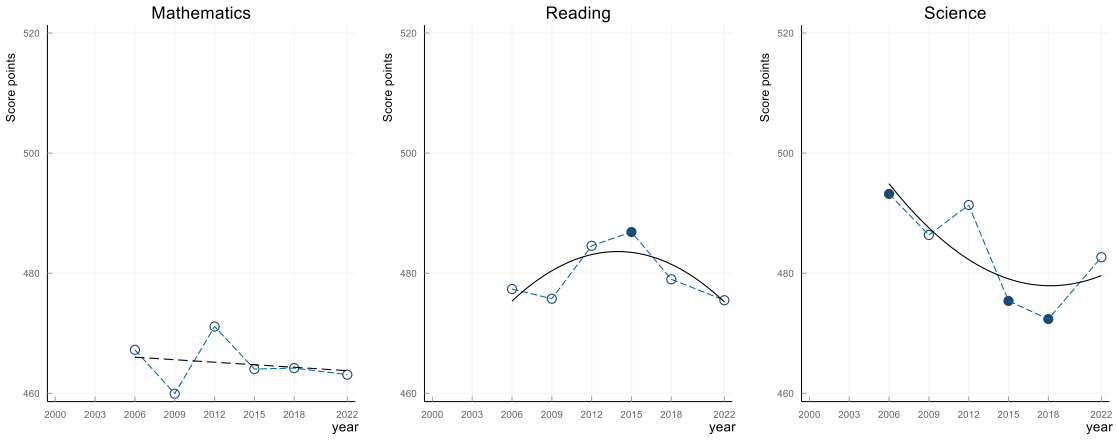
Snapshot of mathematics, reading and science results for Costa Rica

Mean performance	Mathematics	Reading	Science
PISA 2000		m	
PISA 2003	m	m	
PISA 2006	m	m	m
PISA 2009	409*	443*	430*
PISA 2012	407*	441*	429*
PISA 2015	400*	427*	420*
PISA 2018	402*	426*	416
PISA 2022	385	415	411
Average 10-year trend in mean performance (2012 to 2022)	-20.3*	-23.2*	-17.5*
Short-term change in mean performance (2018 to 2022)	-17.8*	-11.3*	-4.6
Proficiency levels: Change between 2012 and 2022			
Percentage-point change in the share of top-performing students (Level 5 or 6)	-0.4	+0.2	+0.2
Percentage-point change in the share of low-performing students (below Level 2)	+12.0*	+14.7*	+11.4*
Variation in performance: Change between 2018 and 2022			
Average change among high-achieving students (90th percentile)	-29.1*	-5.9	+3.6
Average change among low-achieving students (10th percentile)	-6.1	-17.3*	-14.3*
Gap in learning outcomes between high- and low-achieving students	narrowing gap	stable gap	widening gap
Trends by quarter of socio-economic status (ESCS): 2018-22 / average 10-year trend			
Performance among advantaged students (top quarter of ESCS)	m / m	m / m	m / m
Performance among disadvantaged students (bottom quarter of ESCS)	m / m	m / m	m / m
Performance gap (top – bottom quarter)	m / m	m / m	m / m

Note: * indicates statistically significant trends and changes or mean-performance estimates that are significantly above or below PISA 2022 estimates.
Source: PISA 2022 Database, Tables I.B1.5.1-12, I.B1.5.19, I.B1.5.20 and I.B1.5.21.

Overview of performance trends in Croatia

Trends in mathematics, reading and science performance in Croatia



Note: White dots indicate mean-performance estimates that are not statistically significantly above/below PISA 2022 estimates. Black lines indicate the best-fitting trend.
Source: OECD, PISA 2022 Database, Tables I.B1.5.4, I.B1.5.5 and I.B1.5.6.

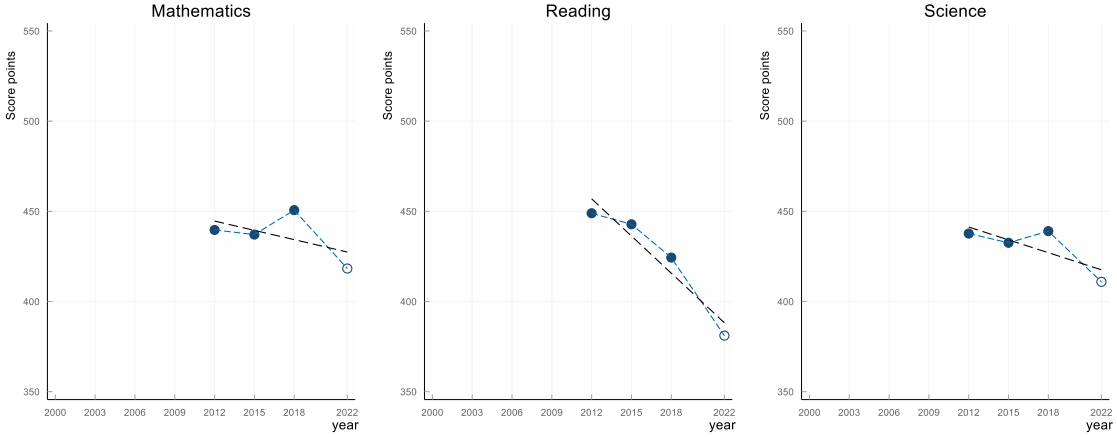
Snapshot of mathematics, reading and science results for Croatia

Mean performance	Mathematics	Reading	Science
PISA 2000		m	
PISA 2003	m	m	
PISA 2006	467	477	493*
PISA 2009	460	476	486
PISA 2012	471	485	491
PISA 2015	464	487*	475*
PISA 2018	464	479	472*
PISA 2022	463	475	483
Average 10-year trend in mean performance (2012 to 2022)	-6.5	-10.9	-7.5
Short-term change in mean performance (2018 to 2022)	-1.1	-3.5	+10.3*
Proficiency levels: Change between 2012 and 2022			
Percentage-point change in the share of top-performing students (Level 5 or 6)	-1.1	-0.2	+0.9
Percentage-point change in the share of low-performing students (below Level 2)	+3.1	+4.0	+5.1*
Variation in performance: Change between 2018 and 2022			
Average change among high-achieving students (90th percentile)	+4.9	-4.2	+14.3*
Average change among low-achieving students (10th percentile)	-1.7	-4.3	+6.4
Gap in learning outcomes between high- and low-achieving students	stable gap	stable gap	stable gap
Trends by quarter of socio-economic status (ESCS): 2018-22 / average 10-year trend			
Performance among advantaged students (top quarter of ESCS)	+2.3 / -7.1	-1.7 / -14.8*	+11.0 / -7.3
Performance among disadvantaged students (bottom quarter of ESCS)	-10.0 / -9.5*	-12.3* / -11.2*	+4.6 / -10.2*
Performance gap (top – bottom quarter)	stable / stable	stable / stable	stable / stable

Note: * indicates statistically significant trends and changes or mean-performance estimates that are significantly above or below PISA 2022 estimates.
Source: PISA 2022 Database, Tables I.B1.5.1-12, I.B1.5.19, I.B1.5.20 and I.B1.5.21.

Overview of performance trends in Cyprus

Trends in mathematics, reading and science performance in Cyprus



Note: White dots indicate mean-performance estimates that are not statistically significantly above/below PISA 2022 estimates. Black lines indicate the best-fitting trend.
Source: OECD, PISA 2022 Database, Tables I.B1.5.4, I.B1.5.5 and I.B1.5.6.

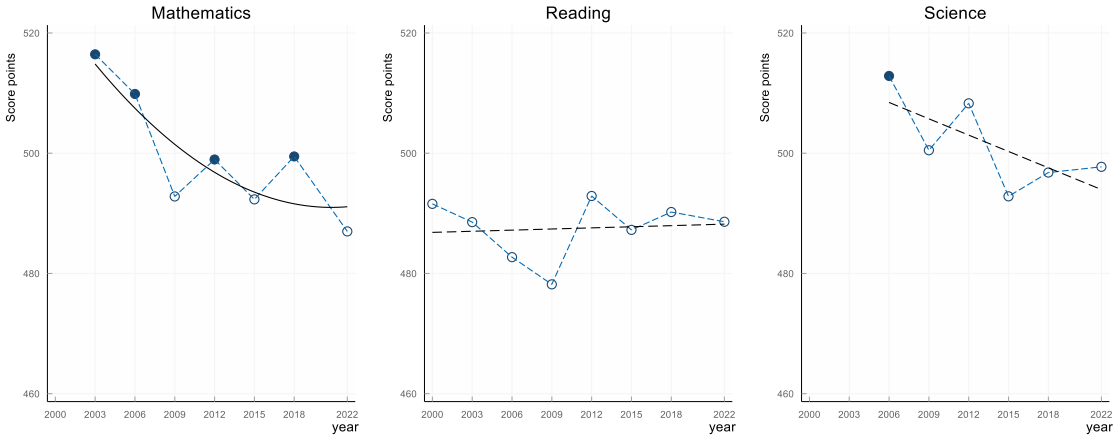
Snapshot of mathematics, reading and science results for Cyprus

Mean performance	Mathematics	Reading	Science
PISA 2000		m	
PISA 2003	m	m	
PISA 2006	m	m	m
PISA 2009	m	m	m
PISA 2012	440*	449*	438*
PISA 2015	437*	443*	433*
PISA 2018	451*	424*	439*
PISA 2022	418	381	411
Average 10-year trend in mean performance (2012 to 2022)	-16.8*	-68.9*	-23.5*
Short-term change in mean performance (2018 to 2022)	-32.4*	-43.3*	-28.1*
Proficiency levels: Change between 2012 and 2022			
Percentage-point change in the share of top-performing students (Level 5 or 6)	+0.2	-2.6*	+0.1
Percentage-point change in the share of low-performing students (below Level 2)	+11.1*	+27.9*	+13.7*
Variation in performance: Change between 2018 and 2022			
Average change among high-achieving students (90th percentile)	-15.3*	-26.9*	-9.6*
Average change among low-achieving students (10th percentile)	-31.2*	-49.4*	-38.3*
Gap in learning outcomes between high- and low-achieving students	widening gap	widening gap	widening gap
Trends by quarter of socio-economic status (ESCS): 2018-22 / average 10-year trend			
Performance among advantaged students (top quarter of ESCS)	-18.0* / -19.3*	-31.3* / -72.4*	-20.8* / -33.7*
Performance among disadvantaged students (bottom quarter of ESCS)	-35.2* / -16.0*	-44.6* / -68.3*	-25.7* / -21.1*
Performance gap (top – bottom quarter)	widening / stable	stable / stable	stable / narrowing

Note: * indicates statistically significant trends and changes or mean-performance estimates that are significantly above or below PISA 2022 estimates.
Source: PISA 2022 Database, Tables I.B1.5.1-12, I.B1.5.19, I.B1.5.20 and I.B1.5.21.

Overview of performance trends in Czech Republic

Trends in mathematics, reading and science performance in Czech Republic



Note: White dots indicate mean-performance estimates that are not statistically significantly above/below PISA 2022 estimates. Black lines indicate the best-fitting trend.
Source: OECD, PISA 2022 Database, Tables I.B1.5.4, I.B1.5.5 and I.B1.5.6.

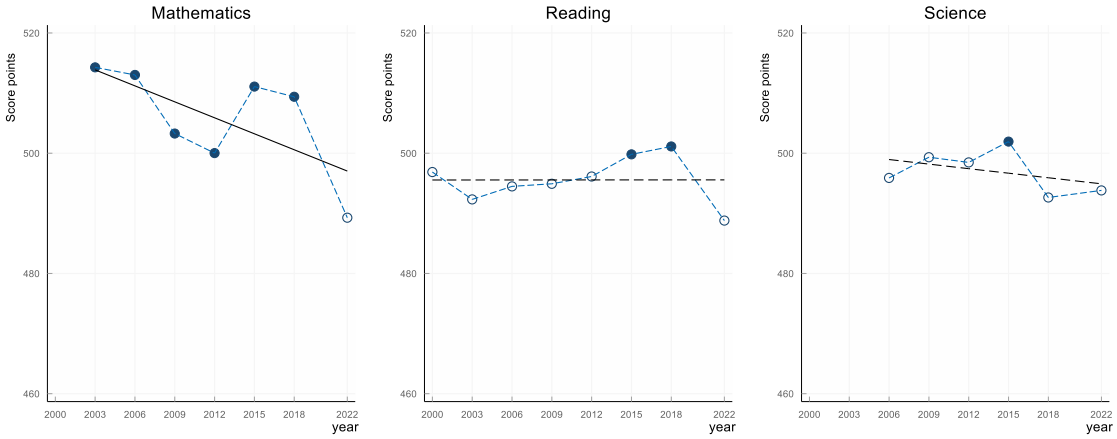
Snapshot of mathematics, reading and science results for Czech Republic

Mean performance	Mathematics	Reading	Science
PISA 2000		492	
PISA 2003	516*	489	
PISA 2006	510*	483	513*
PISA 2009	493	478	500
PISA 2012	499*	493	508
PISA 2015	492	487	493
PISA 2018	499*	490	497
PISA 2022	487	489	498
Average 10-year trend in mean performance (2012 to 2022)	-9.2	-3.1	-7.7
Short-term change in mean performance (2018 to 2022)	-12.5*	-1.6	+1.0
Proficiency levels: Change between 2012 and 2022			
Percentage-point change in the share of top-performing students (Level 5 or 6)	-2.3	+2.0	+1.3
Percentage-point change in the share of low-performing students (below Level 2)	+4.6*	+4.5	+6.1*
Variation in performance: Change between 2018 and 2022			
Average change among high-achieving students (90th percentile)	-8.9	-1.5	+8.0
Average change among low-achieving students (10th percentile)	-12.2*	-2.9	-4.8
Gap in learning outcomes between high- and low-achieving students	stable gap	stable gap	widening gap
Trends by quarter of socio-economic status (ESCS): 2018-22 / average 10-year trend			
Performance among advantaged students (top quarter of ESCS)	-9.4 / -7.7	-0.3 / +1.6	+4.8 / +0.3
Performance among disadvantaged students (bottom quarter of ESCS)	-17.6* / -15.3*	-4.9 / -11.5*	-7.4 / -22.3*
Performance gap (top – bottom quarter)	stable / stable	stable / stable	stable / widening

Note: * indicates statistically significant trends and changes or mean-performance estimates that are significantly above or below PISA 2022 estimates.
Source: PISA 2022 Database, Tables I.B1.5.1-12, I.B1.5.19, I.B1.5.20 and I.B1.5.21.

Overview of performance trends in Denmark

Trends in mathematics, reading and science performance in Denmark



Note: White dots indicate mean-performance estimates that are not statistically significantly above/below PISA 2022 estimates. Black lines indicate the best-fitting trend.
Source: OECD, PISA 2022 Database, Tables I.B1.5.4, I.B1.5.5 and I.B1.5.6.

Snapshot of mathematics, reading and science results for Denmark

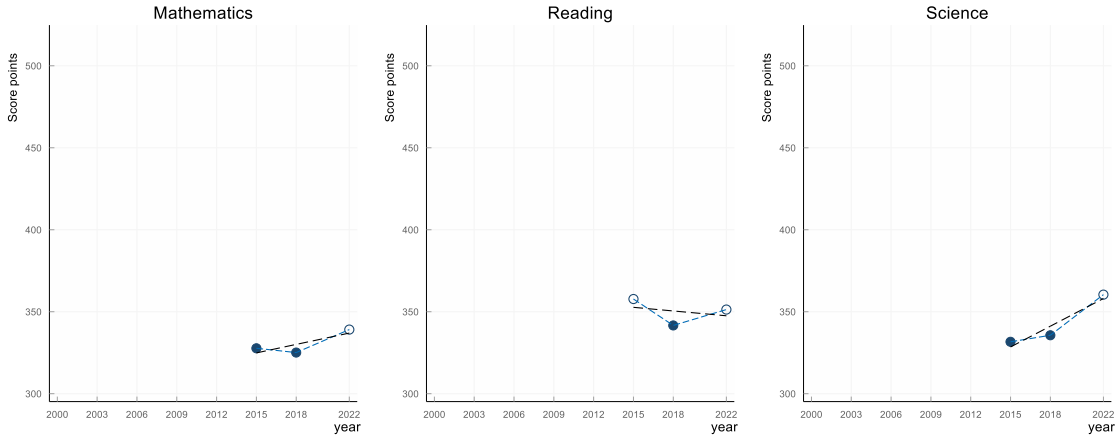
Mean performance	Mathematics	Reading	Science
PISA 2000		497	
PISA 2003	514*	492	
PISA 2006	513*	494	496
PISA 2009	503*	495	499
PISA 2012	500*	496	498
PISA 2015	511*	500*	502*
PISA 2018	509*	501*	493
PISA 2022	489	489	494
Average 10-year trend in mean performance (2012 to 2022)	-11.9*	-7.1	-7.1
Short-term change in mean performance (2018 to 2022)	-20.1*	-12.3*	+1.2
Proficiency levels: Change between 2012 and 2022			
Percentage-point change in the share of top-performing students (Level 5 or 6)	-2.3*	+0.9	+0.2
Percentage-point change in the share of low-performing students (below Level 2)	+3.6*	+4.3*	+2.8
Variation in performance: Change between 2018 and 2022			
Average change among high-achieving students (90th percentile)	-18.0*	-12.8*	+6.8
Average change among low-achieving students (10th percentile)	-17.9*	-12.6*	-2.3
Gap in learning outcomes between high- and low-achieving students	stable gap	stable gap	stable gap
Trends by quarter of socio-economic status (ESCS): 2018-22 / average 10-year trend			
Performance among advantaged students (top quarter of ESCS)	-19.3* / -20.1*	-17.7* / -18.1*	-1.8 / -16.6*
Performance among disadvantaged students (bottom quarter of ESCS)	-22.6* / -8.7*	-12.7* / -4.0	-0.0 / -3.8
Performance gap (top – bottom quarter)	stable / narrowing	stable / narrowing	stable / stable

Note: * indicates statistically significant trends and changes or mean-performance estimates that are significantly above or below PISA 2022 estimates.
Source: PISA 2022 Database, Tables I.B1.5.1-12, I.B1.5.19, I.B1.5.20 and I.B1.5.21.

> *Note: In 2022, exclusions from the sample exceeded the acceptable rate by a large margin and showed a marked increase with respect to 2018. High levels of student exclusions may bias performance results upwards. In Denmark, a major reason for the rise appears to be the increased share of students with diagnosed dyslexia and the fact that more of these students are using electronic assistive devices to help them read on the screen, including during exams. The lack of such an accommodation in PISA led schools to exclude many of these students.*

Overview of performance trends in Dominican Republic

Trends in mathematics, reading and science performance in Dominican Republic



Note: White dots indicate mean-performance estimates that are not statistically significantly above/below PISA 2022 estimates. Black lines indicate the best-fitting trend.
Source: OECD, PISA 2022 Database, Tables I.B1.5.4, I.B1.5.5 and I.B1.5.6.

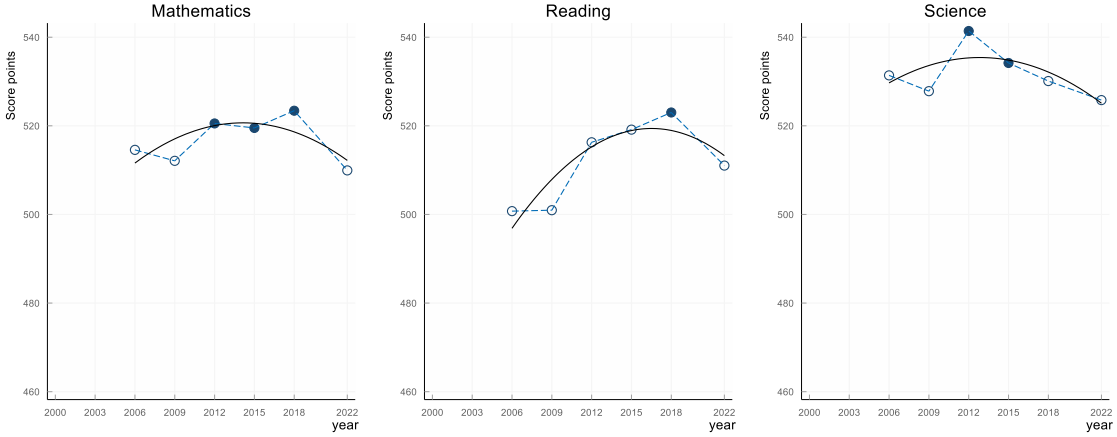
Snapshot of mathematics, reading and science results for Dominican Republic

Mean performance	Mathematics	Reading	Science
PISA 2000		m	
PISA 2003	m	m	
PISA 2006	m	m	m
PISA 2009	m	m	m
PISA 2012	m	m	m
PISA 2015	328*	358	332*
PISA 2018	325*	342*	336*
PISA 2022	339	351	360
Average 10-year trend in mean performance (2015 to 2022)	+17.2*	-7.0	+41.5*
Short-term change in mean performance (2018 to 2022)	+14.0*	+9.7*	+24.8*
Proficiency levels: Change between 2015 and 2022			
Percentage-point change in the share of top-performing students (Level 5 or 6)	-0.0*	+0.0	+0.0
Percentage-point change in the share of low-performing students (below Level 2)	+1.9	+3.3	-9.1*
Variation in performance: Change between 2018 and 2022			
Average change among high-achieving students (90th percentile)	-7.0	+10.7	+21.4*
Average change among low-achieving students (10th percentile)	+36.4*	+7.5	+25.0*
Gap in learning outcomes between high- and low-achieving students	narrowing gap	stable gap	stable gap
Trends by quarter of socio-economic status (ESCS): 2018-22 / average 10-year trend			
Performance among advantaged students (top quarter of ESCS)	+6.4 / +4.8	+12.9 / -12.4	+21.1* / +29.3*
Performance among disadvantaged students (bottom quarter of ESCS)	+17.4* / +20.1*	+7.0 / -3.7	+26.5* / +48.2*
Performance gap (top – bottom quarter)	stable / stable	stable / stable	stable / stable

Note: * indicates statistically significant trends and changes or mean-performance estimates that are significantly above or below PISA 2022 estimates.
Source: PISA 2022 Database, Tables I.B1.5.1-12, I.B1.5.19, I.B1.5.20 and I.B1.5.21.

Overview of performance trends in Estonia

Trends in mathematics, reading and science performance in Estonia



Note: White dots indicate mean-performance estimates that are not statistically significantly above/below PISA 2022 estimates. Black lines indicate the best-fitting trend.
Source: OECD, PISA 2022 Database, Tables I.B1.5.4, I.B1.5.5 and I.B1.5.6.

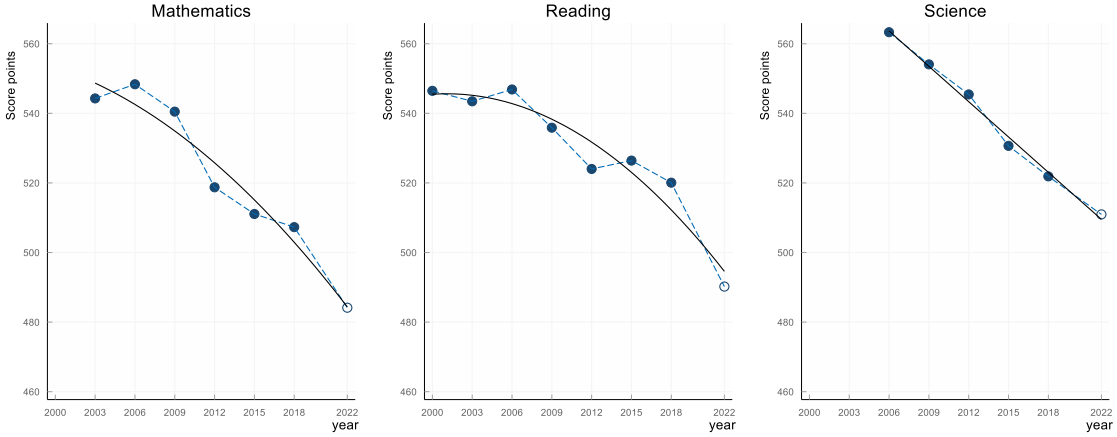
Snapshot of mathematics, reading and science results for Estonia

Mean performance	Mathematics	Reading	Science
PISA 2000		m	
PISA 2003	m	m	
PISA 2006	515	501	531
PISA 2009	512	501	528
PISA 2012	521*	516	541*
PISA 2015	520*	519	534*
PISA 2018	523*	523*	530
PISA 2022	510	511	526
Average 10-year trend in mean performance (2012 to 2022)	-8.9*	-3.7	-15.4*
Short-term change in mean performance (2018 to 2022)	-13.5*	-12.0*	-4.3
Proficiency levels: Change between 2012 and 2022			
Percentage-point change in the share of top-performing students (Level 5 or 6)	-1.5	+2.3	-1.2
Percentage-point change in the share of low-performing students (below Level 2)	+4.4*	+4.7*	+5.1*
Variation in performance: Change between 2018 and 2022			
Average change among high-achieving students (90th percentile)	-7.3	-14.9*	-3.0
Average change among low-achieving students (10th percentile)	-17.7*	-13.7*	-7.7
Gap in learning outcomes between high- and low-achieving students	widening gap	stable gap	stable gap
Trends by quarter of socio-economic status (ESCS): 2018-22 / average 10-year trend			
Performance among advantaged students (top quarter of ESCS)	-5.6 / -1.7	-9.7 / +2.4	-0.8 / -8.2*
Performance among disadvantaged students (bottom quarter of ESCS)	-23.1* / -22.6*	-21.1* / -18.0*	-14.2* / -29.8*
Performance gap (top – bottom quarter)	widening / widening	stable / widening	stable / widening

Note: * indicates statistically significant trends and changes or mean-performance estimates that are significantly above or below PISA 2022 estimates.
Source: PISA 2022 Database, Tables I.B1.5.1-12, I.B1.5.19, I.B1.5.20 and I.B1.5.21.

Overview of performance trends in Finland

Trends in mathematics, reading and science performance in Finland



Note: White dots indicate mean-performance estimates that are not statistically significantly above/below PISA 2022 estimates. Black lines indicate the best-fitting trend.
Source: OECD, PISA 2022 Database, Tables I.B1.5.4, I.B1.5.5 and I.B1.5.6.

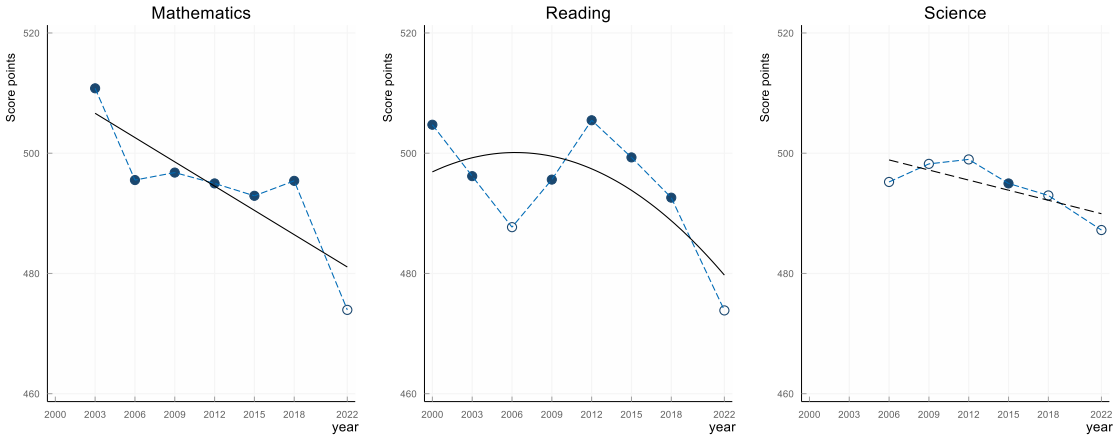
Snapshot of mathematics, reading and science results for Finland

Mean performance	Mathematics	Reading	Science
PISA 2000		546*	
PISA 2003	544*	543*	
PISA 2006	548*	547*	563*
PISA 2009	541*	536*	554*
PISA 2012	519*	524*	545*
PISA 2015	511*	526*	531*
PISA 2018	507*	520*	522*
PISA 2022	484	490	511
Average 10-year trend in mean performance (2012 to 2022)	-33.2*	-34.0*	-34.1*
Short-term change in mean performance (2018 to 2022)	-23.2*	-29.9*	-10.9*
Proficiency levels: Change between 2012 and 2022			
Percentage-point change in the share of top-performing students (Level 5 or 6)	-6.7*	-4.7*	-4.4*
Percentage-point change in the share of low-performing students (below Level 2)	+12.6*	+10.1*	+10.3*
Variation in performance: Change between 2018 and 2022			
Average change among high-achieving students (90th percentile)	-12.2*	-23.5*	+3.9
Average change among low-achieving students (10th percentile)	-33.3*	-36.9*	-23.5*
Gap in learning outcomes between high- and low-achieving students	widening gap	widening gap	widening gap
Trends by quarter of socio-economic status (ESCS): 2018-22 / average 10-year trend			
Performance among advantaged students (top quarter of ESCS)	-16.0* / -25.8*	-24.4* / -25.2*	-3.7 / -22.6*
Performance among disadvantaged students (bottom quarter of ESCS)	-26.5* / -40.4*	-32.8* / -41.2*	-14.5* / -43.3*
Performance gap (top – bottom quarter)	widening / widening	stable / widening	stable / widening

Note: * indicates statistically significant trends and changes or mean-performance estimates that are significantly above or below PISA 2022 estimates.
Source: PISA 2022 Database, Tables I.B1.5.1-12, I.B1.5.19, I.B1.5.20 and I.B1.5.21.

Overview of performance trends in France

Trends in mathematics, reading and science performance in France



Note: White dots indicate mean-performance estimates that are not statistically significantly above/below PISA 2022 estimates. Black lines indicate the best-fitting trend.
Source: OECD, PISA 2022 Database, Tables I.B1.5.4, I.B1.5.5 and I.B1.5.6.

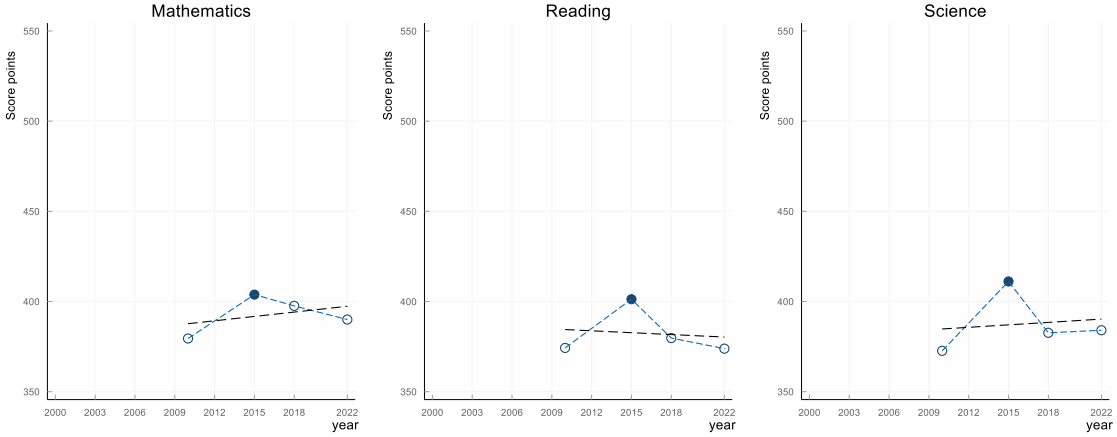
Snapshot of mathematics, reading and science results for France

Mean performance	Mathematics	Reading	Science
PISA 2000		505*	
PISA 2003	511*	496*	
PISA 2006	496*	488	495
PISA 2009	497*	496*	498
PISA 2012	495*	505*	499
PISA 2015	493*	499*	495*
PISA 2018	495*	493*	493
PISA 2022	474	474	487
Average 10-year trend in mean performance (2012 to 2022)	-19.7*	-31.2*	-11.5
Short-term change in mean performance (2018 to 2022)	-21.5*	-18.8*	-5.8
Proficiency levels: Change between 2012 and 2022			
Percentage-point change in the share of top-performing students (Level 5 or 6)	-5.5*	-5.8*	-0.2
Percentage-point change in the share of low-performing students (below Level 2)	+6.5*	+8.0*	+5.1*
Variation in performance: Change between 2018 and 2022			
Average change among high-achieving students (90th percentile)	-18.5*	-13.9*	+5.0
Average change among low-achieving students (10th percentile)	-16.7*	-24.6*	-14.3*
Gap in learning outcomes between high- and low-achieving students	stable gap	stable gap	widening gap
Trends by quarter of socio-economic status (ESCS): 2018-22 / average 10-year trend			
Performance among advantaged students (top quarter of ESCS)	-16.3* / -25.0*	-13.4* / -39.6*	+0.6 / -14.7*
Performance among disadvantaged students (bottom quarter of ESCS)	-21.8* / -17.7*	-23.8* / -26.3*	-12.9* / -13.5*
Performance gap (top – bottom quarter)	stable / stable	stable / stable	stable / stable

Note: * indicates statistically significant trends and changes or mean-performance estimates that are significantly above or below PISA 2022 estimates.
Source: PISA 2022 Database, Tables I.B1.5.1-12, I.B1.5.19, I.B1.5.20 and I.B1.5.21.

Overview of performance trends in Georgia

Trends in mathematics, reading and science performance in Georgia



Note: White dots indicate mean-performance estimates that are not statistically significantly above/below PISA 2022 estimates. Black lines indicate the best-fitting trend.
Source: OECD, PISA 2022 Database, Tables I.B1.5.4, I.B1.5.5 and I.B1.5.6.

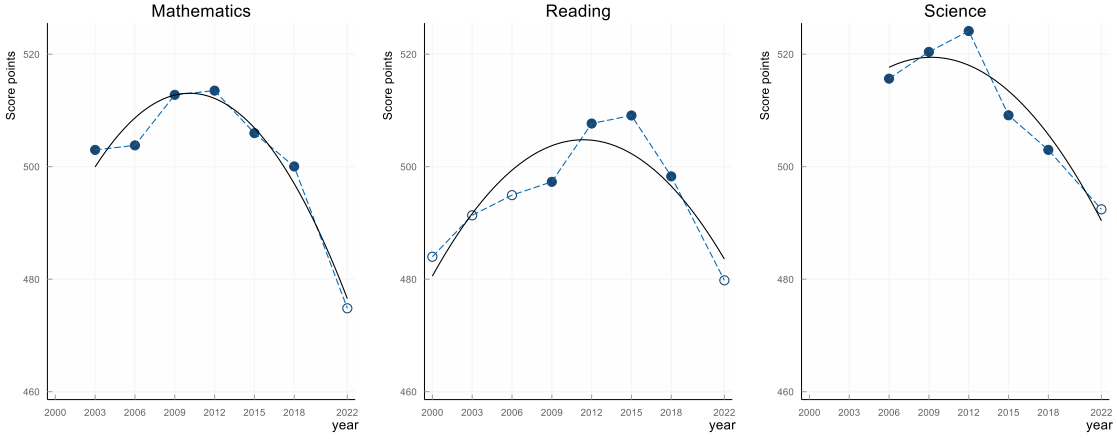
Snapshot of mathematics, reading and science results for Georgia

Mean performance	Mathematics	Reading	Science
PISA 2000		m	
PISA 2003	m	m	
PISA 2006	m	m	m
PISA 2009	379	374	373
PISA 2012	m	m	m
PISA 2015	404*	401*	411*
PISA 2018	398	380	383
PISA 2022	390	374	384
Average 10-year trend in mean performance (2015 to 2022)	-19.8*	-37.6*	-35.9*
Short-term change in mean performance (2018 to 2022)	-7.6	-5.9	+1.4
Proficiency levels: Change between 2015 and 2022			
Percentage-point change in the share of top-performing students (Level 5 or 6)	-0.4	-1.0*	-0.6*
Percentage-point change in the share of low-performing students (below Level 2)	+9.4*	+15.2*	+13.8*
Variation in performance: Change between 2018 and 2022			
Average change among high-achieving students (90th percentile)	-12.1	-7.6	+0.6
Average change among low-achieving students (10th percentile)	+1.9	-4.4	+3.5
Gap in learning outcomes between high- and low-achieving students	stable gap	stable gap	stable gap
Trends by quarter of socio-economic status (ESCS): 2018-22 / average 10-year trend			
Performance among advantaged students (top quarter of ESCS)	-13.0 / -34.4*	-8.5 / -55.9*	+4.2 / -40.4*
Performance among disadvantaged students (bottom quarter of ESCS)	-1.1 / +3.1	-7.4 / -17.6*	-0.3 / -28.3*
Performance gap (top – bottom quarter)	stable / narrowing	stable / narrowing	stable / stable

Note: * indicates statistically significant trends and changes or mean-performance estimates that are significantly above or below PISA 2022 estimates.
Source: PISA 2022 Database, Tables I.B1.5.1-12, I.B1.5.19, I.B1.5.20 and I.B1.5.21.

Overview of performance trends in Germany

Trends in mathematics, reading and science performance in Germany



Note: White dots indicate mean-performance estimates that are not statistically significantly above/below PISA 2022 estimates. Black lines indicate the best-fitting trend.
Source: OECD, PISA 2022 Database, Tables I.B1.5.4, I.B1.5.5 and I.B1.5.6.

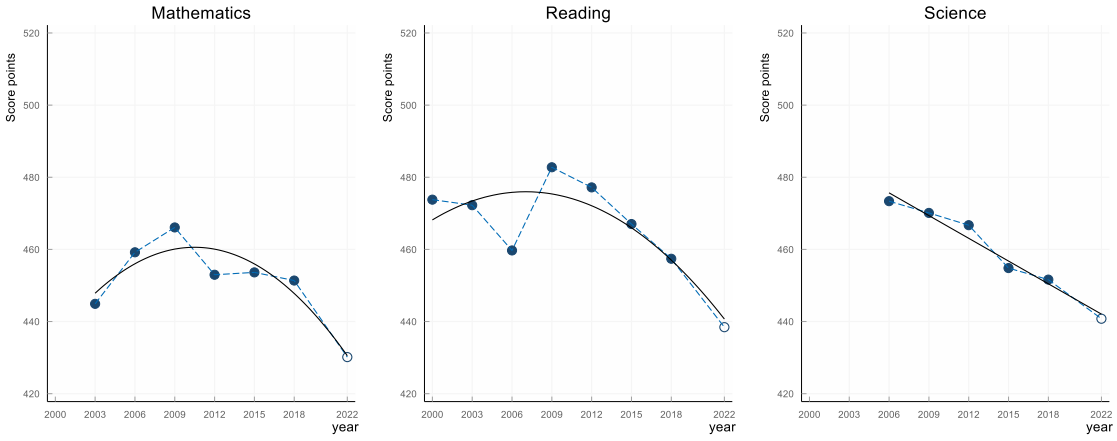
Snapshot of mathematics, reading and science results for Germany

Mean performance	Mathematics	Reading	Science
PISA 2000		484	
PISA 2003	503*	491	
PISA 2006	504*	495	516*
PISA 2009	513*	497*	520*
PISA 2012	514*	508*	524*
PISA 2015	506*	509*	509*
PISA 2018	500*	498*	503*
PISA 2022	475	480	492
Average 10-year trend in mean performance (2012 to 2022)	-38.0*	-29.9*	-30.6*
Short-term change in mean performance (2018 to 2022)	-25.2*	-18.5*	-10.6*
Proficiency levels: Change between 2012 and 2022			
Percentage-point change in the share of top-performing students (Level 5 or 6)	-8.9*	-0.8	-2.5
Percentage-point change in the share of low-performing students (below Level 2)	+11.8*	+11.0*	+10.7*
Variation in performance: Change between 2018 and 2022			
Average change among high-achieving students (90th percentile)	-21.6*	-16.7*	-1.8
Average change among low-achieving students (10th percentile)	-22.2*	-14.1*	-11.2
Gap in learning outcomes between high- and low-achieving students	stable gap	stable gap	stable gap
Trends by quarter of socio-economic status (ESCS): 2018-22 / average 10-year trend			
Performance among advantaged students (top quarter of ESCS)	-18.5* / -28.7*	-16.2* / -13.3*	-2.2 / -16.2*
Performance among disadvantaged students (bottom quarter of ESCS)	-25.5* / -35.0*	-16.6* / -31.7*	-8.9 / -30.9*
Performance gap (top – bottom quarter)	stable / stable	stable / widening	stable / widening

Note: * indicates statistically significant trends and changes or mean-performance estimates that are significantly above or below PISA 2022 estimates.
Source: PISA 2022 Database, Tables I.B1.5.1-12, I.B1.5.19, I.B1.5.20 and I.B1.5.21.

Overview of performance trends in Greece

Trends in mathematics, reading and science performance in Greece



Note: White dots indicate mean-performance estimates that are not statistically significantly above/below PISA 2022 estimates. Black lines indicate the best-fitting trend.
Source: OECD, PISA 2022 Database, Tables I.B1.5.4, I.B1.5.5 and I.B1.5.6.

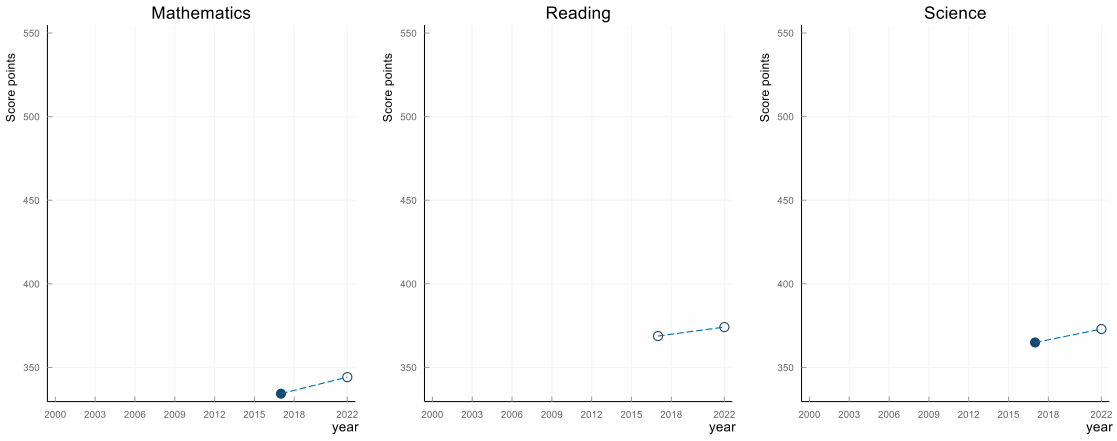
Snapshot of mathematics, reading and science results for Greece

Mean performance	Mathematics	Reading	Science
PISA 2000		474*	
PISA 2003	445*	472*	
PISA 2006	459*	460*	473*
PISA 2009	466*	483*	470*
PISA 2012	453*	477*	467*
PISA 2015	454*	467*	455*
PISA 2018	451*	457*	452*
PISA 2022	430	438	441
Average 10-year trend in mean performance (2012 to 2022)	-22.5*	-38.5*	-24.2*
Short-term change in mean performance (2018 to 2022)	-21.2*	-19.0*	-10.8*
Proficiency levels: Change between 2012 and 2022			
Percentage-point change in the share of top-performing students (Level 5 or 6)	-1.9*	-3.2*	-1.0
Percentage-point change in the share of low-performing students (below Level 2)	+11.5*	+15.0*	+11.8*
Variation in performance: Change between 2018 and 2022			
Average change among high-achieving students (90th percentile)	-22.9*	-22.2*	-1.8
Average change among low-achieving students (10th percentile)	-8.2	-10.7	-15.0*
Gap in learning outcomes between high- and low-achieving students	narrowing gap	stable gap	stable gap
Trends by quarter of socio-economic status (ESCS): 2018-22 / average 10-year trend			
Performance among advantaged students (top quarter of ESCS)	-21.3* / -28.2*	-17.6* / -41.6*	-3.8 / -27.1*
Performance among disadvantaged students (bottom quarter of ESCS)	-15.5* / -14.2*	-16.3* / -29.9*	-12.0* / -18.1*
Performance gap (top – bottom quarter)	stable / narrowing	stable / stable	stable / stable

Note: * indicates statistically significant trends and changes or mean-performance estimates that are significantly above or below PISA 2022 estimates.
Source: PISA 2022 Database, Tables I.B1.5.1-12, I.B1.5.19, I.B1.5.20 and I.B1.5.21.

Overview of performance trends in Guatemala

Trends in mathematics, reading and science performance in Guatemala



Note: White dots indicate mean-performance estimates that are not statistically significantly above/below PISA 2022 estimates.
Source: OECD, PISA 2022 Database, Tables I.B1.5.4, I.B1.5.5 and I.B1.5.6.

Snapshot of mathematics, reading and science results for Guatemala

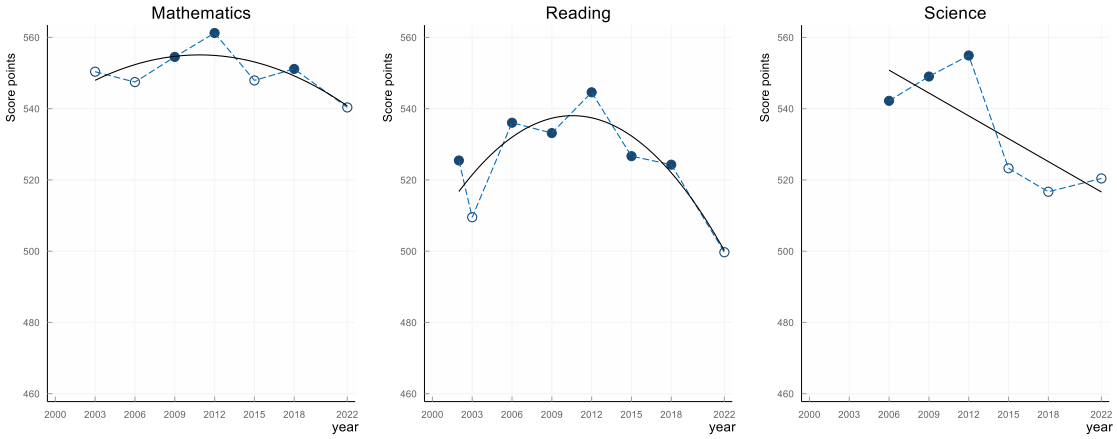
Mean performance	Mathematics	Reading	Science
PISA 2000		m	
PISA 2003	m	m	
PISA 2006	m	m	m
PISA 2009	m	m	m
PISA 2012	m	m	m
PISA 2015	m	m	m
PISA 2018	334*	369	365*
PISA 2022	344	374	373
Average 10-year trend in mean performance (2012 to 2022)	m	m	m
Short-term change in mean performance (2018 to 2022)	+9.9*	+5.4	+8.0*
Proficiency levels: Change between 2017 and 2022			
Percentage-point change in the share of top-performing students (Level 5 or 6)	m	m	m
Percentage-point change in the share of low-performing students (below Level 2)	m	m	m
Variation in performance: Change between 2018 and 2022			
Average change among high-achieving students (90th percentile)	+9.2	+3.5	+10.8
Average change among low-achieving students (10th percentile)	+8.8	+10.0	+5.5
Gap in learning outcomes between high- and low-achieving students	stable gap	stable gap	stable gap
Trends by quarter of socio-economic status (ESCS): 2018-22 / average 10-year trend			
Performance among advantaged students (top quarter of ESCS)	m / m	m / m	m / m
Performance among disadvantaged students (bottom quarter of ESCS)	m / m	m / m	m / m
Performance gap (top – bottom quarter)	m / m	m / m	m / m

Note: * indicates statistically significant trends and changes or mean-performance estimates that are significantly above or below PISA 2022 estimates.
Source: PISA 2022 Database, Tables I.B1.5.1-12, I.B1.5.19, I.B1.5.20 and I.B1.5.21.

> *Note: Results for 2018 refer to the results of the PISA for Development assessment in 2017.*

Overview of performance trends in Hong Kong (China)

Trends in mathematics, reading and science performance in Hong Kong (China)



Note: White dots indicate mean-performance estimates that are not statistically significantly above/below PISA 2022 estimates. Black lines indicate the best-fitting trend.
Source: OECD, PISA 2022 Database, Tables I.B1.5.4, I.B1.5.5 and I.B1.5.6.

Snapshot of mathematics, reading and science results for Hong Kong (China)

Mean performance	Mathematics	Reading	Science
PISA 2000		525*	
PISA 2003	550	510	
PISA 2006	547	536*	542*
PISA 2009	555*	533*	549*
PISA 2012	561*	545*	555*
PISA 2015	548	527*	523
PISA 2018	551*	524*	517
PISA 2022	540	500	520
Average 10-year trend in mean performance (2012 to 2022)	-17.8*	-41.5*	-31.3*
Short-term change in mean performance (2018 to 2022)	-10.8*	-24.6*	+3.7
Proficiency levels: Change between 2012 and 2022			
Percentage-point change in the share of top-performing students (Level 5 or 6)	-6.5*	-7.8*	-6.0*
Percentage-point change in the share of low-performing students (below Level 2)	+5.3*	+10.7*	+7.3*
Variation in performance: Change between 2018 and 2022			
Average change among high-achieving students (90th percentile)	+5.5	-23.8*	+13.2*
Average change among low-achieving students (10th percentile)	-27.2*	-23.9*	-6.4
Gap in learning outcomes between high- and low-achieving students	widening gap	stable gap	widening gap
Trends by quarter of socio-economic status (ESCS): 2018-22 / average 10-year trend			
Performance among advantaged students (top quarter of ESCS)	-5.2 / -22.1*	-31.9* / -46.5*	+1.6 / -31.1*
Performance among disadvantaged students (bottom quarter of ESCS)	-12.6 / -19.8*	-19.4* / -42.3*	+3.9 / -31.3*
Performance gap (top – bottom quarter)	stable / stable	stable / stable	stable / stable

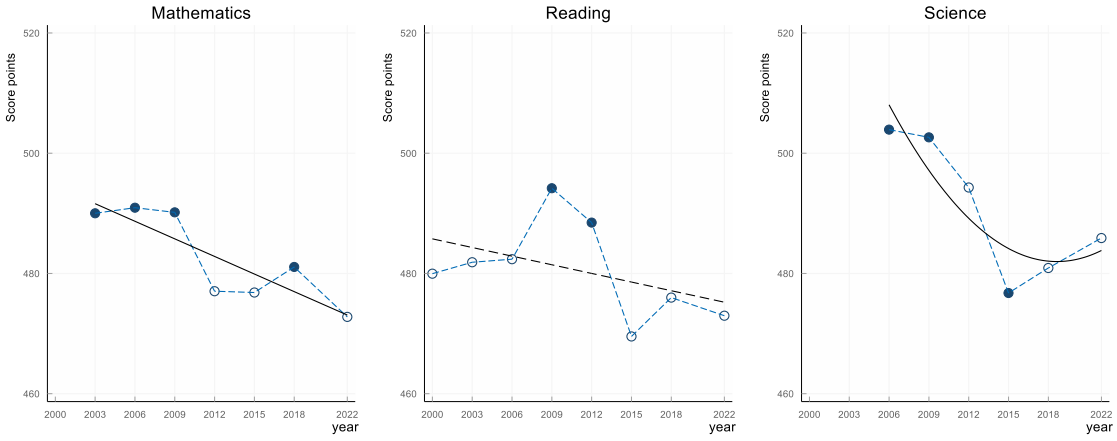
Note: * indicates statistically significant trends and changes or mean-performance estimates that are significantly above or below PISA 2022 estimates.
Source: PISA 2022 Database, Tables I.B1.5.1-12, I.B1.5.19, I.B1.5.20 and I.B1.5.21.

> *Note: In 2022, student response rates decreased with respect to PISA 2018. School response rates also fell short of the target (as they did in 2018). At the school level, the risk of bias due to non-response is limited due to the sampling design. A non-response bias analysis was submitted; however, the strength of the evidence was limited by the fact that no external student-level achievement variables could be used in the analysis (only student grade information, already used in non-*

response adjustments, was available). Reassuringly, the proxies for school and student achievement (school size and student grade) that were used in the analyses showed no or very limited relationship with participation rates. Nevertheless, based on the available evidence, and on the experience of other countries participating in PISA, a small residual upward bias could not be excluded, even though non-response adjustments likely limited its severity.

Overview of performance trends in Hungary

Trends in mathematics, reading and science performance in Hungary



Note: White dots indicate mean-performance estimates that are not statistically significantly above/below PISA 2022 estimates. Black lines indicate the best-fitting trend.
Source: OECD, PISA 2022 Database, Tables I.B1.5.4, I.B1.5.5 and I.B1.5.6.

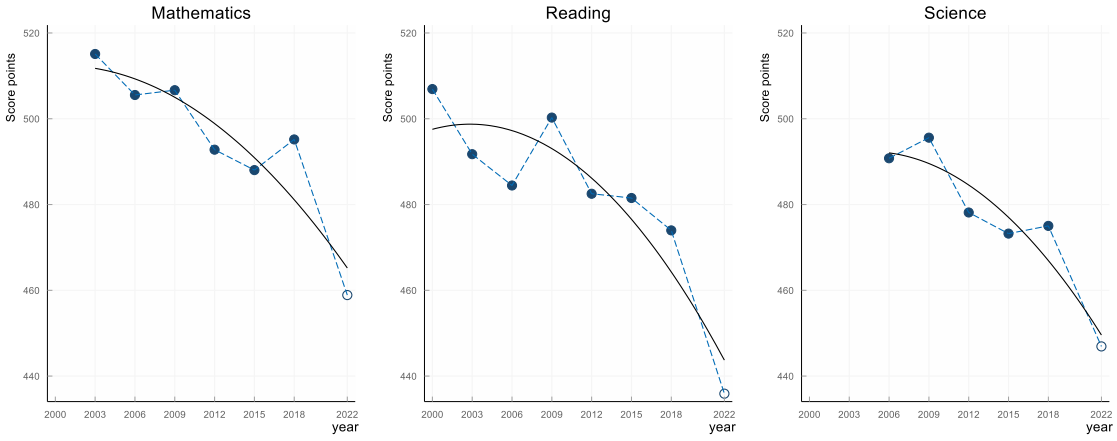
Snapshot of mathematics, reading and science results for Hungary

Mean performance	Mathematics	Reading	Science
PISA 2000		480	
PISA 2003	490*	482	
PISA 2006	491*	482	504*
PISA 2009	490*	494*	503*
PISA 2012	477	488*	494
PISA 2015	477	470	477*
PISA 2018	481*	476	481
PISA 2022	473	473	486
Average 10-year trend in mean performance (2012 to 2022)	-2.9	-11.7	-5.5
Short-term change in mean performance (2018 to 2022)	-8.3*	-3.0	+5.0
Proficiency levels: Change between 2012 and 2022			
Percentage-point change in the share of top-performing students (Level 5 or 6)	-1.4	-0.2	+0.2
Percentage-point change in the share of low-performing students (below Level 2)	+1.4	+6.2*	+4.9*
Variation in performance: Change between 2018 and 2022			
Average change among high-achieving students (90th percentile)	-2.6	-2.3	+9.0
Average change among low-achieving students (10th percentile)	-12.6*	-10.1	+0.6
Gap in learning outcomes between high- and low-achieving students	stable gap	stable gap	stable gap
Trends by quarter of socio-economic status (ESCS): 2018-22 / average 10-year trend			
Performance among advantaged students (top quarter of ESCS)	-5.0 / -2.5	+3.0 / -4.6	+11.2 / -1.4
Performance among disadvantaged students (bottom quarter of ESCS)	-11.8* / -7.2	-10.5 / -19.9*	-2.9 / -14.7*
Performance gap (top – bottom quarter)	stable / stable	stable / stable	stable / stable

Note: * indicates statistically significant trends and changes or mean-performance estimates that are significantly above or below PISA 2022 estimates.
Source: PISA 2022 Database, Tables I.B1.5.1-12, I.B1.5.19, I.B1.5.20 and I.B1.5.21.

Overview of performance trends in Iceland

Trends in mathematics, reading and science performance in Iceland



Note: White dots indicate mean-performance estimates that are not statistically significantly above/below PISA 2022 estimates. Black lines indicate the best-fitting trend.
Source: OECD, PISA 2022 Database, Tables I.B1.5.4, I.B1.5.5 and I.B1.5.6.

Snapshot of mathematics, reading and science results for Iceland

Mean performance	Mathematics	Reading	Science
PISA 2000		507*	
PISA 2003	515*	492*	
PISA 2006	506*	484*	491*
PISA 2009	507*	500*	496*
PISA 2012	493*	483*	478*
PISA 2015	488*	482*	473*
PISA 2018	495*	474*	475*
PISA 2022	459	436	447
Average 10-year trend in mean performance (2012 to 2022)	-30.5*	-46.1*	-29.1*
Short-term change in mean performance (2018 to 2022)	-36.3*	-38.1*	-28.1*
Proficiency levels: Change between 2012 and 2022			
Percentage-point change in the share of top-performing students (Level 5 or 6)	-6.3*	-3.1*	-2.9*
Percentage-point change in the share of low-performing students (below Level 2)	+12.6*	+18.7*	+11.9*
Variation in performance: Change between 2018 and 2022			
Average change among high-achieving students (90th percentile)	-34.4*	-39.4*	-23.0*
Average change among low-achieving students (10th percentile)	-29.6*	-33.3*	-30.1*
Gap in learning outcomes between high- and low-achieving students	stable gap	stable gap	stable gap
Trends by quarter of socio-economic status (ESCS): 2018-22 / average 10-year trend			
Performance among advantaged students (top quarter of ESCS)	-33.7* / -29.5*	-33.1* / -36.6*	-23.8* / -23.3*
Performance among disadvantaged students (bottom quarter of ESCS)	-35.5* / -42.1*	-42.4* / -65.6*	-33.9* / -49.4*
Performance gap (top – bottom quarter)	stable / stable	stable / widening	stable / widening

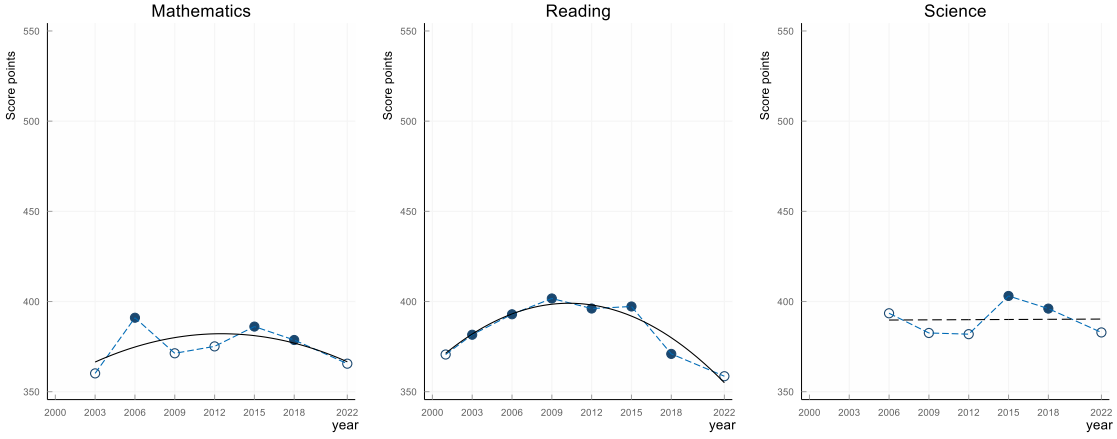
Note: * indicates statistically significant trends and changes or mean-performance estimates that are significantly above or below PISA 2022 estimates.
Source: PISA 2022 Database, Tables I.B1.5.1-12, I.B1.5.19, I.B1.5.20 and I.B1.5.21.

> *Note: In 2022, Iceland relied on a server-based administration (using Chromebooks) in some schools. Students in these schools experienced difficulties moving through the cognitive assessment early in the testing period. Further investigation traced the problem back to overload on the PISA contractor's server. The problem was rapidly solved for students who were tested later and did not affect other countries that used a server-based administration. In Iceland, it affected at most 13%*

of the final sample (438 students). During data adjudication, these data were thoroughly reviewed, and considered to be fit for reporting: the responses of students who were potentially affected did show good fit with the model, and were not remarkably different from the performance of students in other schools (see Annex A4). Furthermore, analyses conducted by the PISA National Centre for Iceland (where, due to the census nature of the survey, schools' results in PISA could be tracked over time) confirmed that the issue affected only students' ability to complete the test but not the way in which these students responded to the parts that they completed: performance changes were very similar in affected and non-affected schools.

Overview of performance trends in Indonesia

Trends in mathematics, reading and science performance in Indonesia



Note: White dots indicate mean-performance estimates that are not statistically significantly above/below PISA 2022 estimates. Black lines indicate the best-fitting trend.
Source: OECD, PISA 2022 Database, Tables I.B1.5.4, I.B1.5.5 and I.B1.5.6.

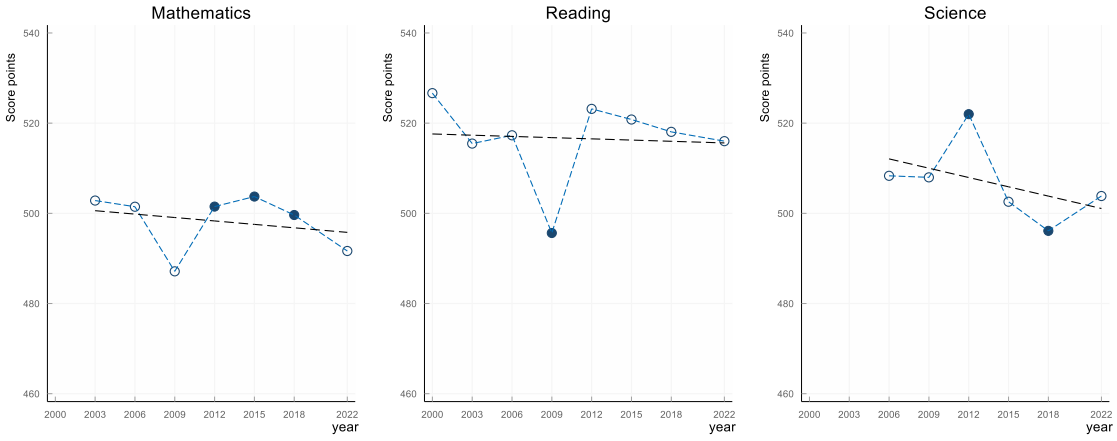
Snapshot of mathematics, reading and science results for Indonesia

Mean performance	Mathematics	Reading	Science
PISA 2000		371	
PISA 2003	360	382*	
PISA 2006	391*	393*	393
PISA 2009	371	402*	383
PISA 2012	375	396*	382
PISA 2015	386*	397*	403*
PISA 2018	379*	371*	396*
PISA 2022	366	359	383
Average 10-year trend in mean performance (2012 to 2022)	-11.8*	-42.1*	-2.8
Short-term change in mean performance (2018 to 2022)	-13.1*	-12.4*	-13.2*
Proficiency levels: Change between 2012 and 2022			
Percentage-point change in the share of top-performing students (Level 5 or 6)	-0.2	-0.1	+0.0
Percentage-point change in the share of low-performing students (below Level 2)	+6.0*	+19.3*	-0.8
Variation in performance: Change between 2018 and 2022			
Average change among high-achieving students (90th percentile)	-31.9*	-12.6	-13.4*
Average change among low-achieving students (10th percentile)	+8.9	-12.7*	-15.2*
Gap in learning outcomes between high- and low-achieving students	narrowing gap	stable gap	stable gap
Trends by quarter of socio-economic status (ESCS): 2018-22 / average 10-year trend			
Performance among advantaged students (top quarter of ESCS)	-22.8* / -28.8*	-16.3 / -47.2*	-21.7* / -14.1
Performance among disadvantaged students (bottom quarter of ESCS)	-5.7 / -2.7	-7.2 / -38.2*	-7.5 / +3.3
Performance gap (top – bottom quarter)	stable / narrowing	stable / stable	stable / narrowing

Note: * indicates statistically significant trends and changes or mean-performance estimates that are significantly above or below PISA 2022 estimates.
Source: PISA 2022 Database, Tables I.B1.5.1-12, I.B1.5.19, I.B1.5.20 and I.B1.5.21.

Overview of performance trends in Ireland

Trends in mathematics, reading and science performance in Ireland



Note: White dots indicate mean-performance estimates that are not statistically significantly above/below PISA 2022 estimates. Black lines indicate the best-fitting trend.
Source: OECD, PISA 2022 Database, Tables I.B1.5.4, I.B1.5.5 and I.B1.5.6.

Snapshot of mathematics, reading and science results for Ireland

Mean performance	Mathematics	Reading	Science
PISA 2000		527	
PISA 2003	503	515	
PISA 2006	501	517	508
PISA 2009	487	496*	508
PISA 2012	501*	523	522*
PISA 2015	504*	521	503
PISA 2018	500*	518	496*
PISA 2022	492	516	504
Average 10-year trend in mean performance (2012 to 2022)	-10.4*	-7.1	-17.1*
Short-term change in mean performance (2018 to 2022)	-8.0*	-2.1	+7.7*
Proficiency levels: Change between 2012 and 2022			
Percentage-point change in the share of top-performing students (Level 5 or 6)	-3.4*	-1.2	-3.2*
Percentage-point change in the share of low-performing students (below Level 2)	+2.1	+1.9	+4.5*
Variation in performance: Change between 2018 and 2022			
Average change among high-achieving students (90th percentile)	-5.0	-7.8	+11.0*
Average change among low-achieving students (10th percentile)	-10.7*	+1.8	+3.9
Gap in learning outcomes between high- and low-achieving students	stable gap	stable gap	stable gap
Trends by quarter of socio-economic status (ESCS): 2018-22 / average 10-year trend			
Performance among advantaged students (top quarter of ESCS)	-3.0 / -17.3*	-1.2 / -14.2*	+11.9* / -23.6*
Performance among disadvantaged students (bottom quarter of ESCS)	-9.8* / -2.8	-3.3 / -1.5	+7.1 / -8.8
Performance gap (top – bottom quarter)	stable / narrowing	stable / narrowing	stable / narrowing

Note: * indicates statistically significant trends and changes or mean-performance estimates that are significantly above or below PISA 2022 estimates.
Source: PISA 2022 Database, Tables I.B1.5.1-12, I.B1.5.19, I.B1.5.20 and I.B1.5.21.

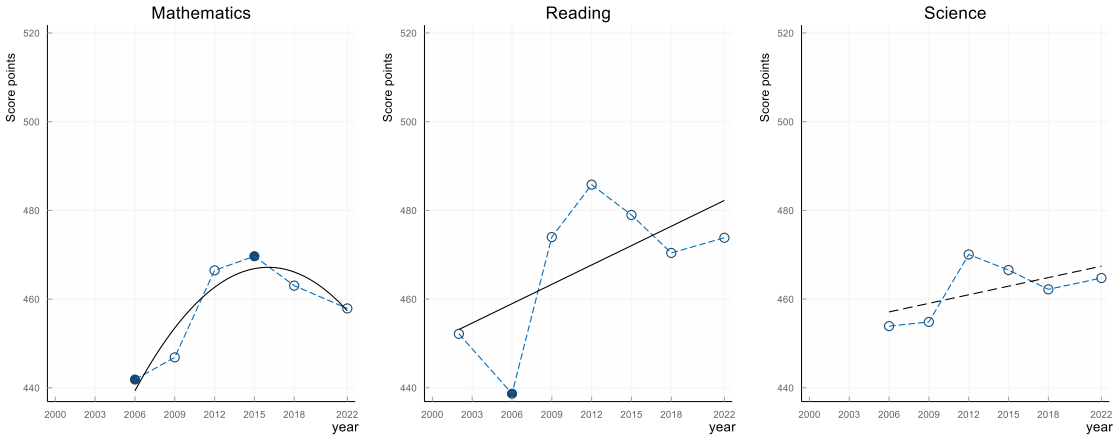
> *Notes: In 2022, student response rates decreased with respect to PISA 2018 and fell short of the target. A thorough non-response bias analysis was submitted using external achievement data at student level as auxiliary information. The analysis provided evidence to suggest a residual upwards bias of about 0.1 standard deviations, after non-response adjustments are taken into account. On the PISA scale, considering that the standard deviation in Ireland ranged (in 2018)*

from 78 score points in mathematics to 91 score points in reading, this could translate into an estimated bias of approximately eight or nine points. The bias associated with trend and cross-country comparisons, however, might be smaller if past data or data for other countries are biased in the same direction.

The testing period changed from March-April (in earlier PISA assessments) to October-December (in PISA 2022).

Overview of performance trends in Israel

Trends in mathematics, reading and science performance in Israel



Note: White dots indicate mean-performance estimates that are not statistically significantly above/below PISA 2022 estimates. Black lines indicate the best-fitting trend.
Source: OECD, PISA 2022 Database, Tables I.B1.5.4, I.B1.5.5 and I.B1.5.6.

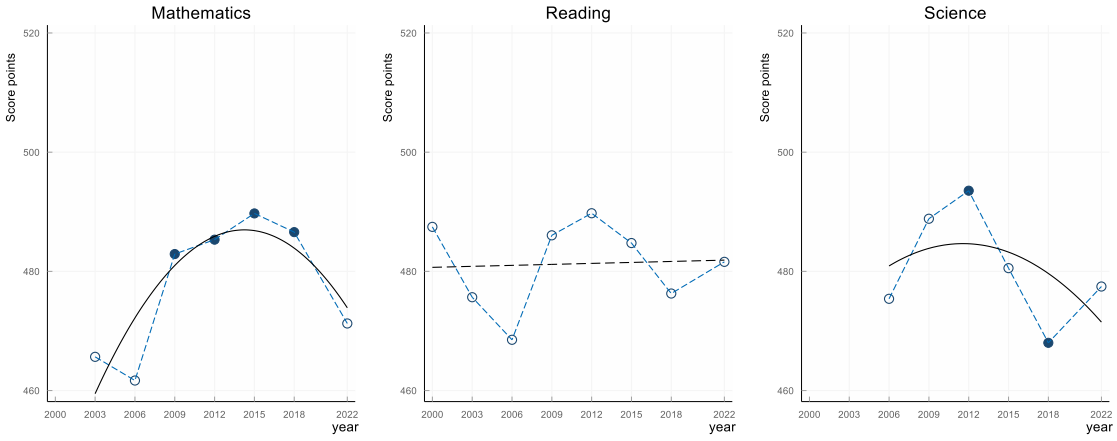
Snapshot of mathematics, reading and science results for Israel

Mean performance	Mathematics	Reading	Science
PISA 2000		452	
PISA 2003	m	m	
PISA 2006	442*	439*	454
PISA 2009	447	474	455
PISA 2012	466	486	470
PISA 2015	470*	479	467
PISA 2018	463	470	462
PISA 2022	458	474	465
Average 10-year trend in mean performance (2012 to 2022)	-9.7	-13.4	-5.1
Short-term change in mean performance (2018 to 2022)	-5.1	+3.4	+2.6
Proficiency levels: Change between 2012 and 2022			
Percentage-point change in the share of top-performing students (Level 5 or 6)	-1.0	+0.9	-0.0
Percentage-point change in the share of low-performing students (below Level 2)	+3.8	+6.1*	+3.2
Variation in performance: Change between 2018 and 2022			
Average change among high-achieving students (90th percentile)	-3.7	+0.6	-1.8
Average change among low-achieving students (10th percentile)	+1.3	+9.8	+6.4
Gap in learning outcomes between high- and low-achieving students	stable gap	stable gap	stable gap
Trends by quarter of socio-economic status (ESCS): 2018-22 / average 10-year trend			
Performance among advantaged students (top quarter of ESCS)	+6.9 / -6.8	+8.9 / -7.1	+9.8 / -4.6
Performance among disadvantaged students (bottom quarter of ESCS)	-10.6 / -9.2	+0.5 / -21.9*	-1.3 / -6.8
Performance gap (top – bottom quarter)	widening / stable	stable / stable	stable / stable

Note: * indicates statistically significant trends and changes or mean-performance estimates that are significantly above or below PISA 2022 estimates.
Source: PISA 2022 Database, Tables I.B1.5.1-12, I.B1.5.19, I.B1.5.20 and I.B1.5.21.

Overview of performance trends in Italy

Trends in mathematics, reading and science performance in Italy



Note: White dots indicate mean-performance estimates that are not statistically significantly above/below PISA 2022 estimates. Black lines indicate the best-fitting trend.
Source: OECD, PISA 2022 Database, Tables I.B1.5.4, I.B1.5.5 and I.B1.5.6.

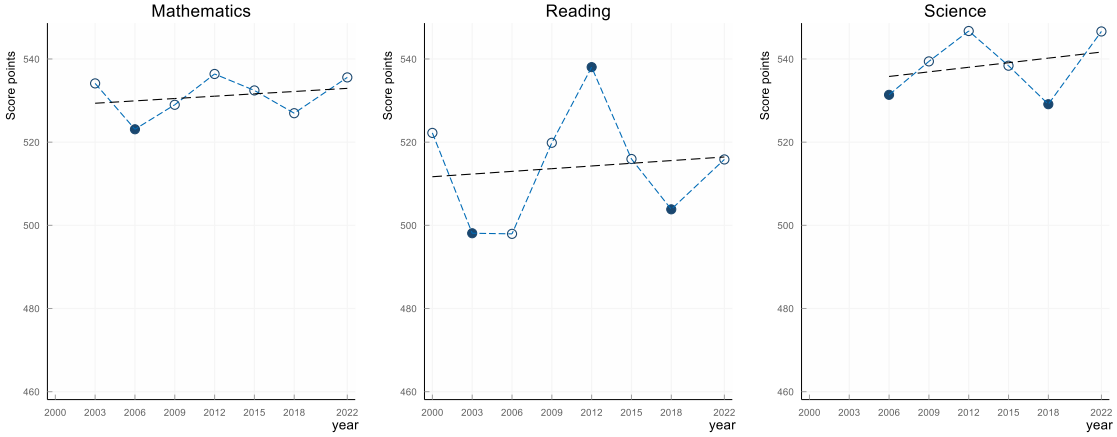
Snapshot of mathematics, reading and science results for Italy

Mean performance	Mathematics	Reading	Science
PISA 2000		487	
PISA 2003	466	476	
PISA 2006	462	469	475
PISA 2009	483*	486	489
PISA 2012	485*	490	494*
PISA 2015	490*	485	481
PISA 2018	487*	476	468*
PISA 2022	471	482	477
Average 10-year trend in mean performance (2012 to 2022)	-14.4*	-9.1	-17.4*
Short-term change in mean performance (2018 to 2022)	-15.3*	+5.3	+9.5*
Proficiency levels: Change between 2012 and 2022			
Percentage-point change in the share of top-performing students (Level 5 or 6)	-3.0*	-1.7	-1.8*
Percentage-point change in the share of low-performing students (below Level 2)	+4.9*	+1.9	+5.2*
Variation in performance: Change between 2018 and 2022			
Average change among high-achieving students (90th percentile)	-15.5*	-1.2	+14.0*
Average change among low-achieving students (10th percentile)	-6.1	+11.6	+8.0
Gap in learning outcomes between high- and low-achieving students	stable gap	stable gap	stable gap
Trends by quarter of socio-economic status (ESCS): 2018-22 / average 10-year trend			
Performance among advantaged students (top quarter of ESCS)	-11.2 / -8.5	+10.1 / -8.9	+21.9* / -11.5*
Performance among disadvantaged students (bottom quarter of ESCS)	-14.9* / -15.3*	+5.9 / -7.3	+2.9 / -19.9*
Performance gap (top – bottom quarter)	stable / stable	stable / stable	widening / stable

Note: * indicates statistically significant trends and changes or mean-performance estimates that are significantly above or below PISA 2022 estimates.
Source: PISA 2022 Database, Tables I.B1.5.1-12, I.B1.5.19, I.B1.5.20 and I.B1.5.21.

Overview of performance trends in Japan

Trends in mathematics, reading and science performance in Japan



Note: White dots indicate mean-performance estimates that are not statistically significantly above/below PISA 2022 estimates. Black lines indicate the best-fitting trend.
Source: OECD, PISA 2022 Database, Tables I.B1.5.4, I.B1.5.5 and I.B1.5.6.

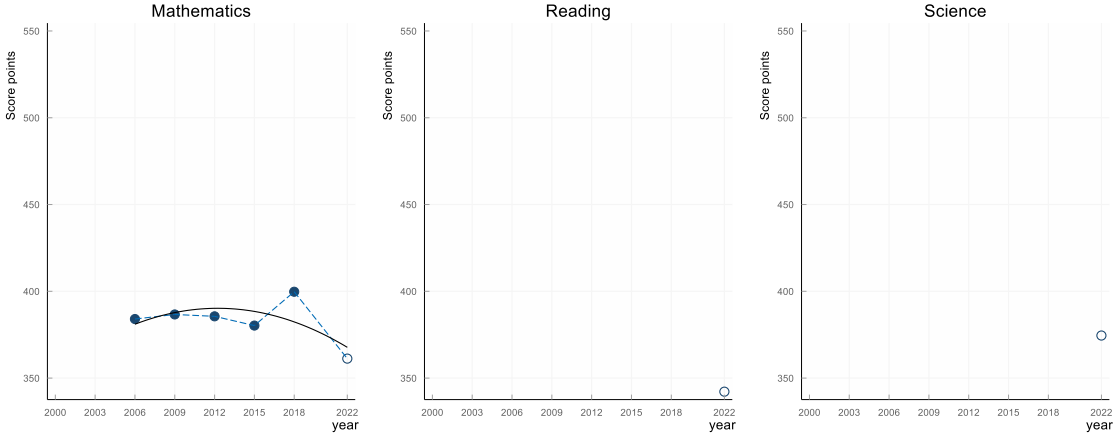
Snapshot of mathematics, reading and science results for Japan

Mean performance	Mathematics	Reading	Science
PISA 2000		522	
PISA 2003	534	498*	
PISA 2006	523*	498	531*
PISA 2009	529	520	539
PISA 2012	536	538*	547
PISA 2015	532	516	538
PISA 2018	527	504*	529*
PISA 2022	536	516	547
Average 10-year trend in mean performance (2012 to 2022)	-1.6	-22.2*	-1.2
Short-term change in mean performance (2018 to 2022)	+8.6	+12.0*	+17.5*
Proficiency levels: Change between 2012 and 2022			
Percentage-point change in the share of top-performing students (Level 5 or 6)	-0.7	-6.1*	-0.2
Percentage-point change in the share of low-performing students (below Level 2)	+0.9	+4.0*	-0.4
Variation in performance: Change between 2018 and 2022			
Average change among high-achieving students (90th percentile)	+16.0*	+9.0	+16.9*
Average change among low-achieving students (10th percentile)	-2.6	+12.8	+16.7*
Gap in learning outcomes between high- and low-achieving students	widening gap	stable gap	stable gap
Trends by quarter of socio-economic status (ESCS): 2018-22 / average 10-year trend			
Performance among advantaged students (top quarter of ESCS)	+17.7* / -5.7	+13.8* / -28.7*	+22.2* / -5.9
Performance among disadvantaged students (bottom quarter of ESCS)	+5.1 / -4.3	+13.1* / -25.0*	+18.1* / -1.4
Performance gap (top – bottom quarter)	stable / stable	stable / stable	stable / stable

Note: * indicates statistically significant trends and changes or mean-performance estimates that are significantly above or below PISA 2022 estimates.
Source: PISA 2022 Database, Tables I.B1.5.1-12, I.B1.5.19, I.B1.5.20 and I.B1.5.21.

Overview of performance trends in Jordan

Trends in mathematics, reading and science performance in Jordan



Note: White dots indicate mean-performance estimates that are not statistically significantly above/below PISA 2022 estimates. Black lines indicate the best-fitting trend.
Source: OECD, PISA 2022 Database, Tables I.B1.5.4, I.B1.5.5 and I.B1.5.6.

Snapshot of mathematics, reading and science results for Jordan

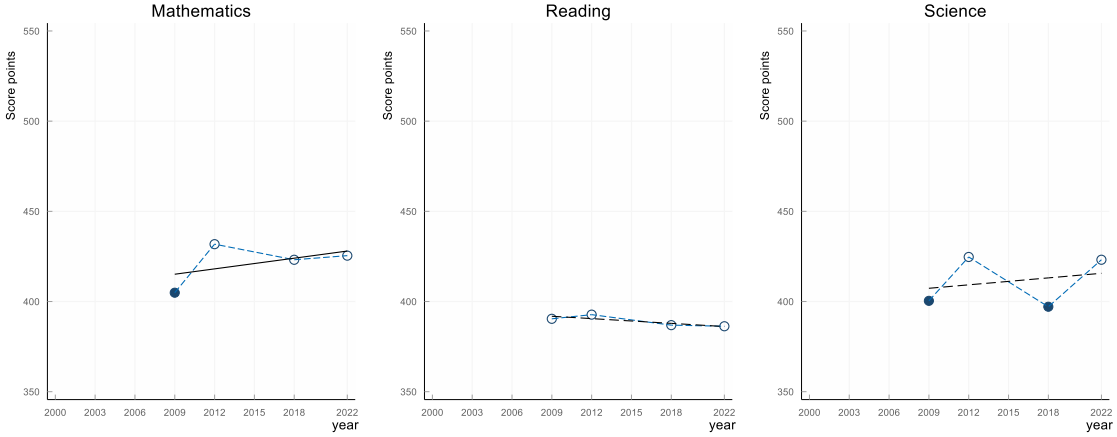
Mean performance	Mathematics	Reading	Science
PISA 2000		m	
PISA 2003	m	m	
PISA 2006	384*	m	m
PISA 2009	387*	m	m
PISA 2012	386*	m	m
PISA 2015	380*	m	m
PISA 2018	400*	m	m
PISA 2022	361	342	375
Average 10-year trend in mean performance (2012 to 2022)	-18.6*	m	m
Short-term change in mean performance (2018 to 2022)	-38.5*	m	m
Proficiency levels: Change between 2012 and 2022			
Percentage-point change in the share of top-performing students (Level 5 or 6)	-0.6	m	m
Percentage-point change in the share of low-performing students (below Level 2)	+14.3*	m	m
Variation in performance: Change between 2018 and 2022			
Average change among high-achieving students (90th percentile)	-66.2*	m	m
Average change among low-achieving students (10th percentile)	-7.9	m	m
Gap in learning outcomes between high- and low-achieving students	narrowing gap		
Trends by quarter of socio-economic status (ESCS): 2018-22 / average 10-year trend			
Performance among advantaged students (top quarter of ESCS)	-47.3* / -34.1*	m / m	m / m
Performance among disadvantaged students (bottom quarter of ESCS)	-32.3* / -3.4	m / m	m / m
Performance gap (top – bottom quarter)	stable / narrowing	m / m	m / m

Note: * indicates statistically significant trends and changes or mean-performance estimates that are significantly above or below PISA 2022 estimates.
Source: PISA 2022 Database, Tables I.B1.5.1-12, I.B1.5.19, I.B1.5.20 and I.B1.5.21.

> *Note: Jordan switched from paper to computer assessment in 2022. Past reading and science scores were computed on a scale that was only weakly linked to the international scale; for this reason, this volume does not report trends in reading and science for Jordan and limits trend reporting to mathematics.*

Overview of performance trends in Kazakhstan

Trends in mathematics, reading and science performance in Kazakhstan



Note: White dots indicate mean-performance estimates that are not statistically significantly above/below PISA 2022 estimates. Black lines indicate the best-fitting trend.
Source: OECD, PISA 2022 Database, Tables I.B1.5.4, I.B1.5.5 and I.B1.5.6.

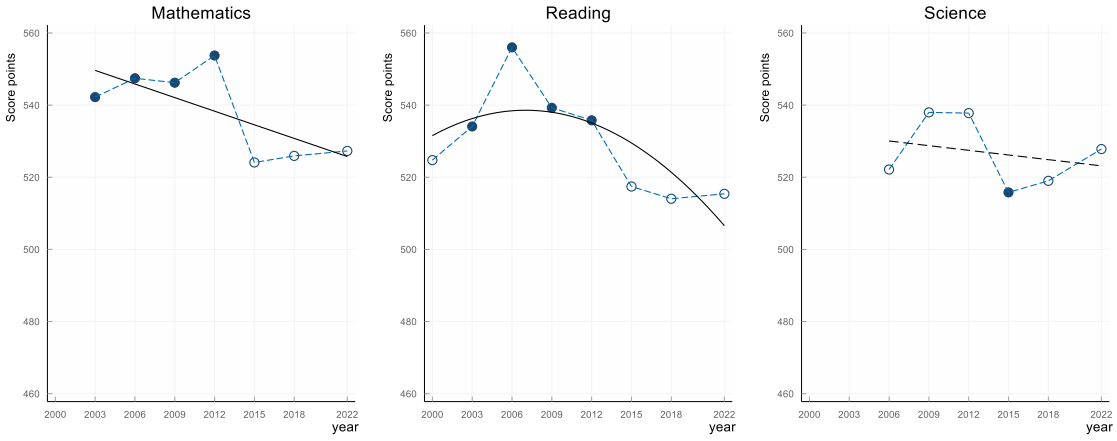
Snapshot of mathematics, reading and science results for Kazakhstan

Mean performance	Mathematics	Reading	Science
PISA 2000		m	
PISA 2003	m	m	
PISA 2006	m	m	m
PISA 2009	405*	390	400*
PISA 2012	432	393	425
PISA 2015	m	m	m
PISA 2018	423	387	397*
PISA 2022	425	386	423
Average 10-year trend in mean performance (2012 to 2022)	-7.0	-6.5	-5.1
Short-term change in mean performance (2018 to 2022)	+2.3	-0.6	+26.1*
Proficiency levels: Change between 2012 and 2022			
Percentage-point change in the share of top-performing students (Level 5 or 6)	+0.6	+0.5*	+0.7*
Percentage-point change in the share of low-performing students (below Level 2)	+4.3	+6.7*	+3.2
Variation in performance: Change between 2018 and 2022			
Average change among high-achieving students (90th percentile)	-5.7	+4.9	+26.5*
Average change among low-achieving students (10th percentile)	+14.8*	-5.2	+22.6*
Gap in learning outcomes between high- and low-achieving students	narrowing gap	widening gap	stable gap
Trends by quarter of socio-economic status (ESCS): 2018-22 / average 10-year trend			
Performance among advantaged students (top quarter of ESCS)	+7.4 / -9.0	+1.9 / -11.8*	+30.1* / -8.8*
Performance among disadvantaged students (bottom quarter of ESCS)	-0.4 / +1.6	-1.4 / +9.5*	+25.2* / +8.2
Performance gap (top – bottom quarter)	stable / stable	stable / narrowing	stable / narrowing

Note: * indicates statistically significant trends and changes or mean-performance estimates that are significantly above or below PISA 2022 estimates.
Source: PISA 2022 Database, Tables I.B1.5.1-12, I.B1.5.19, I.B1.5.20 and I.B1.5.21.

Overview of performance trends in Korea

Trends in mathematics, reading and science performance in Korea



Note: White dots indicate mean-performance estimates that are not statistically significantly above/below PISA 2022 estimates. Black lines indicate the best-fitting trend.
Source: OECD, PISA 2022 Database, Tables I.B1.5.4, I.B1.5.5 and I.B1.5.6.

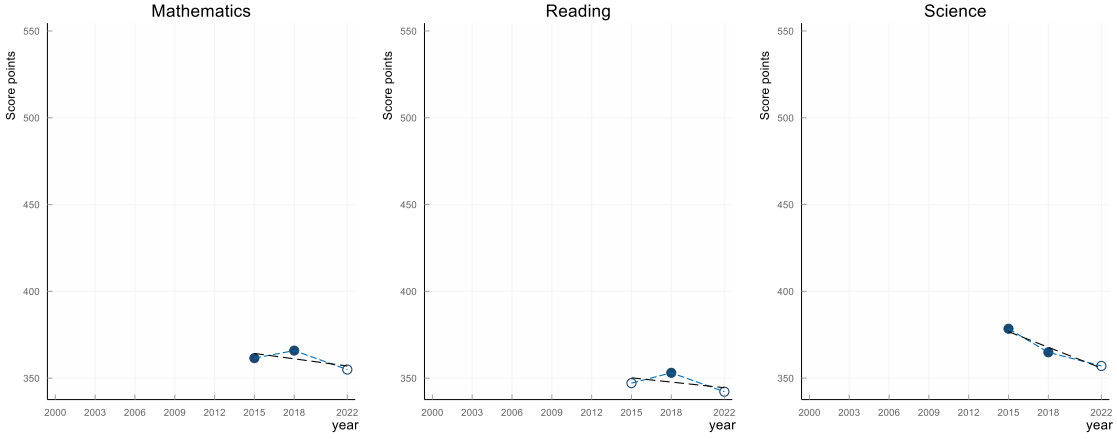
Snapshot of mathematics, reading and science results for Korea

Mean performance	Mathematics	Reading	Science
PISA 2000		525	
PISA 2003	542*	534*	
PISA 2006	547*	556*	522
PISA 2009	546*	539*	538
PISA 2012	554*	536*	538
PISA 2015	524	517	516*
PISA 2018	526	514	519
PISA 2022	527	515	528
Average 10-year trend in mean performance (2012 to 2022)	-22.6*	-18.5*	-7.0
Short-term change in mean performance (2018 to 2022)	+1.4	+1.4	+8.8
Proficiency levels: Change between 2012 and 2022			
Percentage-point change in the share of top-performing students (Level 5 or 6)	-8.0*	-0.8	+4.0*
Percentage-point change in the share of low-performing students (below Level 2)	+7.1*	+7.0*	+7.1*
Variation in performance: Change between 2018 and 2022			
Average change among high-achieving students (90th percentile)	+8.3	+1.4	+15.5*
Average change among low-achieving students (10th percentile)	-5.5	+2.0	-0.2
Gap in learning outcomes between high- and low-achieving students	stable gap	stable gap	stable gap
Trends by quarter of socio-economic status (ESCS): 2018-22 / average 10-year trend			
Performance among advantaged students (top quarter of ESCS)	+5.2 / -17.3*	+5.5 / -8.5	+16.1* / +7.8
Performance among disadvantaged students (bottom quarter of ESCS)	-4.1 / -29.7*	-5.6 / -31.4*	+1.4 / -20.3*
Performance gap (top – bottom quarter)	stable / stable	stable / widening	stable / widening

Note: * indicates statistically significant trends and changes or mean-performance estimates that are significantly above or below PISA 2022 estimates.
Source: PISA 2022 Database, Tables I.B1.5.1-12, I.B1.5.19, I.B1.5.20 and I.B1.5.21.

Overview of performance trends in Kosovo†

Trends in mathematics, reading and science performance in Kosovo



Note: White dots indicate mean-performance estimates that are not statistically significantly above/below PISA 2022 estimates. Black lines indicate the best-fitting trend.
Source: OECD, PISA 2022 Database, Tables I.B1.5.4, I.B1.5.5 and I.B1.5.6.

Snapshot of mathematics, reading and science results for Kosovo

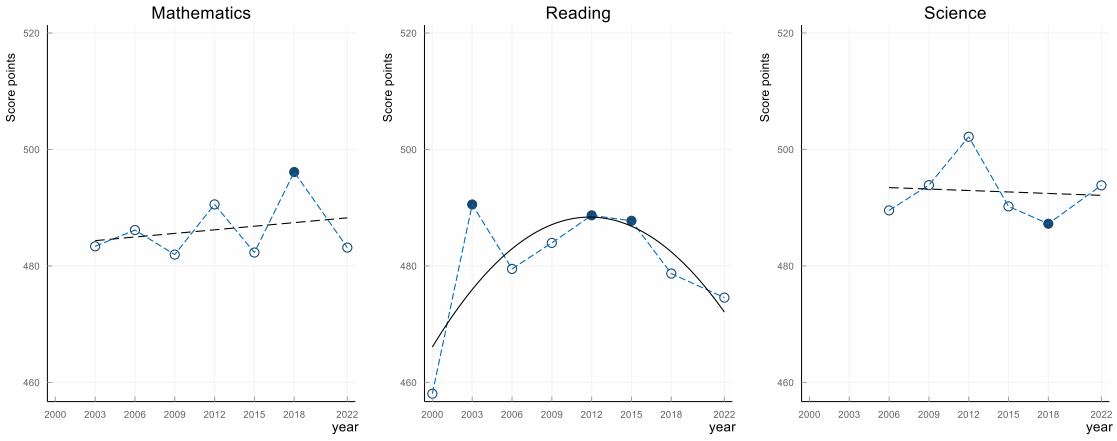
Mean performance	Mathematics	Reading	Science
PISA 2000		m	
PISA 2003	m	m	
PISA 2006	m	m	m
PISA 2009	m	m	m
PISA 2012	m	m	m
PISA 2015	362*	347	378*
PISA 2018	366*	353*	365*
PISA 2022	355	342	357
Average 10-year trend in mean performance (2015 to 2022)	-9.5*	-7.9	-29.4*
Short-term change in mean performance (2018 to 2022)	-10.9*	-10.9*	-7.9*
Proficiency levels: Change between 2015 and 2022			
Percentage-point change in the share of top-performing students (Level 5 or 6)	-0.0	+0.0	-0.0
Percentage-point change in the share of low-performing students (below Level 2)	+7.4*	+6.2*	+11.5*
Variation in performance: Change between 2018 and 2022			
Average change among high-achieving students (90th percentile)	-27.0*	-10.0*	-4.2
Average change among low-achieving students (10th percentile)	+11.1*	-6.0	-7.4*
Gap in learning outcomes between high- and low-achieving students	narrowing gap	stable gap	stable gap
Trends by quarter of socio-economic status (ESCS): 2018-22 / average 10-year trend			
Performance among advantaged students (top quarter of ESCS)	-11.5* / -11.5	-11.4* / -9.1	-5.6 / -30.6*
Performance among disadvantaged students (bottom quarter of ESCS)	-7.7 / +2.0	-9.3* / +0.9	-8.1* / -26.4*
Performance gap (top – bottom quarter)	stable / stable	stable / stable	stable / stable

Note: * indicates statistically significant trends and changes or mean-performance estimates that are significantly above or below PISA 2022 estimates.
Source: PISA 2022 Database, Tables I.B1.5.1-12, I.B1.5.19, I.B1.5.20 and I.B1.5.21.

† *This designation is without prejudice to positions on status, and is in line with United Nations Security Council Resolution 1244/99 and the Advisory Opinion of the International Court of Justice on Kosovo's declaration of independence.*

Overview of performance trends in Latvia

Trends in mathematics, reading and science performance in Latvia



Note: White dots indicate mean-performance estimates that are not statistically significantly above/below PISA 2022 estimates. Black lines indicate the best-fitting trend.
Source: OECD, PISA 2022 Database, Tables I.B1.5.4, I.B1.5.5 and I.B1.5.6.

Snapshot of mathematics, reading and science results for Latvia

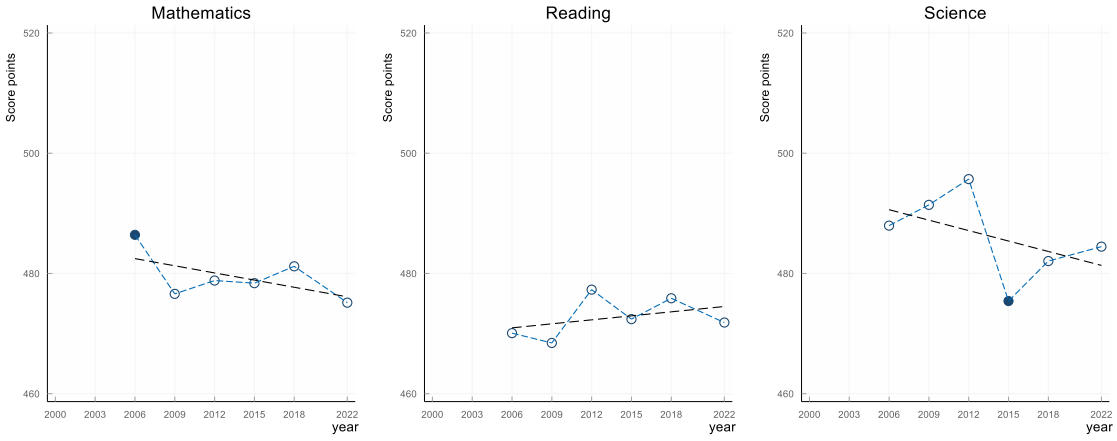
Mean performance	Mathematics	Reading	Science
PISA 2000		458	
PISA 2003	483	491*	
PISA 2006	486	479	490
PISA 2009	482	484	494
PISA 2012	491	489*	502
PISA 2015	482	488*	490
PISA 2018	496*	479	487*
PISA 2022	483	475	494
Average 10-year trend in mean performance (2012 to 2022)	-2.7	-15.4*	-8.1
Short-term change in mean performance (2018 to 2022)	-13.0*	-4.1	+6.6*
Proficiency levels: Change between 2012 and 2022			
Percentage-point change in the share of top-performing students (Level 5 or 6)	-1.5	+0.1	+0.8
Percentage-point change in the share of low-performing students (below Level 2)	+2.2	+5.8*	+4.1*
Variation in performance: Change between 2018 and 2022			
Average change among high-achieving students (90th percentile)	-12.3*	-4.2	+8.8*
Average change among low-achieving students (10th percentile)	-11.9*	-2.4	+8.2
Gap in learning outcomes between high- and low-achieving students	stable gap	stable gap	stable gap
Trends by quarter of socio-economic status (ESCS): 2018-22 / average 10-year trend			
Performance among advantaged students (top quarter of ESCS)	-10.1* / -2.9	+3.2 / -13.3*	+12.6* / -4.3
Performance among disadvantaged students (bottom quarter of ESCS)	-15.8* / -1.6	-10.3* / -12.2*	+2.7 / -10.0*
Performance gap (top – bottom quarter)	stable / stable	widening / stable	stable / stable

Note: * indicates statistically significant trends and changes or mean-performance estimates that are significantly above or below PISA 2022 estimates.
Source: PISA 2022 Database, Tables I.B1.5.1-12, I.B1.5.19, I.B1.5.20 and I.B1.5.21.

> *Note: In 2022, exclusions from the sample exceeded the acceptable rate by a large margin and showed a marked increase, with respect to 2018. High levels of student exclusions may bias performance results upwards.*

Overview of performance trends in Lithuania

Trends in mathematics, reading and science performance in Lithuania



Note: White dots indicate mean-performance estimates that are not statistically significantly above/below PISA 2022 estimates. Black lines indicate the best-fitting trend.
Source: OECD, PISA 2022 Database, Tables I.B1.5.4, I.B1.5.5 and I.B1.5.6.

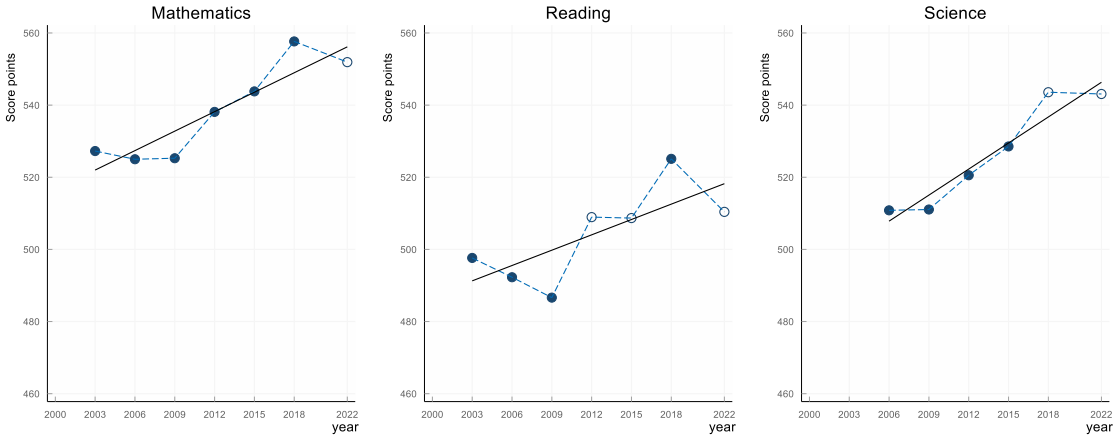
Snapshot of mathematics, reading and science results for Lithuania

Mean performance	Mathematics	Reading	Science
PISA 2000		m	
PISA 2003	m	m	
PISA 2006	486*	470	488
PISA 2009	477	468	491
PISA 2012	479	477	496
PISA 2015	478	472	475*
PISA 2018	481	476	482
PISA 2022	475	472	484
Average 10-year trend in mean performance (2012 to 2022)	-2.5	-4.1	-7.3
Short-term change in mean performance (2018 to 2022)	-6.0	-4.0	+2.4
Proficiency levels: Change between 2012 and 2022			
Percentage-point change in the share of top-performing students (Level 5 or 6)	-0.9	+1.4	+0.4
Percentage-point change in the share of low-performing students (below Level 2)	+1.8	+3.7	+5.7*
Variation in performance: Change between 2018 and 2022			
Average change among high-achieving students (90th percentile)	-7.5	-5.1	+6.5
Average change among low-achieving students (10th percentile)	+1.7	-3.0	+0.2
Gap in learning outcomes between high- and low-achieving students	stable gap	stable gap	stable gap
Trends by quarter of socio-economic status (ESCS): 2018-22 / average 10-year trend			
Performance among advantaged students (top quarter of ESCS)	-1.9 / +5.2	-1.9 / +5.3	+6.8 / +2.0
Performance among disadvantaged students (bottom quarter of ESCS)	-4.0 / -5.3	+0.8 / -8.1	+4.0 / -11.3*
Performance gap (top – bottom quarter)	stable / stable	stable / widening	stable / widening

Note: * indicates statistically significant trends and changes or mean-performance estimates that are significantly above or below PISA 2022 estimates.
Source: PISA 2022 Database, Tables I.B1.5.1-12, I.B1.5.19, I.B1.5.20 and I.B1.5.21.

Overview of performance trends in Macao (China)

Trends in mathematics, reading and science performance in Macao (China)



Note: White dots indicate mean-performance estimates that are not statistically significantly above/below PISA 2022 estimates. Black lines indicate the best-fitting trend.
Source: OECD, PISA 2022 Database, Tables I.B1.5.4, I.B1.5.5 and I.B1.5.6.

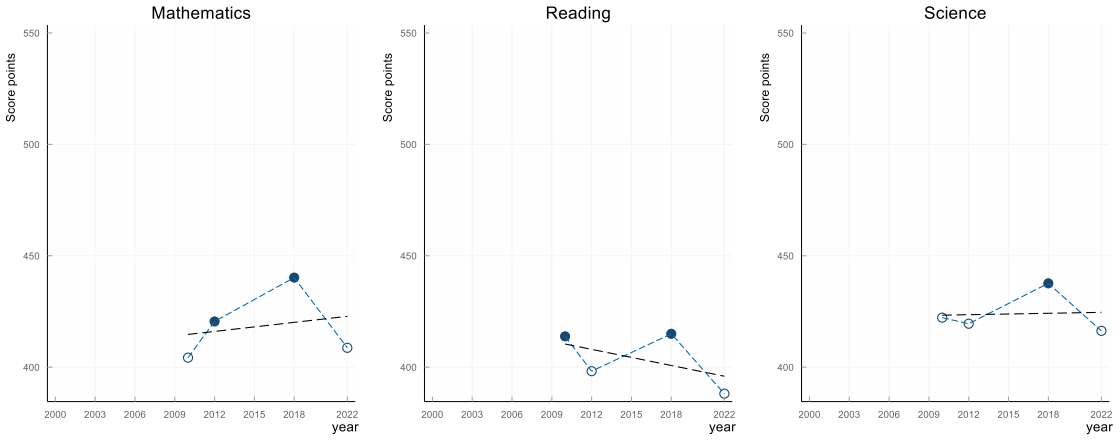
Snapshot of mathematics, reading and science results for Macao (China)

Mean performance	Mathematics	Reading	Science
PISA 2000		m	
PISA 2003	527*	498*	
PISA 2006	525*	492*	511*
PISA 2009	525*	487*	511*
PISA 2012	538*	509	521*
PISA 2015	544*	509	529*
PISA 2018	558*	525*	544
PISA 2022	552	510	543
Average 10-year trend in mean performance (2012 to 2022)	+15.7*	+4.4	+24.2*
Short-term change in mean performance (2018 to 2022)	-5.7*	-14.7*	-0.5
Proficiency levels: Change between 2012 and 2022			
Percentage-point change in the share of top-performing students (Level 5 or 6)	+4.2*	+1.9	+8.0*
Percentage-point change in the share of low-performing students (below Level 2)	-2.3*	+1.2	-1.3
Variation in performance: Change between 2018 and 2022			
Average change among high-achieving students (90th percentile)	+11.0*	-20.3*	+3.1
Average change among low-achieving students (10th percentile)	-23.2*	-9.6*	-7.9
Gap in learning outcomes between high- and low-achieving students	widening gap	stable gap	widening gap
Trends by quarter of socio-economic status (ESCS): 2018-22 / average 10-year trend			
Performance among advantaged students (top quarter of ESCS)	+6.3 / +24.2*	-10.6* / +12.0*	+2.0 / +28.0*
Performance among disadvantaged students (bottom quarter of ESCS)	-13.7* / +5.6	-16.1* / +0.4	-6.4 / +18.7*
Performance gap (top – bottom quarter)	widening / widening	stable / widening	stable / stable

Note: * indicates statistically significant trends and changes or mean-performance estimates that are significantly above or below PISA 2022 estimates.
Source: PISA 2022 Database, Tables I.B1.5.1-12, I.B1.5.19, I.B1.5.20 and I.B1.5.21.

Overview of performance trends in Malaysia

Trends in mathematics, reading and science performance in Malaysia



Note: White dots indicate mean-performance estimates that are not statistically significantly above/below PISA 2022 estimates. Black lines indicate the best-fitting trend.
Source: OECD, PISA 2022 Database, Tables I.B1.5.4, I.B1.5.5 and I.B1.5.6.

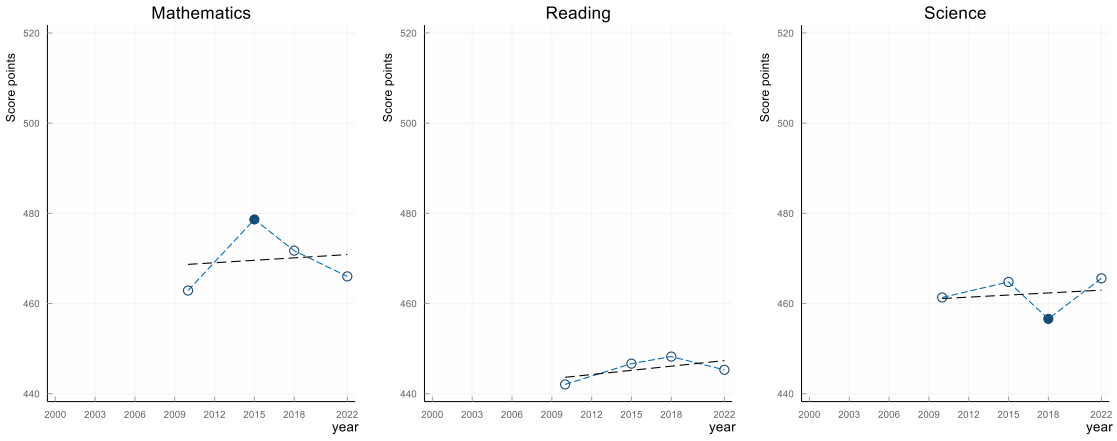
Snapshot of mathematics, reading and science results for Malaysia

Mean performance	Mathematics	Reading	Science
PISA 2000		m	
PISA 2003	m	m	
PISA 2006	m	m	m
PISA 2009	404	414*	422
PISA 2012	421*	398	420
PISA 2015	m	m	m
PISA 2018	440*	415*	438*
PISA 2022	409	388	416
Average 10-year trend in mean performance (2012 to 2022)	-8.4	-7.1	-0.4
Short-term change in mean performance (2018 to 2022)	-31.5*	-26.9*	-21.3*
Proficiency levels: Change between 2012 and 2022			
Percentage-point change in the share of top-performing students (Level 5 or 6)	-0.2	+0.1	+0.2
Percentage-point change in the share of low-performing students (below Level 2)	+7.2*	+5.4	+2.4
Variation in performance: Change between 2018 and 2022			
Average change among high-achieving students (90th percentile)	-40.2*	-24.8*	-19.0*
Average change among low-achieving students (10th percentile)	-18.7*	-27.5*	-22.2*
Gap in learning outcomes between high- and low-achieving students	narrowing gap	stable gap	stable gap
Trends by quarter of socio-economic status (ESCS): 2018-22 / average 10-year trend			
Performance among advantaged students (top quarter of ESCS)	-31.3* / -2.2	-30.3* / +6.4	-21.6* / +8.5
Performance among disadvantaged students (bottom quarter of ESCS)	-26.2* / -9.1*	-20.4* / -13.5*	-16.6* / -4.1
Performance gap (top – bottom quarter)	stable / stable	stable / widening	stable / stable

Note: * indicates statistically significant trends and changes or mean-performance estimates that are significantly above or below PISA 2022 estimates.
Source: PISA 2022 Database, Tables I.B1.5.1-12, I.B1.5.19, I.B1.5.20 and I.B1.5.21.

Overview of performance trends in Malta

Trends in mathematics, reading and science performance in Malta



Note: White dots indicate mean-performance estimates that are not statistically significantly above/below PISA 2022 estimates. Black lines indicate the best-fitting trend.
Source: OECD, PISA 2022 Database, Tables I.B1.5.4, I.B1.5.5 and I.B1.5.6.

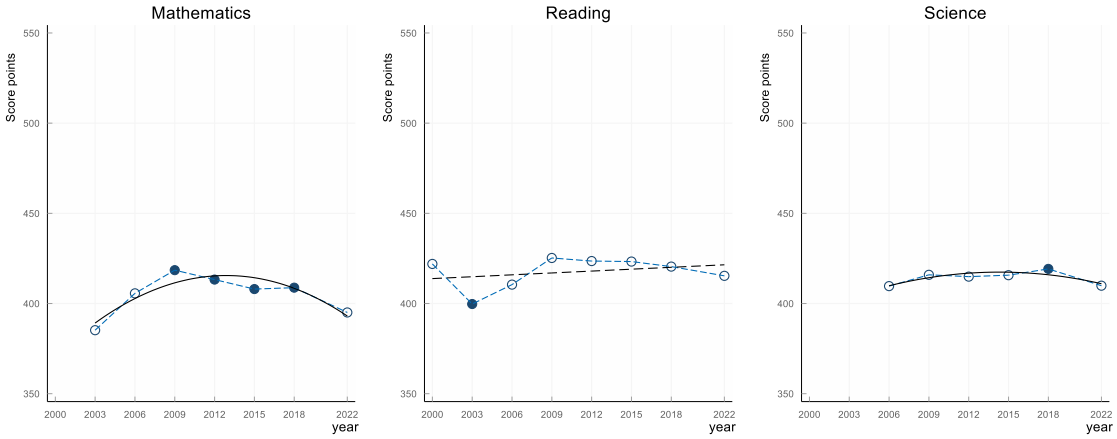
Snapshot of mathematics, reading and science results for Malta

Mean performance	Mathematics	Reading	Science
PISA 2000		m	
PISA 2003	m	m	
PISA 2006	m	m	m
PISA 2009	463	442	461
PISA 2012	m	m	m
PISA 2015	479*	447	465
PISA 2018	472	448	457*
PISA 2022	466	445	466
Average 10-year trend in mean performance (2015 to 2022)	-17.1*	-2.2	+2.5
Short-term change in mean performance (2018 to 2022)	-5.7	-2.9	+9.0*
Proficiency levels: Change between 2015 and 2022			
Percentage-point change in the share of top-performing students (Level 5 or 6)	-4.6*	-1.2	-3.1*
Percentage-point change in the share of low-performing students (below Level 2)	+3.5*	+0.8	-2.2
Variation in performance: Change between 2018 and 2022			
Average change among high-achieving students (90th percentile)	-7.2	-5.4	+3.5
Average change among low-achieving students (10th percentile)	-1.5	-2.0	+14.1*
Gap in learning outcomes between high- and low-achieving students	stable gap	stable gap	stable gap
Trends by quarter of socio-economic status (ESCS): 2018-22 / average 10-year trend			
Performance among advantaged students (top quarter of ESCS)	-9.7 / -27.7*	+3.5 / -15.0*	+12.2* / -18.0*
Performance among disadvantaged students (bottom quarter of ESCS)	-0.9 / -0.2	-4.5 / +11.6	+11.0* / +20.0*
Performance gap (top – bottom quarter)	stable / narrowing	stable / narrowing	stable / narrowing

Note: * indicates statistically significant trends and changes or mean-performance estimates that are significantly above or below PISA 2022 estimates.
Source: PISA 2022 Database, Tables I.B1.5.1-12, I.B1.5.19, I.B1.5.20 and I.B1.5.21.

Overview of performance trends in Mexico

Trends in mathematics, reading and science performance in Mexico



Note: White dots indicate mean-performance estimates that are not statistically significantly above/below PISA 2022 estimates. Black lines indicate the best-fitting trend.
Source: OECD, PISA 2022 Database, Tables I.B1.5.4, I.B1.5.5 and I.B1.5.6.

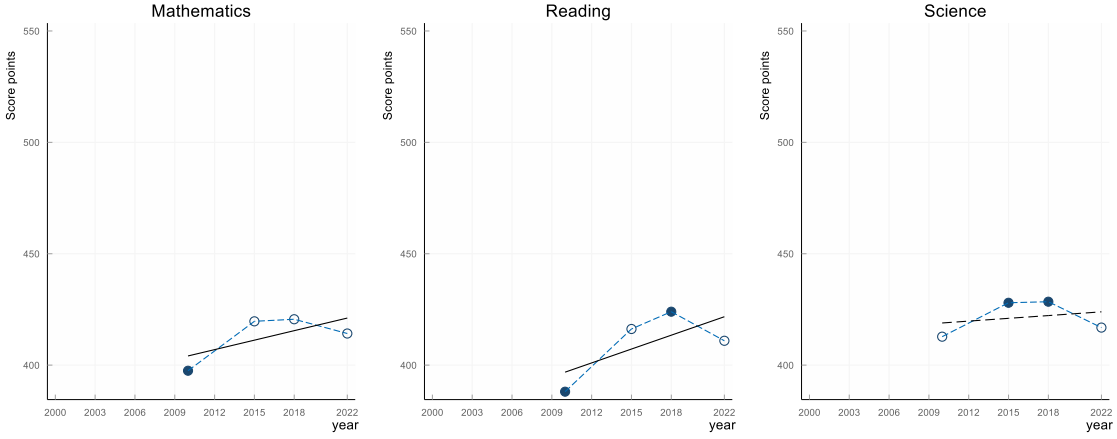
Snapshot of mathematics, reading and science results for Mexico

Mean performance	Mathematics	Reading	Science
PISA 2000		422	
PISA 2003	385	400*	
PISA 2006	406	410	410
PISA 2009	419*	425	416
PISA 2012	413*	424	415
PISA 2015	408*	423	416
PISA 2018	409*	420	419*
PISA 2022	395	415	410
Average 10-year trend in mean performance (2012 to 2022)	-16.9*	-8.5	-4.0
Short-term change in mean performance (2018 to 2022)	-13.8*	-5.1	-9.3*
Proficiency levels: Change between 2012 and 2022			
Percentage-point change in the share of top-performing students (Level 5 or 6)	-0.4*	+0.2	-0.0
Percentage-point change in the share of low-performing students (below Level 2)	+11.1*	+5.9*	+3.8
Variation in performance: Change between 2018 and 2022			
Average change among high-achieving students (90th percentile)	-22.1*	-4.2	-9.7
Average change among low-achieving students (10th percentile)	-1.5	-5.9	-10.8*
Gap in learning outcomes between high- and low-achieving students	narrowing gap	stable gap	stable gap
Trends by quarter of socio-economic status (ESCS): 2018-22 / average 10-year trend			
Performance among advantaged students (top quarter of ESCS)	-16.9* / -16.0*	-4.5 / -0.0	-8.6 / +2.6
Performance among disadvantaged students (bottom quarter of ESCS)	-8.5 / -13.8*	-4.2 / -11.5*	-8.4 / -5.6
Performance gap (top – bottom quarter)	stable / stable	stable / stable	stable / stable

Note: * indicates statistically significant trends and changes or mean-performance estimates that are significantly above or below PISA 2022 estimates.
Source: PISA 2022 Database, Tables I.B1.5.1-12, I.B1.5.19, I.B1.5.20 and I.B1.5.21.

Overview of performance trends in Moldova

Trends in mathematics, reading and science performance in Moldova



Note: White dots indicate mean-performance estimates that are not statistically significantly above/below PISA 2022 estimates. Black lines indicate the best-fitting trend.
Source: OECD, PISA 2022 Database, Tables I.B1.5.4, I.B1.5.5 and I.B1.5.6.

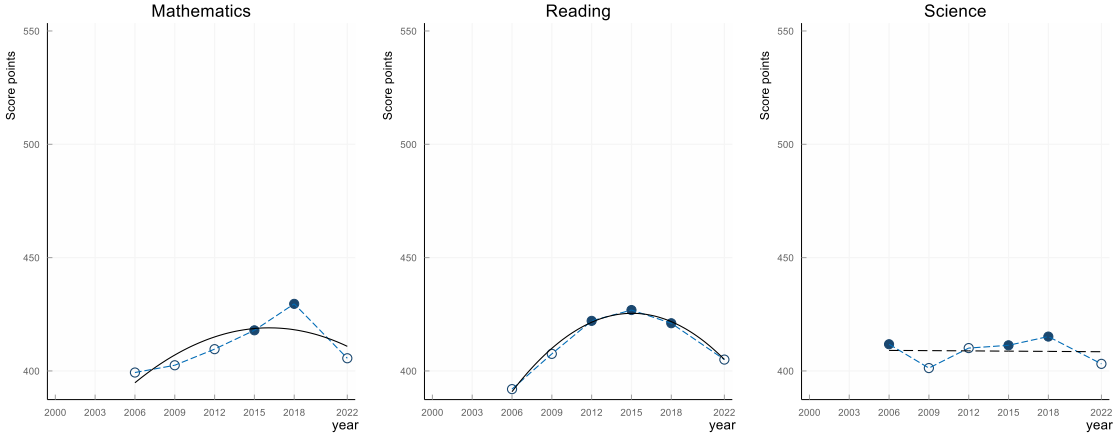
Snapshot of mathematics, reading and science results for Moldova

Mean performance	Mathematics	Reading	Science
PISA 2000		m	
PISA 2003	m	m	
PISA 2006	m	m	m
PISA 2009	397*	388*	413
PISA 2012	m	m	m
PISA 2015	420	416	428*
PISA 2018	421	424*	428*
PISA 2022	414	411	417
Average 10-year trend in mean performance (2015 to 2022)	-8.0	-8.8	-16.5*
Short-term change in mean performance (2018 to 2022)	-6.4	-13.1*	-11.6*
Proficiency levels: Change between 2015 and 2022			
Percentage-point change in the share of top-performing students (Level 5 or 6)	-0.5	-0.7*	-0.3
Percentage-point change in the share of low-performing students (below Level 2)	+5.5*	+3.0	+6.4*
Variation in performance: Change between 2018 and 2022			
Average change among high-achieving students (90th percentile)	-21.9*	-18.9*	-17.8*
Average change among low-achieving students (10th percentile)	+16.9*	-3.8	-0.2
Gap in learning outcomes between high- and low-achieving students	narrowing gap	narrowing gap	narrowing gap
Trends by quarter of socio-economic status (ESCS): 2018-22 / average 10-year trend			
Performance among advantaged students (top quarter of ESCS)	-12.4 / -2.2	-13.3 / -7.5	-12.5 / -11.5
Performance among disadvantaged students (bottom quarter of ESCS)	+3.2 / -0.4	-8.4* / +1.4	-5.5 / -11.0*
Performance gap (top – bottom quarter)	stable / stable	stable / stable	stable / stable

Note: * indicates statistically significant trends and changes or mean-performance estimates that are significantly above or below PISA 2022 estimates.
Source: PISA 2022 Database, Tables I.B1.5.1-12, I.B1.5.19, I.B1.5.20 and I.B1.5.21.

Overview of performance trends in Montenegro

Trends in mathematics, reading and science performance in Montenegro



Note: White dots indicate mean-performance estimates that are not statistically significantly above/below PISA 2022 estimates. Black lines indicate the best-fitting trend.
Source: OECD, PISA 2022 Database, Tables I.B1.5.4, I.B1.5.5 and I.B1.5.6.

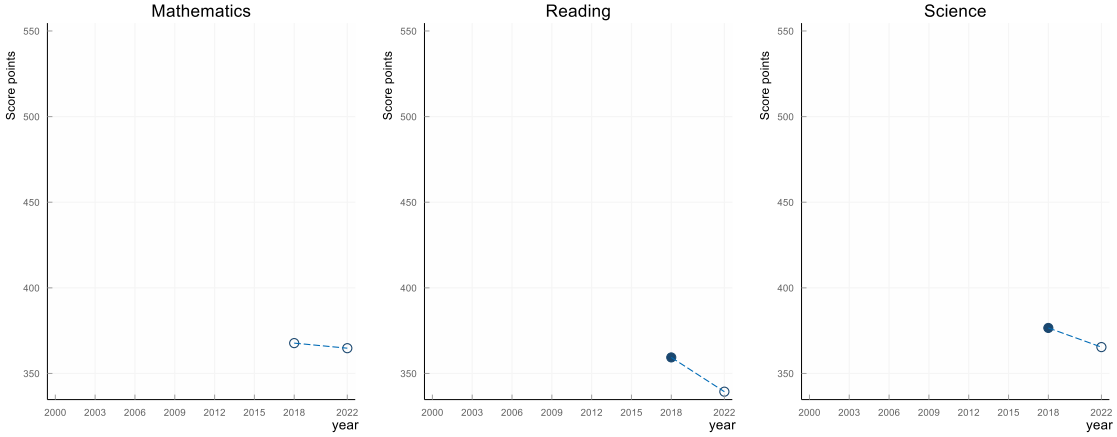
Snapshot of mathematics, reading and science results for Montenegro

Mean performance	Mathematics	Reading	Science
PISA 2000		m	
PISA 2003	m	m	
PISA 2006	399	392	412*
PISA 2009	403	408	401
PISA 2012	410	422*	410
PISA 2015	418*	427*	411*
PISA 2018	430*	421*	415*
PISA 2022	406	405	403
Average 10-year trend in mean performance (2012 to 2022)	-1.7	-17.9*	-5.8
Short-term change in mean performance (2018 to 2022)	-24.0*	-16.0*	-12.0*
Proficiency levels: Change between 2012 and 2022			
Percentage-point change in the share of top-performing students (Level 5 or 6)	-0.1	-0.4	-0.1
Percentage-point change in the share of low-performing students (below Level 2)	+2.9	+9.6*	+4.2
Variation in performance: Change between 2018 and 2022			
Average change among high-achieving students (90th percentile)	-21.4*	-9.3*	-8.1*
Average change among low-achieving students (10th percentile)	-18.0*	-17.1*	-12.7*
Gap in learning outcomes between high- and low-achieving students	stable gap	stable gap	stable gap
Trends by quarter of socio-economic status (ESCS): 2018-22 / average 10-year trend			
Performance among advantaged students (top quarter of ESCS)	-19.2* / -5.8	-11.1* / -26.4*	-3.0 / -8.5*
Performance among disadvantaged students (bottom quarter of ESCS)	-29.0* / +1.1	-23.5* / -13.1*	-23.5* / -5.9*
Performance gap (top – bottom quarter)	stable / stable	widening / narrowing	widening / stable

Note: * indicates statistically significant trends and changes or mean-performance estimates that are significantly above or below PISA 2022 estimates.
Source: PISA 2022 Database, Tables I.B1.5.1-12, I.B1.5.19, I.B1.5.20 and I.B1.5.21.

Overview of performance trends in Morocco

Trends in mathematics, reading and science performance in Morocco



Note: White dots indicate mean-performance estimates that are not statistically significantly above/below PISA 2022 estimates.
Source: OECD, PISA 2022 Database, Tables I.B1.5.4, I.B1.5.5 and I.B1.5.6.

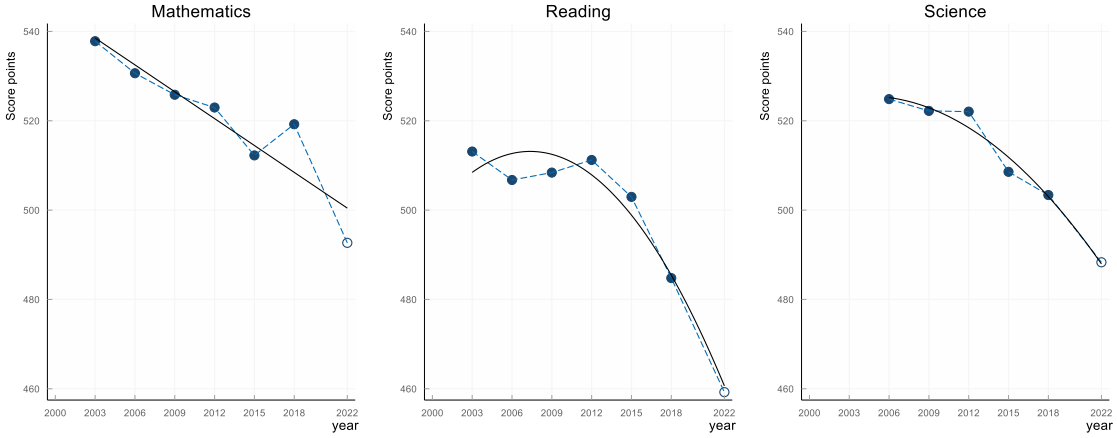
Snapshot of mathematics, reading and science results for Morocco

Mean performance	Mathematics	Reading	Science
PISA 2000		m	
PISA 2003	m	m	
PISA 2006	m	m	m
PISA 2009	m	m	m
PISA 2012	m	m	m
PISA 2015	m	m	m
PISA 2018	368	359*	377*
PISA 2022	365	339	365
Average 10-year trend in mean performance (2012 to 2022)	m	m	m
Short-term change in mean performance (2018 to 2022)	-3.0	-20.0*	-11.2*
Proficiency levels: Change between 2018 and 2022			
Percentage-point change in the share of top-performing students (Level 5 or 6)	-0.1*	-0.0	-0.0
Percentage-point change in the share of low-performing students (below Level 2)	+5.9*	+7.8*	+6.0*
Variation in performance: Change between 2018 and 2022			
Average change among high-achieving students (90th percentile)	-20.1*	-19.5*	-11.6
Average change among low-achieving students (10th percentile)	+15.7*	-20.1*	-9.7*
Gap in learning outcomes between high- and low-achieving students	narrowing gap	stable gap	stable gap
Trends by quarter of socio-economic status (ESCS): 2018-22 / average 10-year trend			
Performance among advantaged students (top quarter of ESCS)	-6.8 / m	-26.7* / m	-9.9 / m
Performance among disadvantaged students (bottom quarter of ESCS)	+1.0 / m	-12.0* / m	-5.6 / m
Performance gap (top – bottom quarter)	stable / m	stable / m	stable / m

Note: * indicates statistically significant trends and changes or mean-performance estimates that are significantly above or below PISA 2022 estimates.
Source: PISA 2022 Database, Tables I.B1.5.1-12, I.B1.5.19, I.B1.5.20 and I.B1.5.21.

Overview of performance trends in Netherlands

Trends in mathematics, reading and science performance in Netherlands



Note: White dots indicate mean-performance estimates that are not statistically significantly above/below PISA 2022 estimates. Black lines indicate the best-fitting trend.
Source: OECD, PISA 2022 Database, Tables I.B1.5.4, I.B1.5.5 and I.B1.5.6.

Snapshot of mathematics, reading and science results for Netherlands

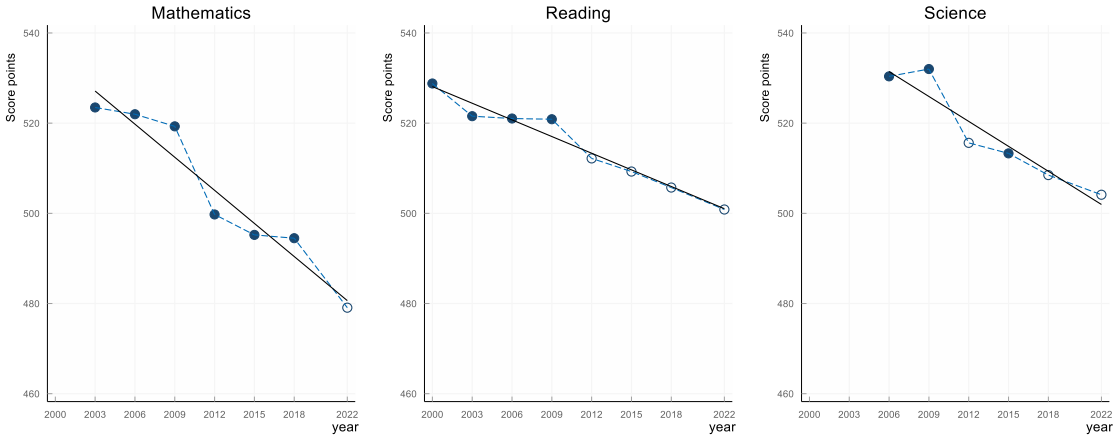
Mean performance	Mathematics	Reading	Science
PISA 2000		m	
PISA 2003	538*	513*	
PISA 2006	531*	507*	525*
PISA 2009	526*	508*	522*
PISA 2012	523*	511*	522*
PISA 2015	512*	503*	509*
PISA 2018	519*	485*	503*
PISA 2022	493	459	488
Average 10-year trend in mean performance (2012 to 2022)	-26.6*	-53.0*	-32.4*
Short-term change in mean performance (2018 to 2022)	-26.6*	-25.5*	-15.1*
Proficiency levels: Change between 2012 and 2022			
Percentage-point change in the share of top-performing students (Level 5 or 6)	-3.9*	-2.8*	-1.3
Percentage-point change in the share of low-performing students (below Level 2)	+12.6*	+20.6*	+14.2*
Variation in performance: Change between 2018 and 2022			
Average change among high-achieving students (90th percentile)	-7.9	-12.8*	-0.1
Average change among low-achieving students (10th percentile)	-46.7*	-39.3*	-23.7*
Gap in learning outcomes between high- and low-achieving students	widening gap	widening gap	widening gap
Trends by quarter of socio-economic status (ESCS): 2018-22 / average 10-year trend			
Performance among advantaged students (top quarter of ESCS)	-17.6* / -9.4	-20.2* / -38.2*	-8.8 / -15.9*
Performance among disadvantaged students (bottom quarter of ESCS)	-34.1* / -34.8*	-33.2* / -57.2*	-19.8* / -37.1*
Performance gap (top – bottom quarter)	stable / widening	stable / widening	stable / widening

Note: * indicates statistically significant trends and changes or mean-performance estimates that are significantly above or below PISA 2022 estimates.
Source: PISA 2022 Database, Tables I.B1.5.1-12, I.B1.5.19, I.B1.5.20 and I.B1.5.21.

> *Notes: In 2022, overall exclusions from the sample (at the student or school level) exceeded the acceptable rate by a large margin and showed a marked increase with respect to 2018. High levels of student exclusions may bias performance results upwards.*
>
> *In the Netherlands, the testing period changed from March-April (in earlier PISA assessments) to October-December (in PISA 2022).*

Overview of performance trends in New Zealand

Trends in mathematics, reading and science performance in New Zealand



Note: White dots indicate mean-performance estimates that are not statistically significantly above/below PISA 2022 estimates. Black lines indicate the best-fitting trend.
Source: OECD, PISA 2022 Database, Tables I.B1.5.4, I.B1.5.5 and I.B1.5.6.

Snapshot of mathematics, reading and science results for New Zealand

Mean performance	Mathematics	Reading	Science
PISA 2000		529*	
PISA 2003	523*	522*	
PISA 2006	522*	521*	530*
PISA 2009	519*	521*	532*
PISA 2012	500*	512	516
PISA 2015	495*	509	513*
PISA 2018	494*	506	508
PISA 2022	479	501	504
Average 10-year trend in mean performance (2012 to 2022)	-19.5*	-11.2	-11.6*
Short-term change in mean performance (2018 to 2022)	-15.4*	-4.9	-4.4
Proficiency levels: Change between 2012 and 2022			
Percentage-point change in the share of top-performing students (Level 5 or 6)	-4.7*	-0.9	-1.4
Percentage-point change in the share of low-performing students (below Level 2)	+6.1*	+4.5*	+4.1*
Variation in performance: Change between 2018 and 2022			
Average change among high-achieving students (90th percentile)	-5.6	+0.5	+3.4
Average change among low-achieving students (10th percentile)	-21.9*	-8.2	-8.8
Gap in learning outcomes between high- and low-achieving students	widening gap	stable gap	stable gap
Trends by quarter of socio-economic status (ESCS): 2018-22 / average 10-year trend			
Performance among advantaged students (top quarter of ESCS)	-8.6 / -25.8*	-8.6 / -19.9*	-2.9 / -19.4*
Performance among disadvantaged students (bottom quarter of ESCS)	-23.2* / -10.4*	-6.6 / +2.4	-11.9* / -1.4
Performance gap (top – bottom quarter)	widening / narrowing	stable / narrowing	stable / narrowing

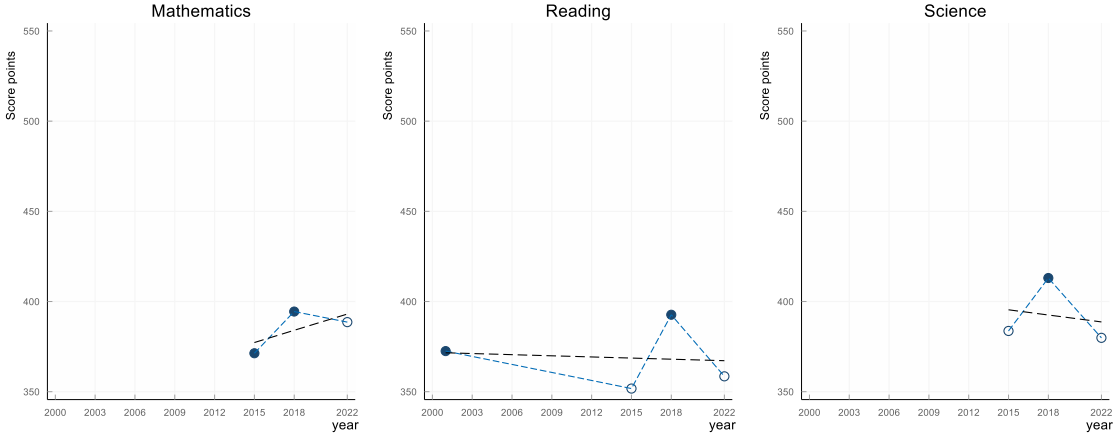
Note: * indicates statistically significant trends and changes or mean-performance estimates that are significantly above or below PISA 2022 estimates.
Source: PISA 2022 Database, Tables I.B1.5.1-12, I.B1.5.19, I.B1.5.20 and I.B1.5.21.

> *Note: In 2022, student response rates decreased with respect to PISA 2018 and fell short of the target. School response rates also fell short of the target. A thorough and detailed non-response bias analysis was submitted using external achievement data at student level but also information on chronic absenteeism as auxiliary information along with demographic characteristics. The analysis provided evidence to suggest a residual upwards bias of about 0.1 standard*

deviations, after non-response adjustments are taken into account, driven entirely by student non-response (school non-participation did not result in significant bias, in contrast). The analysis also suggests that chronically absent students are over-represented among non-respondents in PISA. On the PISA scale, considering that the standard deviation in New Zealand ranged (in 2018) from 93 score points in mathematics to 106 score points in reading, this could translate into an estimated bias of approximately 10 points. The bias associated with trend and cross-country comparisons, however, might be smaller if past data or data for other countries are biased in the same direction.

Overview of performance trends in North Macedonia

Trends in mathematics, reading and science performance in North Macedonia



Note: White dots indicate mean-performance estimates that are not statistically significantly above/below PISA 2022 estimates. Black lines indicate the best-fitting trend.
Source: OECD, PISA 2022 Database, Tables I.B1.5.4, I.B1.5.5 and I.B1.5.6.

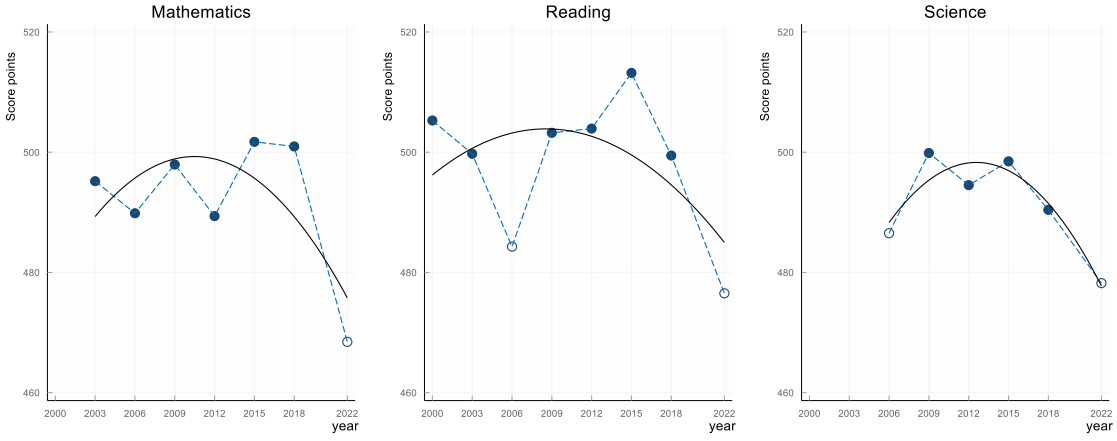
Snapshot of mathematics, reading and science results for North Macedonia

Mean performance	Mathematics	Reading	Science
PISA 2000		373*	
PISA 2003	m	m	
PISA 2006	m	m	m
PISA 2009	m	m	m
PISA 2012	m	m	m
PISA 2015	371*	352	384
PISA 2018	394*	393*	413*
PISA 2022	389	359	380
Average 10-year trend in mean performance (2015 to 2022)	+22.7*	+4.4	-10.0*
Short-term change in mean performance (2018 to 2022)	-5.9*	-34.1*	-33.2*
Proficiency levels: Change between 2015 and 2022			
Percentage-point change in the share of top-performing students (Level 5 or 6)	-0.2	-0.2	-0.1
Percentage-point change in the share of low-performing students (below Level 2)	-4.0*	+3.0	+2.4*
Variation in performance: Change between 2018 and 2022			
Average change among high-achieving students (90th percentile)	-15.6*	-53.7*	-42.8*
Average change among low-achieving students (10th percentile)	+11.9*	-4.4	-16.4*
Gap in learning outcomes between high- and low-achieving students	narrowing gap	narrowing gap	narrowing gap
Trends by quarter of socio-economic status (ESCS): 2018-22 / average 10-year trend			
Performance among advantaged students (top quarter of ESCS)	-12.1* / +31.1*	-45.0* / +7.2	-36.0* / +4.9
Performance among disadvantaged students (bottom quarter of ESCS)	-4.9 / +29.4*	-27.6* / +17.8*	-32.4* / -13.3*
Performance gap (top – bottom quarter)	stable / stable	narrowing / stable	stable / widening

Note: * indicates statistically significant trends and changes or mean-performance estimates that are significantly above or below PISA 2022 estimates.
Source: PISA 2022 Database, Tables I.B1.5.1-12, I.B1.5.19, I.B1.5.20 and I.B1.5.21.

Overview of performance trends in Norway

Trends in mathematics, reading and science performance in Norway



Note: White dots indicate mean-performance estimates that are not statistically significantly above/below PISA 2022 estimates. Black lines indicate the best-fitting trend.
Source: OECD, PISA 2022 Database, Tables I.B1.5.4, I.B1.5.5 and I.B1.5.6.

Snapshot of mathematics, reading and science results for Norway

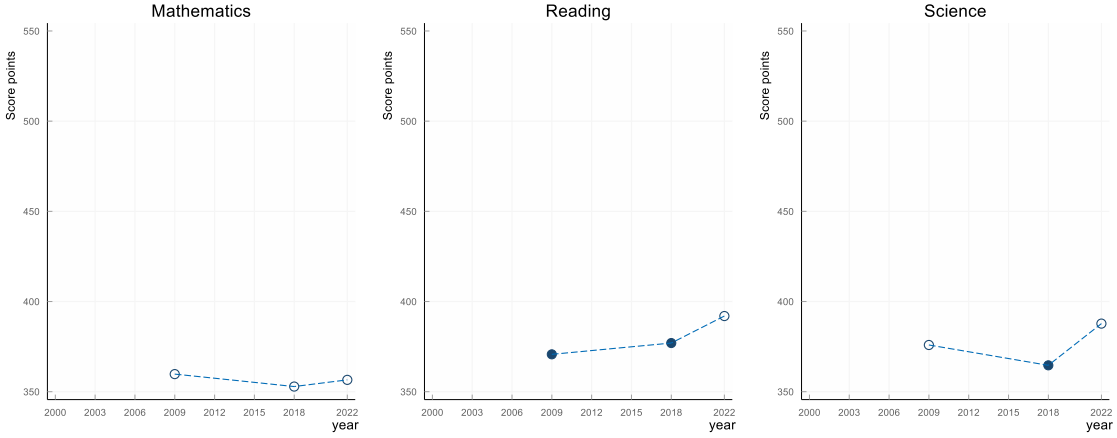
Mean performance	Mathematics	Reading	Science
PISA 2000		505*	
PISA 2003	495*	500*	
PISA 2006	490*	484	487
PISA 2009	498*	503*	500*
PISA 2012	489*	504*	495*
PISA 2015	502*	513*	498*
PISA 2018	501*	499*	490*
PISA 2022	468	477	478
Average 10-year trend in mean performance (2012 to 2022)	-21.3*	-30.3*	-18.0*
Short-term change in mean performance (2018 to 2022)	-32.5*	-22.9*	-12.2*
Proficiency levels: Change between 2012 and 2022			
Percentage-point change in the share of top-performing students (Level 5 or 6)	-2.5*	-1.5	-0.5
Percentage-point change in the share of low-performing students (below Level 2)	+9.2*	+11.3*	+8.0*
Variation in performance: Change between 2018 and 2022			
Average change among high-achieving students (90th percentile)	-27.6*	-13.4*	-1.3
Average change among low-achieving students (10th percentile)	-35.5*	-33.0*	-18.8*
Gap in learning outcomes between high- and low-achieving students	stable gap	widening gap	widening gap
Trends by quarter of socio-economic status (ESCS): 2018-22 / average 10-year trend			
Performance among advantaged students (top quarter of ESCS)	-19.2* / -12.1*	-8.1 / -17.0*	+1.5 / -7.1
Performance among disadvantaged students (bottom quarter of ESCS)	-31.3* / -29.7*	-24.9* / -47.8*	-13.7* / -30.2*
Performance gap (top – bottom quarter)	stable / widening	widening / widening	widening / widening

Note: * indicates statistically significant trends and changes or mean-performance estimates that are significantly above or below PISA 2022 estimates.
Source: PISA 2022 Database, Tables I.B1.5.1-12, I.B1.5.19, I.B1.5.20 and I.B1.5.21.

> *Note: In 2022, Norway relied on a server-based administration (using Chromebooks) in some schools. Students in these schools experienced difficulties moving through the cognitive assessment early in the testing period. Further investigation traced the problem back to overload on the PISA contractor's server. The problem was rapidly solved for students who were tested later and did not affect other countries that used a server-based administration. In Norway, it affected at most 9% of the final sample (584 students). During data adjudication, these data were thoroughly reviewed, and considered to be fit for reporting: the responses of students who were potentially affected did show good fit with the model, and were not remarkably different from the performance of students in other schools (see Annex A4).*

Overview of performance trends in Panama

Trends in mathematics, reading and science performance in Panama



Note: White dots indicate mean-performance estimates that are not statistically significantly above/below PISA 2022 estimates.
Source: OECD, PISA 2022 Database, Tables I.B1.5.4, I.B1.5.5 and I.B1.5.6.

Snapshot of mathematics, reading and science results for Panama

Mean performance	Mathematics	Reading	Science
PISA 2000		m	
PISA 2003	m	m	
PISA 2006	m	m	m
PISA 2009	360	371*	376
PISA 2012	m	m	m
PISA 2015	m	m	m
PISA 2018	353	377*	365*
PISA 2022	357	392	388
Average 10-year trend in mean performance (2012 to 2022)	m	m	m
Short-term change in mean performance (2018 to 2022)	+3.7	+15.0*	+23.1*
Proficiency levels: Change between 2018 and 2022			
Percentage-point change in the share of top-performing students (Level 5 or 6)	-0.0	+0.6*	+0.4
Percentage-point change in the share of low-performing students (below Level 2)	+2.7	-6.6*	-9.2*
Variation in performance: Change between 2018 and 2022			
Average change among high-achieving students (90th percentile)	-10.9	+23.1*	+26.4*
Average change among low-achieving students (10th percentile)	+22.8*	+8.8	+22.3*
Gap in learning outcomes between high- and low-achieving students	narrowing gap	stable gap	stable gap
Trends by quarter of socio-economic status (ESCS): 2018-22 / average 10-year trend			
Performance among advantaged students (top quarter of ESCS)	+2.2 / m	+17.3* / m	+29.4* / m
Performance among disadvantaged students (bottom quarter of ESCS)	+7.3 / m	+8.2 / m	+16.7* / m
Performance gap (top – bottom quarter)	stable / m	stable / m	stable / m

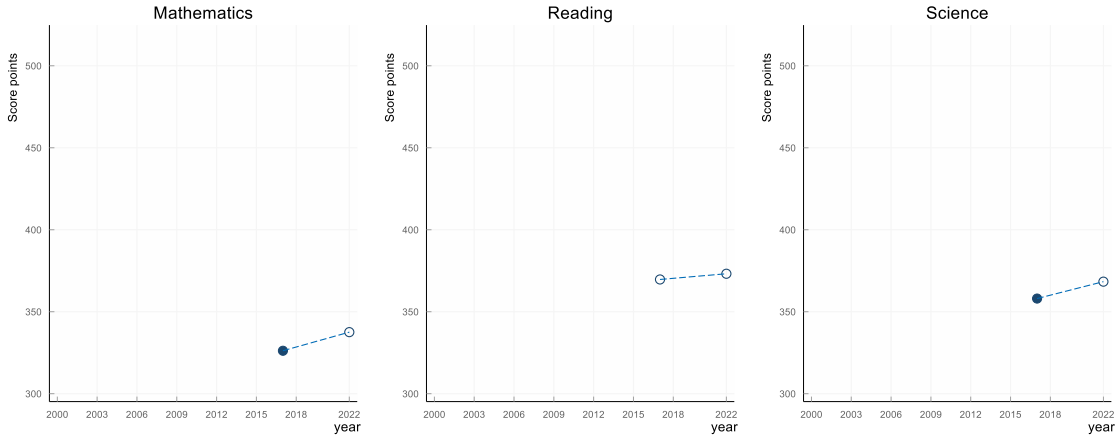
Note: * indicates statistically significant trends and changes or mean-performance estimates that are significantly above or below PISA 2022 estimates.
Source: PISA 2022 Database, Tables I.B1.5.1-12, I.B1.5.19, I.B1.5.20 and I.B1.5.21.

> *Note: In the challenging circumstances surrounding schooling in Panama in 2022 (teacher strikes, road blockades, and student absenteeism), student response rates decreased markedly from 90% with respect to PISA 2018 and fell short of the standard. No non-response bias analysis was submitted; the PISA national centre explained that non-response was potentially related to the agitated school climate students found themselves in when returning to their schools after the*

strikes. A comparison of respondent characteristics (both before and after non-response adjustment) to characteristics of the full eligible sample of students suggests that (before non-response adjustments were taken into account), non-response was related to students' grade level and special-needs status. Based on the available information, it is not possible to exclude the possibility of bias; considering the analyses on student non-response conducted in other countries, the residual bias after non-response adjustments are taken into account is likely to correspond to an upward bias.

Overview of performance trends in Paraguay

Trends in mathematics, reading and science performance in Paraguay



Note: White dots indicate mean-performance estimates that are not statistically significantly above/below PISA 2022 estimates.
Source: OECD, PISA 2022 Database, Tables I.B1.5.4, I.B1.5.5 and I.B1.5.6.

Snapshot of mathematics, reading and science results for Paraguay

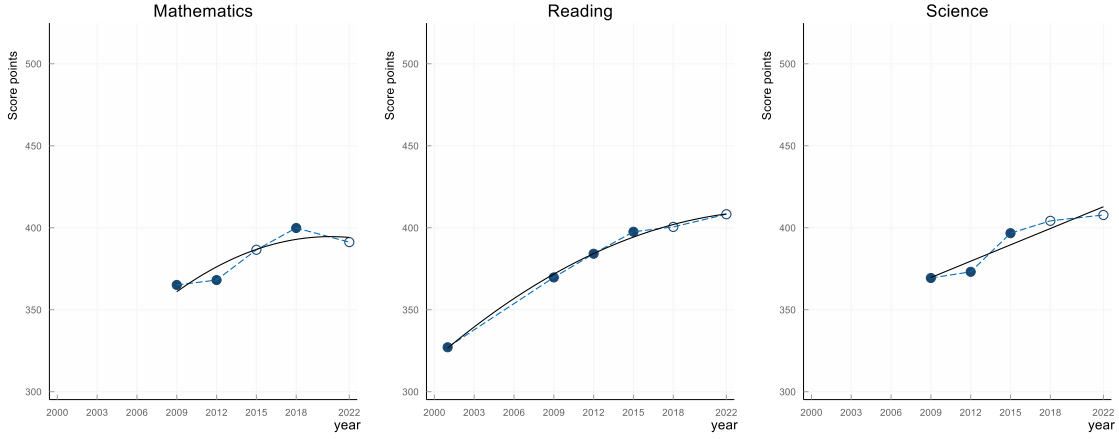
Mean performance	Mathematics	Reading	Science
PISA 2000		m	
PISA 2003	m	m	
PISA 2006	m	m	m
PISA 2009	m	m	m
PISA 2012	m	m	m
PISA 2015	m	m	m
PISA 2018	326*	370	358*
PISA 2022	338	373	368
Average 10-year trend in mean performance (2012 to 2022)	m	m	m
Short-term change in mean performance (2018 to 2022)	+11.4*	+3.5	+10.3*
Proficiency levels: Change between 2017 and 2022			
Percentage-point change in the share of top-performing students (Level 5 or 6)	m	m	m
Percentage-point change in the share of low-performing students (below Level 2)	m	m	m
Variation in performance: Change between 2018 and 2022			
Average change among high-achieving students (90th percentile)	+25.4*	+4.2	+17.5*
Average change among low-achieving students (10th percentile)	+1.9	+3.8	+6.1
Gap in learning outcomes between high- and low-achieving students	widening gap	stable gap	stable gap
Trends by quarter of socio-economic status (ESCS): 2018-22 / average 10-year trend			
Performance among advantaged students (top quarter of ESCS)	m / m	m / m	m / m
Performance among disadvantaged students (bottom quarter of ESCS)	m / m	m / m	m / m
Performance gap (top – bottom quarter)	m / m	m / m	m / m

Note: * indicates statistically significant trends and changes or mean-performance estimates that are significantly above or below PISA 2022 estimates.
Source: PISA 2022 Database, Tables I.B1.5.1-12, I.B1.5.19, I.B1.5.20 and I.B1.5.21.

> *Note: Results for 2018 refer to the results of the PISA for Development assessment, in 2017.*

Overview of performance trends in Peru

Trends in mathematics, reading and science performance in Peru



Note: White dots indicate mean-performance estimates that are not statistically significantly above/below PISA 2022 estimates. Black lines indicate the best-fitting trend.
Source: OECD, PISA 2022 Database, Tables I.B1.5.4, I.B1.5.5 and I.B1.5.6.

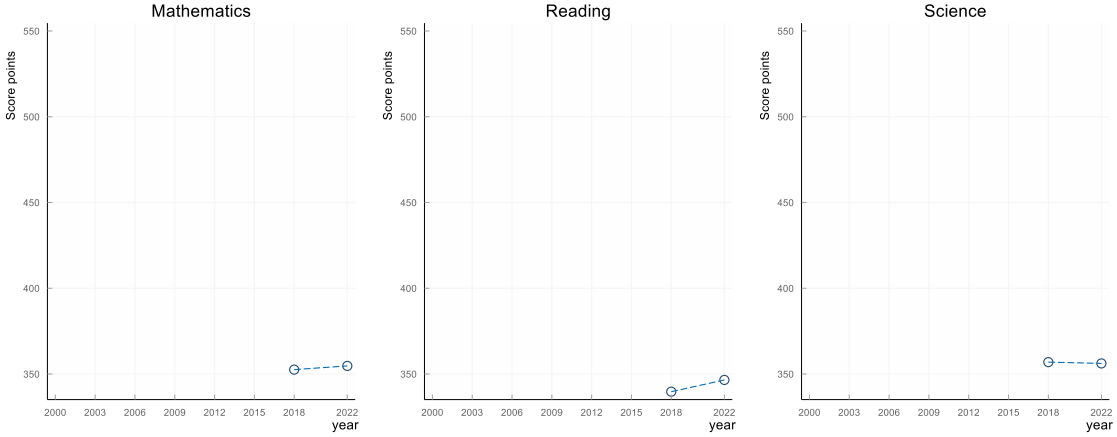
Snapshot of mathematics, reading and science results for Peru

Mean performance	Mathematics	Reading	Science
PISA 2000		327*	
PISA 2003	m	m	
PISA 2006	m	m	m
PISA 2009	365*	370*	369*
PISA 2012	368*	384*	373*
PISA 2015	387	398*	397*
PISA 2018	400*	401	404
PISA 2022	391	408	408
Average 10-year trend in mean performance (2012 to 2022)	+23.9*	+22.2*	+32.9*
Short-term change in mean performance (2018 to 2022)	-8.6*	+7.7	+3.6
Proficiency levels: Change between 2012 and 2022			
Percentage-point change in the share of top-performing students (Level 5 or 6)	-0.1	+0.2	+0.5*
Percentage-point change in the share of low-performing students (below Level 2)	-8.4*	-9.5*	-15.9*
Variation in performance: Change between 2018 and 2022			
Average change among high-achieving students (90th percentile)	-14.4*	+5.5	+11.1
Average change among low-achieving students (10th percentile)	+1.6	+7.5	-4.3
Gap in learning outcomes between high- and low-achieving students	narrowing gap	stable gap	widening gap
Trends by quarter of socio-economic status (ESCS): 2018-22 / average 10-year trend			
Performance among advantaged students (top quarter of ESCS)	-13.2* / +13.2*	-0.0 / +9.7	+2.0 / +30.9*
Performance among disadvantaged students (bottom quarter of ESCS)	-2.0 / +33.7*	+10.5* / +32.8*	+4.9 / +37.9*
Performance gap (top – bottom quarter)	stable / narrowing	stable / narrowing	stable / stable

Note: * indicates statistically significant trends and changes or mean-performance estimates that are significantly above or below PISA 2022 estimates.
Source: PISA 2022 Database, Tables I.B1.5.1-12, I.B1.5.19, I.B1.5.20 and I.B1.5.21.

Overview of performance trends in Philippines

Trends in mathematics, reading and science performance in Philippines



Note: White dots indicate mean-performance estimates that are not statistically significantly above/below PISA 2022 estimates.
Source: OECD, PISA 2022 Database, Tables I.B1.5.4, I.B1.5.5 and I.B1.5.6.

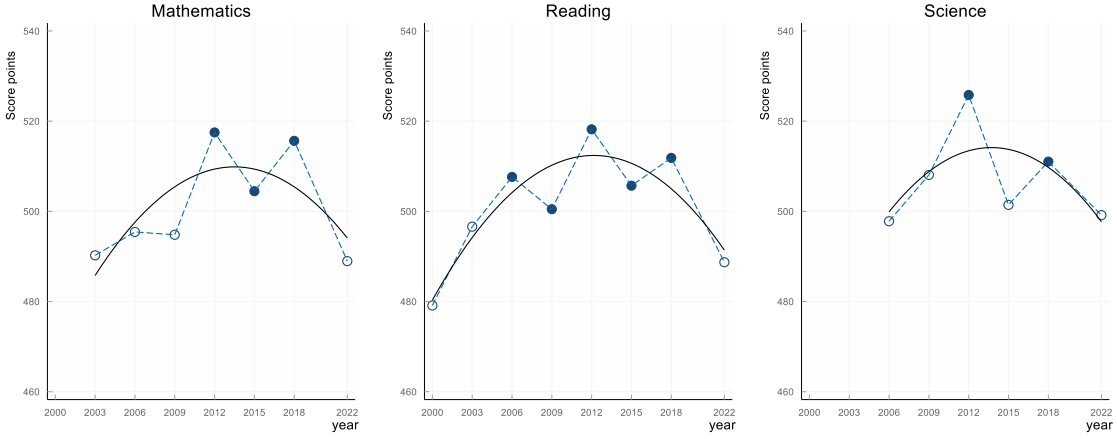
Snapshot of mathematics, reading and science results for Philippines

Mean performance	Mathematics	Reading	Science
PISA 2000		m	
PISA 2003	m	m	
PISA 2006	m	m	m
PISA 2009	m	m	m
PISA 2012	m	m	m
PISA 2015	m	m	m
PISA 2018	353	340	357
PISA 2022	355	347	356
Average 10-year trend in mean performance (2012 to 2022)	m	m	m
Short-term change in mean performance (2018 to 2022)	+2.2	+6.9	-0.8
Proficiency levels: Change between 2018 and 2022			
Percentage-point change in the share of top-performing students (Level 5 or 6)	-0.0	+0.0	+0.1
Percentage-point change in the share of low-performing students (below Level 2)	+3.3	-4.3*	-0.7
Variation in performance: Change between 2018 and 2022			
Average change among high-achieving students (90th percentile)	-13.0	+12.7	+2.4
Average change among low-achieving students (10th percentile)	+23.3*	-2.6	-3.2
Gap in learning outcomes between high- and low-achieving students	narrowing gap	stable gap	stable gap
Trends by quarter of socio-economic status (ESCS): 2018-22 / average 10-year trend			
Performance among advantaged students (top quarter of ESCS)	-18.4* / m	-12.3 / m	-12.5 / m
Performance among disadvantaged students (bottom quarter of ESCS)	+20.0* / m	+23.2* / m	+11.3* / m
Performance gap (top – bottom quarter)	narrowing / m	narrowing / m	narrowing / m

Note: * indicates statistically significant trends and changes or mean-performance estimates that are significantly above or below PISA 2022 estimates.
Source: PISA 2022 Database, Tables I.B1.5.1-12, I.B1.5.19, I.B1.5.20 and I.B1.5.21.

Overview of performance trends in Poland

Trends in mathematics, reading and science performance in Poland



Note: White dots indicate mean-performance estimates that are not statistically significantly above/below PISA 2022 estimates. Black lines indicate the best-fitting trend.
Source: OECD, PISA 2022 Database, Tables I.B1.5.4, I.B1.5.5 and I.B1.5.6.

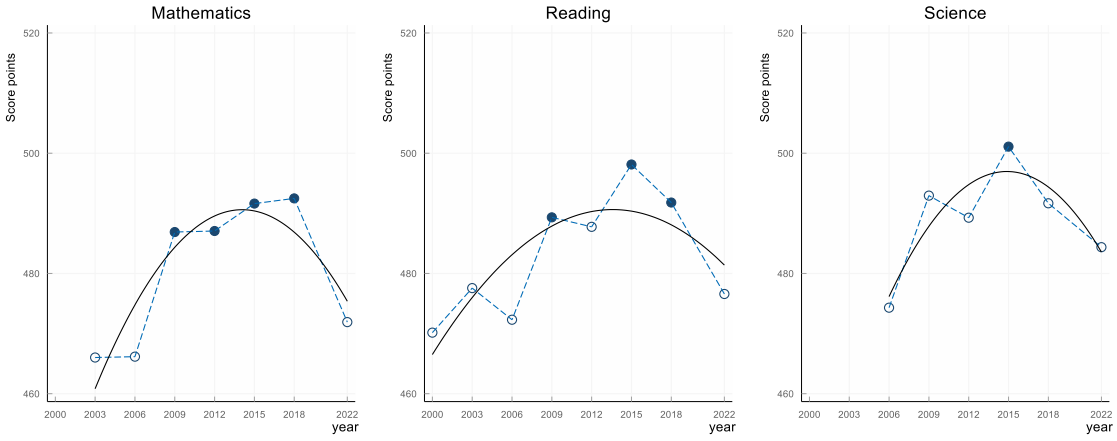
Snapshot of mathematics, reading and science results for Poland

Mean performance	Mathematics	Reading	Science
PISA 2000		479	
PISA 2003	490	497	
PISA 2006	495	508*	498
PISA 2009	495	500*	508
PISA 2012	518*	518*	526*
PISA 2015	504*	506*	501
PISA 2018	516*	512*	511*
PISA 2022	489	489	499
Average 10-year trend in mean performance (2012 to 2022)	-23.7*	-25.8*	-21.4*
Short-term change in mean performance (2018 to 2022)	-26.7*	-23.1*	-11.9*
Proficiency levels: Change between 2012 and 2022			
Percentage-point change in the share of top-performing students (Level 5 or 6)	-7.3*	-1.2	-2.8*
Percentage-point change in the share of low-performing students (below Level 2)	+8.6*	+11.6*	+9.6*
Variation in performance: Change between 2018 and 2022			
Average change among high-achieving students (90th percentile)	-26.5*	-16.9*	-7.1
Average change among low-achieving students (10th percentile)	-27.9*	-37.0*	-22.0*
Gap in learning outcomes between high- and low-achieving students	stable gap	widening gap	widening gap
Trends by quarter of socio-economic status (ESCS): 2018-22 / average 10-year trend			
Performance among advantaged students (top quarter of ESCS)	-24.4* / -22.6*	-17.6* / -17.9*	-8.3 / -20.0*
Performance among disadvantaged students (bottom quarter of ESCS)	-29.4* / -26.9*	-28.4* / -33.8*	-17.0* / -27.5*
Performance gap (top – bottom quarter)	stable / stable	stable / widening	stable / stable

Note: * indicates statistically significant trends and changes or mean-performance estimates that are significantly above or below PISA 2022 estimates.
Source: PISA 2022 Database, Tables I.B1.5.1-12, I.B1.5.19, I.B1.5.20 and I.B1.5.21.

Overview of performance trends in Portugal

Trends in mathematics, reading and science performance in Portugal



Note: White dots indicate mean-performance estimates that are not statistically significantly above/below PISA 2022 estimates. Black lines indicate the best-fitting trend.
Source: OECD, PISA 2022 Database, Tables I.B1.5.4, I.B1.5.5 and I.B1.5.6.

Snapshot of mathematics, reading and science results for Portugal

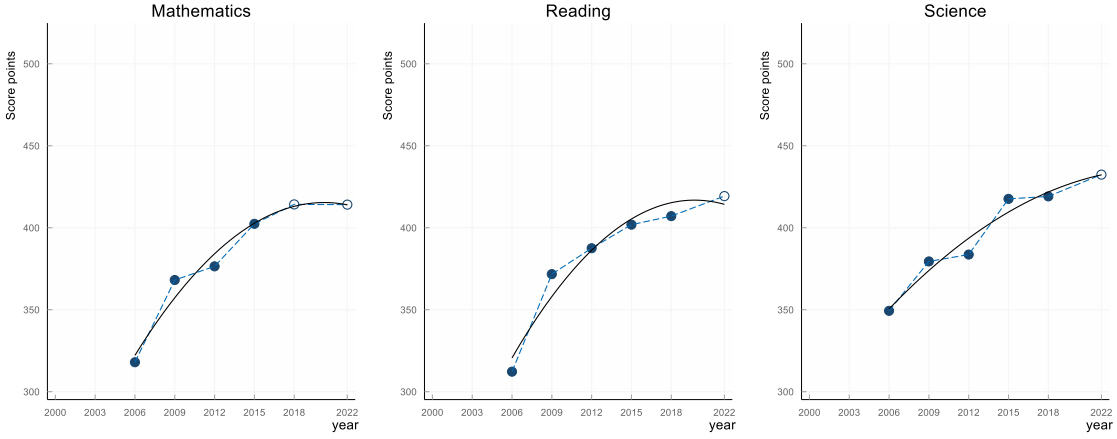
Mean performance	Mathematics	Reading	Science
PISA 2000		470	
PISA 2003	466	478	
PISA 2006	466	472	474
PISA 2009	487*	489*	493
PISA 2012	487*	488	489
PISA 2015	492*	498*	501*
PISA 2018	492*	492*	492
PISA 2022	472	477	484
Average 10-year trend in mean performance (2012 to 2022)	-14.6*	-12.8	-7.3
Short-term change in mean performance (2018 to 2022)	-20.6*	-15.2*	-7.3
Proficiency levels: Change between 2012 and 2022			
Percentage-point change in the share of top-performing students (Level 5 or 6)	-4.0*	-1.1	+0.3
Percentage-point change in the share of low-performing students (below Level 2)	+4.8*	+4.3	+2.8
Variation in performance: Change between 2018 and 2022			
Average change among high-achieving students (90th percentile)	-24.7*	-18.2*	-5.7
Average change among low-achieving students (10th percentile)	-5.8	-10.4	-4.1
Gap in learning outcomes between high- and low-achieving students	narrowing gap	stable gap	stable gap
Trends by quarter of socio-economic status (ESCS): 2018-22 / average 10-year trend			
Performance among advantaged students (top quarter of ESCS)	-19.8* / -17.8*	-15.6* / -14.8*	-8.3 / -8.8*
Performance among disadvantaged students (bottom quarter of ESCS)	-17.0* / -10.0	-11.2 / -4.8	-2.4 / -1.1
Performance gap (top – bottom quarter)	stable / stable	stable / stable	stable / stable

Note: * indicates statistically significant trends and changes or mean-performance estimates that are significantly above or below PISA 2022 estimates.
Source: PISA 2022 Database, Tables I.B1.5.1-12, I.B1.5.19, I.B1.5.20 and I.B1.5.21.

> *Note: In 2018, Portugal did not meet the student-response rate standard: response rates dropped between 2015 and 2018 but then returned to higher levels in 2022. The non-response-bias analysis submitted for 2018 implies a small upward bias for PISA 2018 performance results in Portugal.*

Overview of performance trends in Qatar

Trends in mathematics, reading and science performance in Qatar



Note: White dots indicate mean-performance estimates that are not statistically significantly above/below PISA 2022 estimates. Black lines indicate the best-fitting trend.
Source: OECD, PISA 2022 Database, Tables I.B1.5.4, I.B1.5.5 and I.B1.5.6.

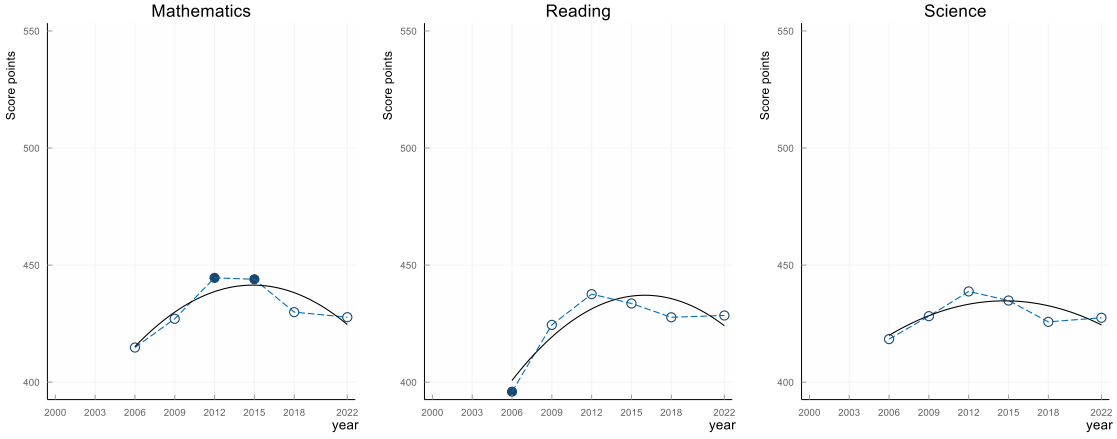
Snapshot of mathematics, reading and science results for Qatar

Mean performance	Mathematics	Reading	Science
PISA 2000		m	
PISA 2003	m	m	
PISA 2006	318*	312*	349*
PISA 2009	368*	372*	379*
PISA 2012	376*	388*	384*
PISA 2015	402*	402*	418*
PISA 2018	414	407*	419*
PISA 2022	414	419	432
Average 10-year trend in mean performance (2012 to 2022)	+36.1*	+30.6*	+44.2*
Short-term change in mean performance (2018 to 2022)	-0.1	+12.2*	+13.3*
Proficiency levels: Change between 2012 and 2022			
Percentage-point change in the share of top-performing students (Level 5 or 6)	+0.6	+1.2*	+1.3*
Percentage-point change in the share of low-performing students (below Level 2)	-13.1*	-9.8*	-18.9*
Variation in performance: Change between 2018 and 2022			
Average change among high-achieving students (90th percentile)	-7.8	+8.9*	+6.5
Average change among low-achieving students (10th percentile)	+17.0*	+20.6*	+23.6*
Gap in learning outcomes between high- and low-achieving students	narrowing gap	narrowing gap	narrowing gap
Trends by quarter of socio-economic status (ESCS): 2018-22 / average 10-year trend			
Performance among advantaged students (top quarter of ESCS)	-4.9 / +37.7*	+7.7 / +34.0*	+8.0* / +45.5*
Performance among disadvantaged students (bottom quarter of ESCS)	+3.9 / +38.8*	+13.9* / +32.2*	+13.3* / +47.6*
Performance gap (top – bottom quarter)	stable / stable	stable / stable	stable / stable

Note: * indicates statistically significant trends and changes or mean-performance estimates that are significantly above or below PISA 2022 estimates.
Source: PISA 2022 Database, Tables I.B1.5.1-12, I.B1.5.19, I.B1.5.20 and I.B1.5.21.

Overview of performance trends in Romania

Trends in mathematics, reading and science performance in Romania



Note: White dots indicate mean-performance estimates that are not statistically significantly above/below PISA 2022 estimates. Black lines indicate the best-fitting trend.
Source: OECD, PISA 2022 Database, Tables I.B1.5.4, I.B1.5.5 and I.B1.5.6.

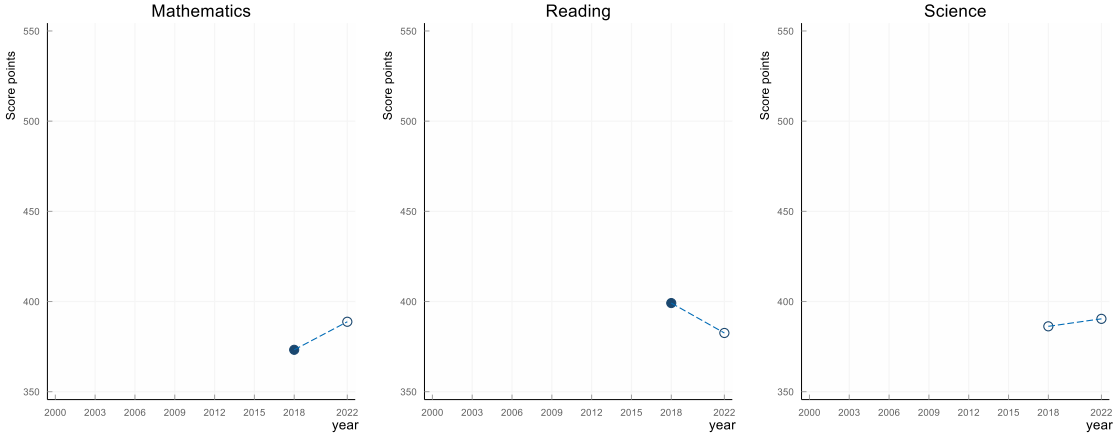
Snapshot of mathematics, reading and science results for Romania

Mean performance	Mathematics	Reading	Science
PISA 2000		m	
PISA 2003	m	m	
PISA 2006	415	396*	418
PISA 2009	427	424	428
PISA 2012	445*	438	439
PISA 2015	444*	434	435
PISA 2018	430	428	426
PISA 2022	428	428	428
Average 10-year trend in mean performance (2012 to 2022)	-19.5*	-9.7	-12.5
Short-term change in mean performance (2018 to 2022)	-2.2	+0.8	+1.7
Proficiency levels: Change between 2012 and 2022			
Percentage-point change in the share of top-performing students (Level 5 or 6)	+0.8	+0.4	+0.5
Percentage-point change in the share of low-performing students (below Level 2)	+7.7*	+4.5	+6.7*
Variation in performance: Change between 2018 and 2022			
Average change among high-achieving students (90th percentile)	+6.0	+5.1	+11.2
Average change among low-achieving students (10th percentile)	-6.9	-0.5	-8.0
Gap in learning outcomes between high- and low-achieving students	stable gap	stable gap	widening gap
Trends by quarter of socio-economic status (ESCS): 2018-22 / average 10-year trend			
Performance among advantaged students (top quarter of ESCS)	+13.0 / -2.6	+11.3 / +2.6	+17.3* / +4.1
Performance among disadvantaged students (bottom quarter of ESCS)	-10.8 / -43.3*	-4.4 / -27.6*	-11.6 / -36.5*
Performance gap (top – bottom quarter)	widening / widening	stable / widening	widening / widening

Note: * indicates statistically significant trends and changes or mean-performance estimates that are significantly above or below PISA 2022 estimates.
Source: PISA 2022 Database, Tables I.B1.5.1-12, I.B1.5.19, I.B1.5.20 and I.B1.5.21.

Overview of performance trends in Saudi Arabia

Trends in mathematics, reading and science performance in Saudi Arabia



Note: White dots indicate mean-performance estimates that are not statistically significantly above/below PISA 2022 estimates.
Source: OECD, PISA 2022 Database, Tables I.B1.5.4, I.B1.5.5 and I.B1.5.6.

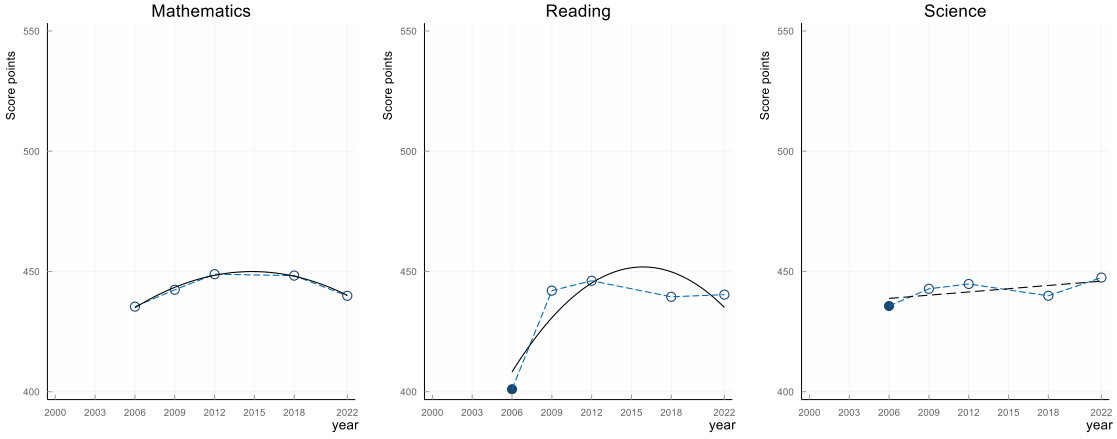
Snapshot of mathematics, reading and science results for Saudi Arabia

Mean performance	Mathematics	Reading	Science
PISA 2000		m	
PISA 2003	m	m	
PISA 2006	m	m	m
PISA 2009	m	m	m
PISA 2012	m	m	m
PISA 2015	m	m	m
PISA 2018	373*	399*	386
PISA 2022	389	383	390
Average 10-year trend in mean performance (2012 to 2022)	m	m	m
Short-term change in mean performance (2018 to 2022)	+15.5*	-16.6*	+4.1
Proficiency levels: Change between 2018 and 2022			
Percentage-point change in the share of top-performing students (Level 5 or 6)	-0.0	-0.0	-0.0
Percentage-point change in the share of low-performing students (below Level 2)	-2.7	+10.2*	-0.0
Variation in performance: Change between 2018 and 2022			
Average change among high-achieving students (90th percentile)	-0.7	-21.4*	-7.3
Average change among low-achieving students (10th percentile)	+35.6*	-5.2	+17.0*
Gap in learning outcomes between high- and low-achieving students	narrowing gap	narrowing gap	narrowing gap
Trends by quarter of socio-economic status (ESCS): 2018-22 / average 10-year trend			
Performance among advantaged students (top quarter of ESCS)	+6.8 / m	-23.6* / m	-5.8 / m
Performance among disadvantaged students (bottom quarter of ESCS)	+26.8* / m	-3.4 / m	+17.7* / m
Performance gap (top – bottom quarter)	narrowing / m	narrowing / m	narrowing / m

Note: * indicates statistically significant trends and changes or mean-performance estimates that are significantly above or below PISA 2022 estimates.
Source: PISA 2022 Database, Tables I.B1.5.1-12, I.B1.5.19, I.B1.5.20 and I.B1.5.21.

Overview of performance trends in Serbia

Trends in mathematics, reading and science performance in Serbia



Note: White dots indicate mean-performance estimates that are not statistically significantly above/below PISA 2022 estimates. Black lines indicate the best-fitting trend.
Source: OECD, PISA 2022 Database, Tables I.B1.5.4, I.B1.5.5 and I.B1.5.6.

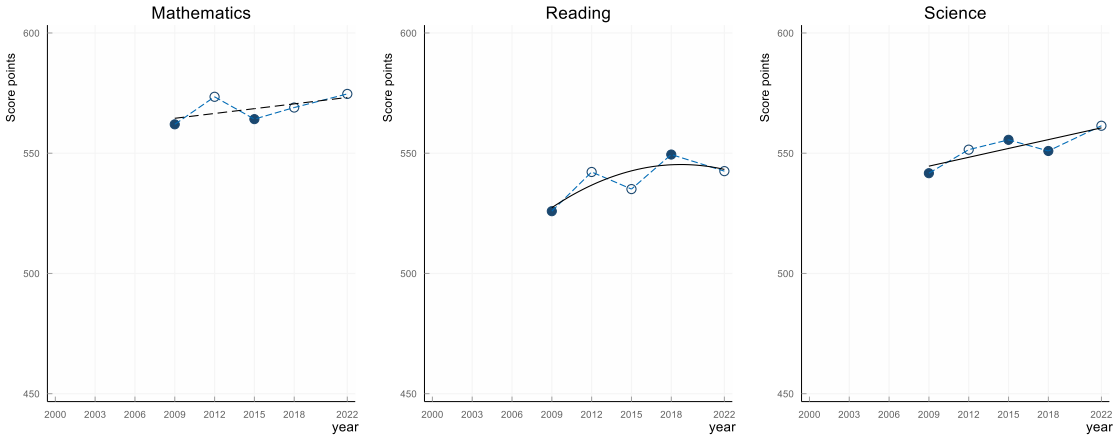
Snapshot of mathematics, reading and science results for Serbia

Mean performance	Mathematics	Reading	Science
PISA 2000		m	
PISA 2003	m	m	
PISA 2006	435	401*	436*
PISA 2009	442	442	443
PISA 2012	449	446	445
PISA 2015	m	m	m
PISA 2018	448	439	440
PISA 2022	440	440	447
Average 10-year trend in mean performance (2012 to 2022)	-8.5	-5.8	+1.8
Short-term change in mean performance (2018 to 2022)	-8.4	+0.9	+7.6
Proficiency levels: Change between 2012 and 2022			
Percentage-point change in the share of top-performing students (Level 5 or 6)	-0.8	-0.4	+0.5
Percentage-point change in the share of low-performing students (below Level 2)	+4.2	+3.3	+0.1
Variation in performance: Change between 2018 and 2022			
Average change among high-achieving students (90th percentile)	-17.4*	-7.4	+4.8
Average change among low-achieving students (10th percentile)	+4.6	+10.3	+10.4
Gap in learning outcomes between high- and low-achieving students	narrowing gap	narrowing gap	stable gap
Trends by quarter of socio-economic status (ESCS): 2018-22 / average 10-year trend			
Performance among advantaged students (top quarter of ESCS)	-10.4 / -11.7	-0.6 / -7.8	+6.7 / +5.1
Performance among disadvantaged students (bottom quarter of ESCS)	-15.2* / -14.9*	-3.0 / -13.0*	-0.4 / -8.7
Performance gap (top – bottom quarter)	stable / stable	stable / stable	stable / stable

Note: * indicates statistically significant trends and changes or mean-performance estimates that are significantly above or below PISA 2022 estimates.
Source: PISA 2022 Database, Tables I.B1.5.1-12, I.B1.5.19, I.B1.5.20 and I.B1.5.21.

Overview of performance trends in Singapore

Trends in mathematics, reading and science performance in Singapore



Note: White dots indicate mean-performance estimates that are not statistically significantly above/below PISA 2022 estimates. Black lines indicate the best-fitting trend.
Source: OECD, PISA 2022 Database, Tables I.B1.5.4, I.B1.5.5 and I.B1.5.6.

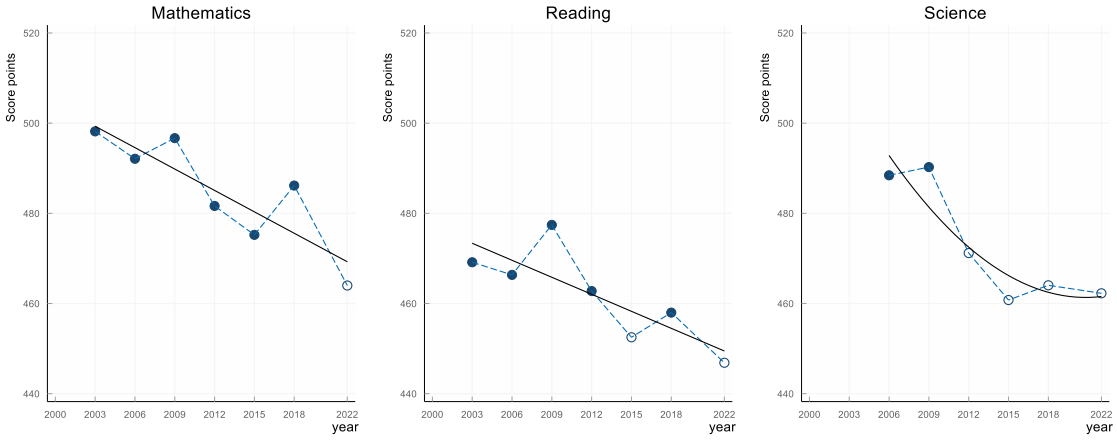
Snapshot of mathematics, reading and science results for Singapore

Mean performance	Mathematics	Reading	Science
PISA 2000		m	
PISA 2003	m	m	
PISA 2006	m	m	m
PISA 2009	562*	526*	542*
PISA 2012	573	542	551
PISA 2015	564*	535	556*
PISA 2018	569	549*	551*
PISA 2022	575	543	561
Average 10-year trend in mean performance (2012 to 2022)	+2.7	+4.2	+8.4
Short-term change in mean performance (2018 to 2022)	+5.7	-6.9*	+10.5*
Proficiency levels: Change between 2012 and 2022			
Percentage-point change in the share of top-performing students (Level 5 or 6)	+0.5	+1.4	+1.7
Percentage-point change in the share of low-performing students (below Level 2)	-0.2	+1.3	-1.8
Variation in performance: Change between 2018 and 2022			
Average change among high-achieving students (90th percentile)	+17.6*	-12.2*	+13.9*
Average change among low-achieving students (10th percentile)	-7.1	+1.6	+9.4*
Gap in learning outcomes between high- and low-achieving students	widening gap	narrowing gap	stable gap
Trends by quarter of socio-economic status (ESCS): 2018-22 / average 10-year trend			
Performance among advantaged students (top quarter of ESCS)	+15.7* / -1.6	-2.0 / +1.1	+16.2* / -2.8
Performance among disadvantaged students (bottom quarter of ESCS)	-5.8 / -4.4	-13.2* / -3.3	+2.6 / +8.0
Performance gap (top – bottom quarter)	widening / stable	stable / stable	widening / stable

Note: * indicates statistically significant trends and changes or mean-performance estimates that are significantly above or below PISA 2022 estimates.
Source: PISA 2022 Database, Tables I.B1.5.1-12, I.B1.5.19, I.B1.5.20 and I.B1.5.21.

Overview of performance trends in Slovak Republic

Trends in mathematics, reading and science performance in Slovak Republic



Note: White dots indicate mean-performance estimates that are not statistically significantly above/below PISA 2022 estimates. Black lines indicate the best-fitting trend.
Source: OECD, PISA 2022 Database, Tables I.B1.5.4, I.B1.5.5 and I.B1.5.6.

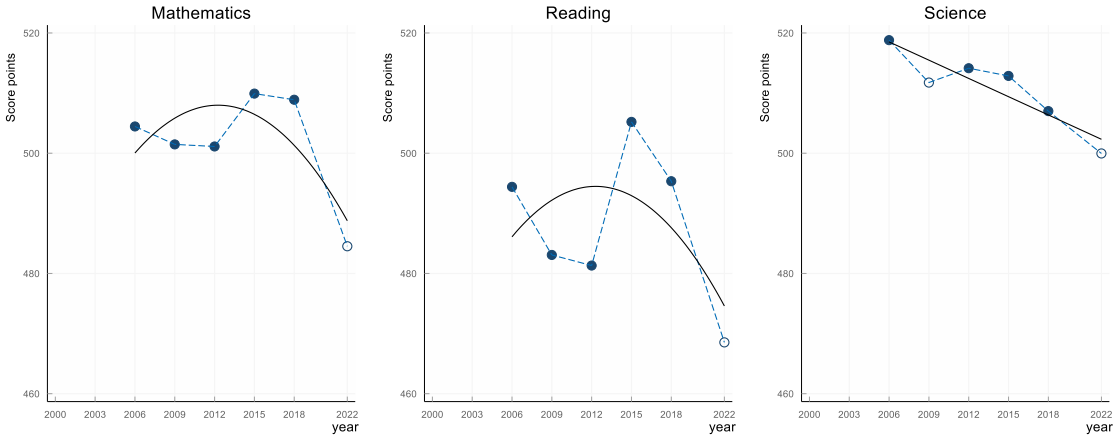
Snapshot of mathematics, reading and science results for Slovak Republic

Mean performance	Mathematics	Reading	Science
PISA 2000		m	
PISA 2003	498*	469*	
PISA 2006	492*	466*	488*
PISA 2009	497*	477*	490*
PISA 2012	482*	463*	471
PISA 2015	475*	453	461
PISA 2018	486*	458*	464
PISA 2022	464	447	462
Average 10-year trend in mean performance (2012 to 2022)	-14.0*	-13.1	-6.8
Short-term change in mean performance (2018 to 2022)	-22.2*	-11.1*	-1.8
Proficiency levels: Change between 2012 and 2022			
Percentage-point change in the share of top-performing students (Level 5 or 6)	-3.7*	-1.0	-0.6
Percentage-point change in the share of low-performing students (below Level 2)	+5.7*	+7.2*	+3.8
Variation in performance: Change between 2018 and 2022			
Average change among high-achieving students (90th percentile)	-19.7*	-9.1	+3.6
Average change among low-achieving students (10th percentile)	-26.0*	-20.4*	-13.7*
Gap in learning outcomes between high- and low-achieving students	stable gap	stable gap	widening gap
Trends by quarter of socio-economic status (ESCS): 2018-22 / average 10-year trend			
Performance among advantaged students (top quarter of ESCS)	-15.3* / -10.6	-6.8 / -17.3*	+10.2 / -3.4
Performance among disadvantaged students (bottom quarter of ESCS)	-31.7* / -21.8*	-19.0* / -6.2	-20.8* / -13.4*
Performance gap (top – bottom quarter)	stable / stable	stable / stable	widening / stable

Note: * indicates statistically significant trends and changes or mean-performance estimates that are significantly above or below PISA 2022 estimates.
Source: PISA 2022 Database, Tables I.B1.5.1-12, I.B1.5.19, I.B1.5.20 and I.B1.5.21.

Overview of performance trends in Slovenia

Trends in mathematics, reading and science performance in Slovenia



Note: White dots indicate mean-performance estimates that are not statistically significantly above/below PISA 2022 estimates. Black lines indicate the best-fitting trend.
Source: OECD, PISA 2022 Database, Tables I.B1.5.4, I.B1.5.5 and I.B1.5.6.

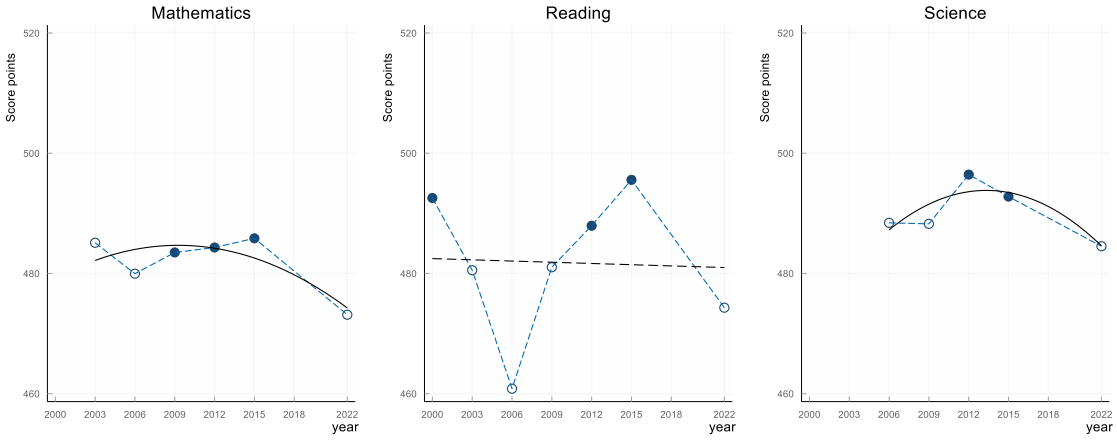
Snapshot of mathematics, reading and science results for Slovenia

Mean performance	Mathematics	Reading	Science
PISA 2000		m	
PISA 2003	m	m	
PISA 2006	504*	494*	519*
PISA 2009	501*	483*	512
PISA 2012	501*	481*	514*
PISA 2015	510*	505*	513*
PISA 2018	509*	495*	507*
PISA 2022	485	469	500
Average 10-year trend in mean performance (2012 to 2022)	-16.7*	-17.0*	-14.4*
Short-term change in mean performance (2018 to 2022)	-24.4*	-26.8*	-7.0*
Proficiency levels: Change between 2012 and 2022			
Percentage-point change in the share of top-performing students (Level 5 or 6)	-4.3*	-0.6	-1.6
Percentage-point change in the share of low-performing students (below Level 2)	+4.5*	+4.9*	+4.9*
Variation in performance: Change between 2018 and 2022			
Average change among high-achieving students (90th percentile)	-18.3*	-22.3*	+1.7
Average change among low-achieving students (10th percentile)	-22.9*	-32.3*	-13.5*
Gap in learning outcomes between high- and low-achieving students	stable gap	stable gap	widening gap
Trends by quarter of socio-economic status (ESCS): 2018-22 / average 10-year trend			
Performance among advantaged students (top quarter of ESCS)	-25.2* / -16.8*	-31.1* / -25.6*	-4.2 / -16.0*
Performance among disadvantaged students (bottom quarter of ESCS)	-30.4* / -19.5*	-32.1* / -16.9*	-16.8* / -17.8*
Performance gap (top – bottom quarter)	stable / stable	stable / stable	widening / stable

Note: * indicates statistically significant trends and changes or mean-performance estimates that are significantly above or below PISA 2022 estimates.
Source: PISA 2022 Database, Tables I.B1.5.1-12, I.B1.5.19, I.B1.5.20 and I.B1.5.21.

Overview of performance trends in Spain

Trends in mathematics, reading and science performance in Spain



Note: White dots indicate mean-performance estimates that are not statistically significantly above/below PISA 2022 estimates. Black lines indicate the best-fitting trend.
Source: OECD, PISA 2022 Database, Tables I.B1.5.4, I.B1.5.5 and I.B1.5.6.

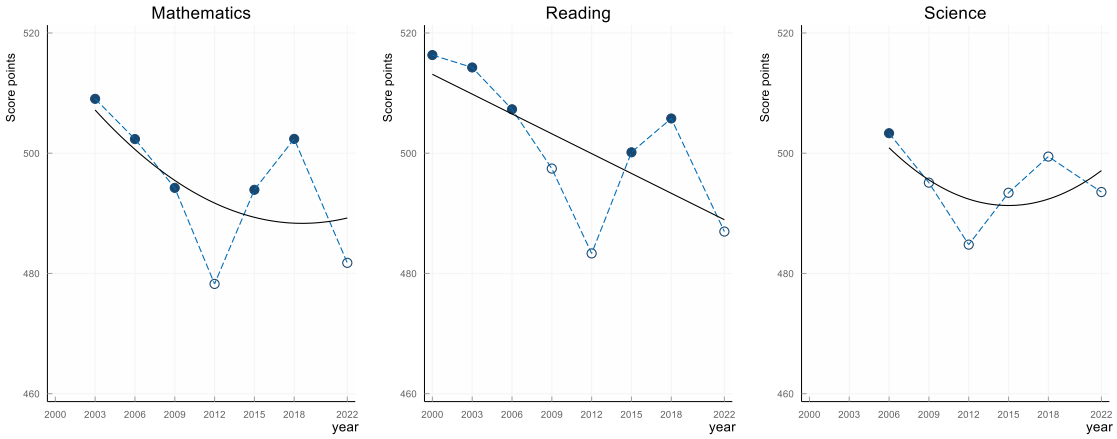
Snapshot of mathematics, reading and science results for Spain

Mean performance	Mathematics	Reading	Science
PISA 2000		493*	
PISA 2003	485	481	
PISA 2006	480	461	488
PISA 2009	483*	481	488
PISA 2012	484*	488*	496*
PISA 2015	486*	496*	493*
PISA 2018	m	m	m
PISA 2022	473	474	485
Average 10-year trend in mean performance (2012 to 2022)	-12.4*	-16.5*	-12.1*
Short-term change in mean performance (2018 to 2022)	m	m	m
Proficiency levels: Change between 2012 and 2022			
Percentage-point change in the share of top-performing students (Level 5 or 6)	-2.1*	-0.2	+0.1
Percentage-point change in the share of low-performing students (below Level 2)	+3.7*	+6.1*	+5.6*
Variation in performance: Change between 2018 and 2022			
Average change among high-achieving students (90th percentile)	m	m	m
Average change among low-achieving students (10th percentile)	m	m	m
Gap in learning outcomes between high- and low-achieving students			
Trends by quarter of socio-economic status (ESCS): 2018-22 / average 10-year trend			
Performance among advantaged students (top quarter of ESCS)	m / -13.1*	m / -16.2*	m / -12.7*
Performance among disadvantaged students (bottom quarter of ESCS)	m / -10.1*	m / -14.1*	m / -10.0*
Performance gap (top – bottom quarter)	m / stable	m / stable	m / stable

Note: * indicates statistically significant trends and changes or mean-performance estimates that are significantly above or below PISA 2022 estimates.
Source: PISA 2022 Database, Tables I.B1.5.1-12, I.B1.5.19, I.B1.5.20 and I.B1.5.21.

Overview of performance trends in Sweden

Trends in mathematics, reading and science performance in Sweden



Note: White dots indicate mean-performance estimates that are not statistically significantly above/below PISA 2022 estimates. Black lines indicate the best-fitting trend.
Source: OECD, PISA 2022 Database, Tables I.B1.5.4, I.B1.5.5 and I.B1.5.6.

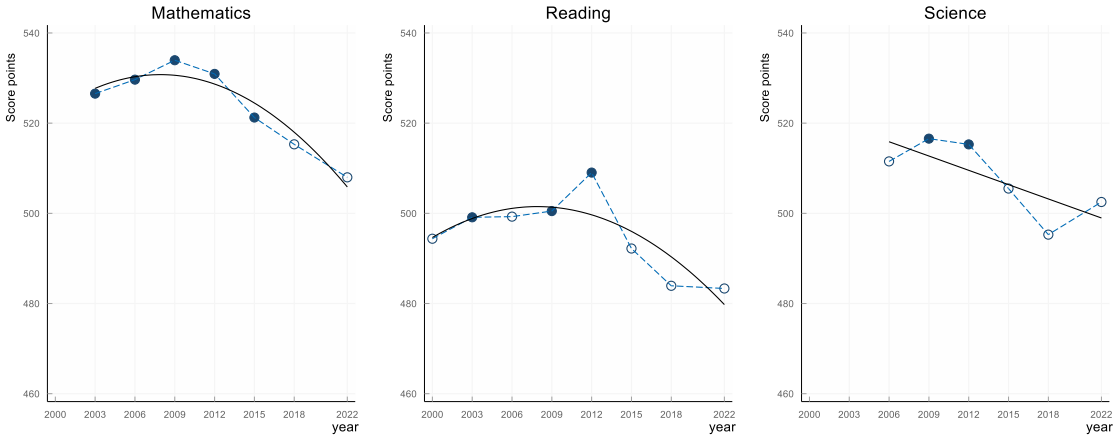
Snapshot of mathematics, reading and science results for Sweden

Mean performance	Mathematics	Reading	Science
PISA 2000		516*	
PISA 2003	509*	514*	
PISA 2006	502*	507*	503*
PISA 2009	494*	497	495
PISA 2012	478	483	485
PISA 2015	494*	500*	493
PISA 2018	502*	506*	499
PISA 2022	482	487	494
Average 10-year trend in mean performance (2012 to 2022)	+4.0	+3.3	+9.0
Short-term change in mean performance (2018 to 2022)	-20.6*	-18.8*	-5.9
Proficiency levels: Change between 2012 and 2022			
Percentage-point change in the share of top-performing students (Level 5 or 6)	+2.0*	+2.3	+3.6*
Percentage-point change in the share of low-performing students (below Level 2)	+0.2	+1.6	+1.5
Variation in performance: Change between 2018 and 2022			
Average change among high-achieving students (90th percentile)	-11.3*	-13.7*	+9.2
Average change among low-achieving students (10th percentile)	-26.8*	-23.1*	-18.5*
Gap in learning outcomes between high- and low-achieving students	widening gap	stable gap	widening gap
Trends by quarter of socio-economic status (ESCS): 2018-22 / average 10-year trend			
Performance among advantaged students (top quarter of ESCS)	-8.8 / +12.8*	-3.3 / +14.5*	+10.5 / +19.2*
Performance among disadvantaged students (bottom quarter of ESCS)	-24.1* / -3.5	-26.6* / -6.9	-14.2* / -2.6
Performance gap (top – bottom quarter)	widening / widening	widening / widening	widening / widening

Note: * indicates statistically significant trends and changes or mean-performance estimates that are significantly above or below PISA 2022 estimates.
Source: PISA 2022 Database, Tables I.B1.5.1-12, I.B1.5.19, I.B1.5.20 and I.B1.5.21.

Overview of performance trends in Switzerland

Trends in mathematics, reading and science performance in Switzerland



Note: White dots indicate mean-performance estimates that are not statistically significantly above/below PISA 2022 estimates. Black lines indicate the best-fitting trend.
Source: OECD, PISA 2022 Database, Tables I.B1.5.4, I.B1.5.5 and I.B1.5.6.

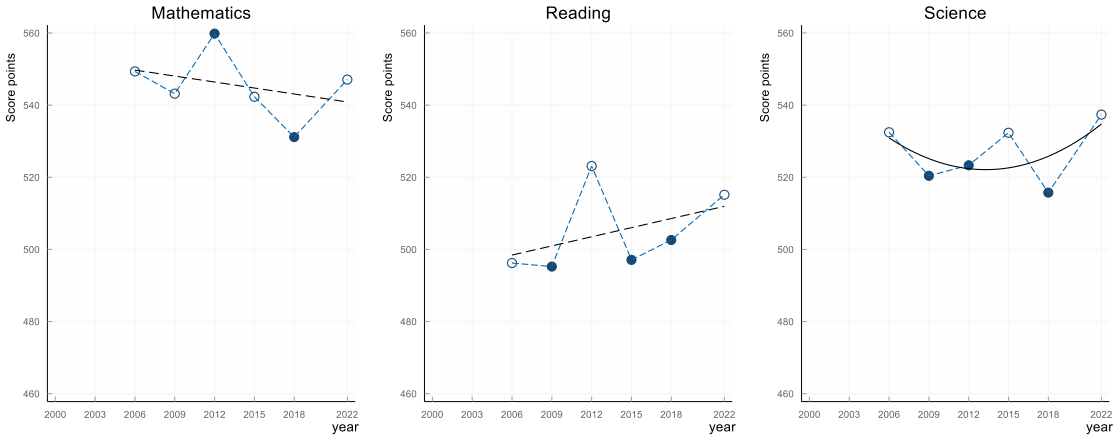
Snapshot of mathematics, reading and science results for Switzerland

Mean performance	Mathematics	Reading	Science
PISA 2000		494	
PISA 2003	527*	499*	
PISA 2006	530*	499	512
PISA 2009	534*	501*	517*
PISA 2012	531*	509*	515*
PISA 2015	521*	492	506
PISA 2018	515	484	495
PISA 2022	508	483	503
Average 10-year trend in mean performance (2012 to 2022)	-22.7*	-25.1*	-13.7*
Short-term change in mean performance (2018 to 2022)	-7.3	-0.6	+7.2
Proficiency levels: Change between 2012 and 2022			
Percentage-point change in the share of top-performing students (Level 5 or 6)	-5.2*	-0.6	+0.3
Percentage-point change in the share of low-performing students (below Level 2)	+7.0*	+10.9*	+6.4*
Variation in performance: Change between 2018 and 2022			
Average change among high-achieving students (90th percentile)	-3.8	+2.8	+9.7
Average change among low-achieving students (10th percentile)	-11.9*	-0.2	+3.5
Gap in learning outcomes between high- and low-achieving students	stable gap	stable gap	stable gap
Trends by quarter of socio-economic status (ESCS): 2018-22 / average 10-year trend			
Performance among advantaged students (top quarter of ESCS)	+1.8 / -8.3	+8.1 / -7.6	+17.9* / -1.2
Performance among disadvantaged students (bottom quarter of ESCS)	-15.3* / -30.3*	-9.9 / -35.1*	+0.8 / -17.9*
Performance gap (top – bottom quarter)	widening / widening	widening / widening	widening / widening

Note: * indicates statistically significant trends and changes or mean-performance estimates that are significantly above or below PISA 2022 estimates.
Source: PISA 2022 Database, Tables I.B1.5.1-12, I.B1.5.19, I.B1.5.20 and I.B1.5.21.

Overview of performance trends in Chinese Taipei

Trends in mathematics, reading and science performance in Chinese Taipei



Note: White dots indicate mean-performance estimates that are not statistically significantly above/below PISA 2022 estimates. Black lines indicate the best-fitting trend.
Source: OECD, PISA 2022 Database, Tables I.B1.5.4, I.B1.5.5 and I.B1.5.6.

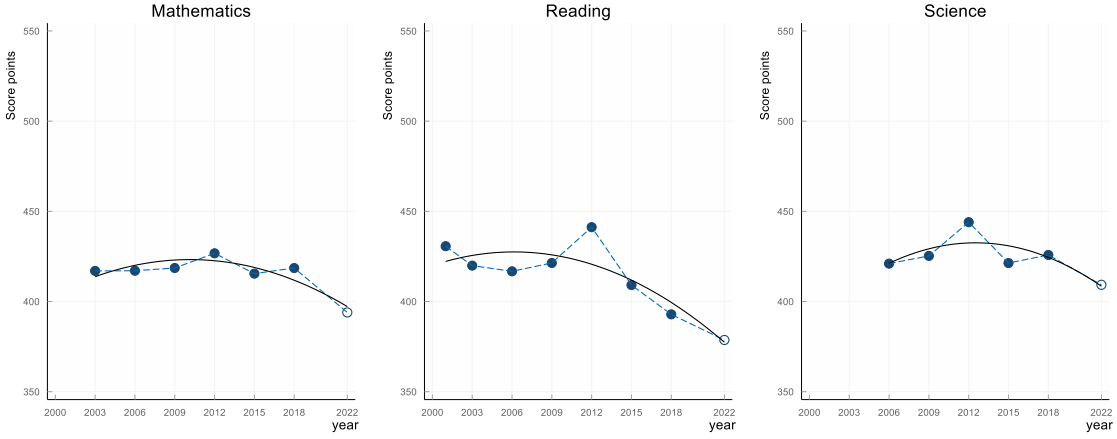
Snapshot of mathematics, reading and science results for Chinese Taipei

Mean performance	Mathematics	Reading	Science
PISA 2000		m	
PISA 2003	m	m	
PISA 2006	549	496	532
PISA 2009	543	495*	520*
PISA 2012	560*	523	523*
PISA 2015	542	497*	532
PISA 2018	531*	503*	516*
PISA 2022	547	515	537
Average 10-year trend in mean performance (2012 to 2022)	-13.0*	-4.1	+9.0
Short-term change in mean performance (2018 to 2022)	+16.0*	+12.6*	+21.6*
Proficiency levels: Change between 2012 and 2022			
Percentage-point change in the share of top-performing students (Level 5 or 6)	-5.5*	+2.2	+9.4*
Percentage-point change in the share of low-performing students (below Level 2)	+1.8	+4.3*	+2.3
Variation in performance: Change between 2018 and 2022			
Average change among high-achieving students (90th percentile)	+30.6*	+13.5*	+22.5*
Average change among low-achieving students (10th percentile)	-4.1	+7.4	+14.5*
Gap in learning outcomes between high- and low-achieving students	widening gap	stable gap	stable gap
Trends by quarter of socio-economic status (ESCS): 2018-22 / average 10-year trend			
Performance among advantaged students (top quarter of ESCS)	+29.9* / -16.2*	+14.0 / -0.8	+27.4* / +13.9*
Performance among disadvantaged students (bottom quarter of ESCS)	+3.3 / -8.0	+6.6 / -5.2	+14.5* / +7.2
Performance gap (top – bottom quarter)	widening / stable	stable / stable	stable / stable

Note: * indicates statistically significant trends and changes or mean-performance estimates that are significantly above or below PISA 2022 estimates.
Source: PISA 2022 Database, Tables I.B1.5.1-12, I.B1.5.19, I.B1.5.20 and I.B1.5.21.

Overview of performance trends in Thailand

Trends in mathematics, reading and science performance in Thailand



Note: White dots indicate mean-performance estimates that are not statistically significantly above/below PISA 2022 estimates. Black lines indicate the best-fitting trend.
Source: OECD, PISA 2022 Database, Tables I.B1.5.4, I.B1.5.5 and I.B1.5.6.

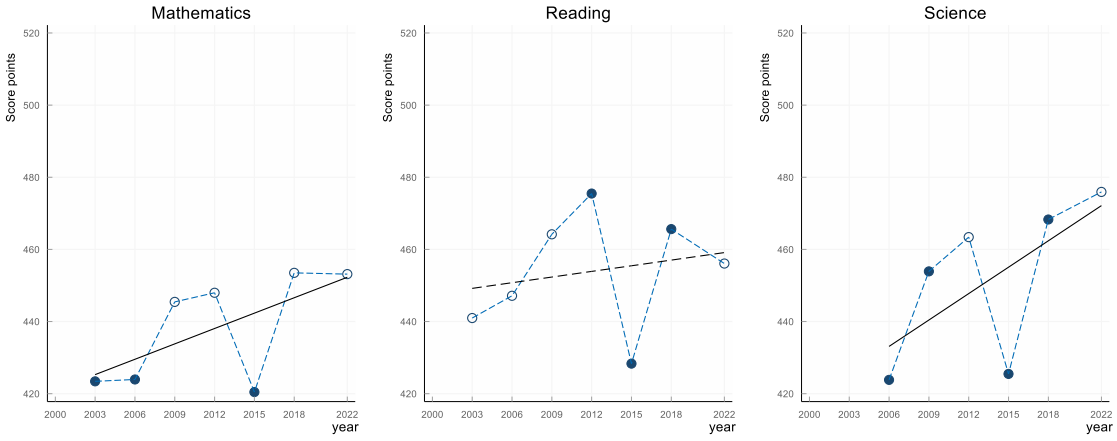
Snapshot of mathematics, reading and science results for Thailand

Mean performance	Mathematics	Reading	Science
PISA 2000		431*	
PISA 2003	417*	420*	
PISA 2006	417*	417*	421*
PISA 2009	419*	421*	425*
PISA 2012	427*	441*	444*
PISA 2015	415*	409*	421*
PISA 2018	419*	393*	426*
PISA 2022	394	379	409
Average 10-year trend in mean performance (2012 to 2022)	-29.6*	-60.5*	-30.5*
Short-term change in mean performance (2018 to 2022)	-24.6*	-14.2*	-16.5*
Proficiency levels: Change between 2012 and 2022			
Percentage-point change in the share of top-performing students (Level 5 or 6)	-1.5*	-0.7*	-0.3
Percentage-point change in the share of low-performing students (below Level 2)	+18.5*	+32.5*	+19.4*
Variation in performance: Change between 2018 and 2022			
Average change among high-achieving students (90th percentile)	-40.1*	-15.0*	-17.0*
Average change among low-achieving students (10th percentile)	-3.5	-15.8*	-14.9*
Gap in learning outcomes between high- and low-achieving students	narrowing gap	stable gap	stable gap
Trends by quarter of socio-economic status (ESCS): 2018-22 / average 10-year trend			
Performance among advantaged students (top quarter of ESCS)	-31.7* / -25.6*	-17.5* / -56.0*	-19.5* / -19.7*
Performance among disadvantaged students (bottom quarter of ESCS)	-22.0* / -30.5*	-13.8* / -61.6*	-14.8* / -34.8*
Performance gap (top – bottom quarter)	stable / stable	stable / stable	stable / stable

Note: * indicates statistically significant trends and changes or mean-performance estimates that are significantly above or below PISA 2022 estimates.
Source: PISA 2022 Database, Tables I.B1.5.1-12, I.B1.5.19, I.B1.5.20 and I.B1.5.21.

Overview of performance trends in Türkiye

Trends in mathematics, reading and science performance in Türkiye



Note: White dots indicate mean-performance estimates that are not statistically significantly above/below PISA 2022 estimates. Black lines indicate the best-fitting trend.
Source: OECD, PISA 2022 Database, Tables I.B1.5.4, I.B1.5.5 and I.B1.5.6.

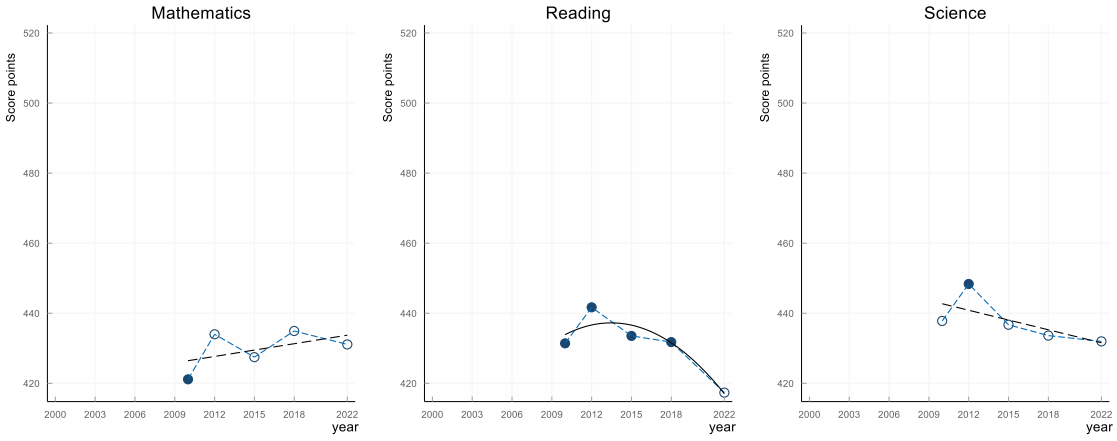
Snapshot of mathematics, reading and science results for Türkiye

Mean performance	Mathematics	Reading	Science
PISA 2000		m	
PISA 2003	423*	441	
PISA 2006	424*	447	424*
PISA 2009	445	464	454*
PISA 2012	448	475*	463
PISA 2015	420*	428*	425*
PISA 2018	454	466*	468*
PISA 2022	453	456	476
Average 10-year trend in mean performance (2012 to 2022)	+15.0*	-6.1	+25.2*
Short-term change in mean performance (2018 to 2022)	-0.4	-9.5*	+7.6*
Proficiency levels: Change between 2012 and 2022			
Percentage-point change in the share of top-performing students (Level 5 or 6)	-0.4	-2.5*	+2.2*
Percentage-point change in the share of low-performing students (below Level 2)	-3.3	+7.6*	-1.7
Variation in performance: Change between 2018 and 2022			
Average change among high-achieving students (90th percentile)	+5.7	-12.8*	+15.8*
Average change among low-achieving students (10th percentile)	-1.8	-9.6	-0.5
Gap in learning outcomes between high- and low-achieving students	stable gap	stable gap	widening gap
Trends by quarter of socio-economic status (ESCS): 2018-22 / average 10-year trend			
Performance among advantaged students (top quarter of ESCS)	-0.4 / +16.9*	-15.7* / -10.1	+7.2 / +33.7*
Performance among disadvantaged students (bottom quarter of ESCS)	-8.1 / +17.2*	-9.8 / -1.5	+4.0 / +24.3*
Performance gap (top – bottom quarter)	stable / stable	stable / stable	stable / stable

Note: * indicates statistically significant trends and changes or mean-performance estimates that are significantly above or below PISA 2022 estimates.
Source: PISA 2022 Database, Tables I.B1.5.1-12, I.B1.5.19, I.B1.5.20 and I.B1.5.21.

Overview of performance trends in United Arab Emirates

Trends in mathematics, reading and science performance in United Arab Emirates



Note: White dots indicate mean-performance estimates that are not statistically significantly above/below PISA 2022 estimates. Black lines indicate the best-fitting trend.
Source: OECD, PISA 2022 Database, Tables I.B1.5.4, I.B1.5.5 and I.B1.5.6.

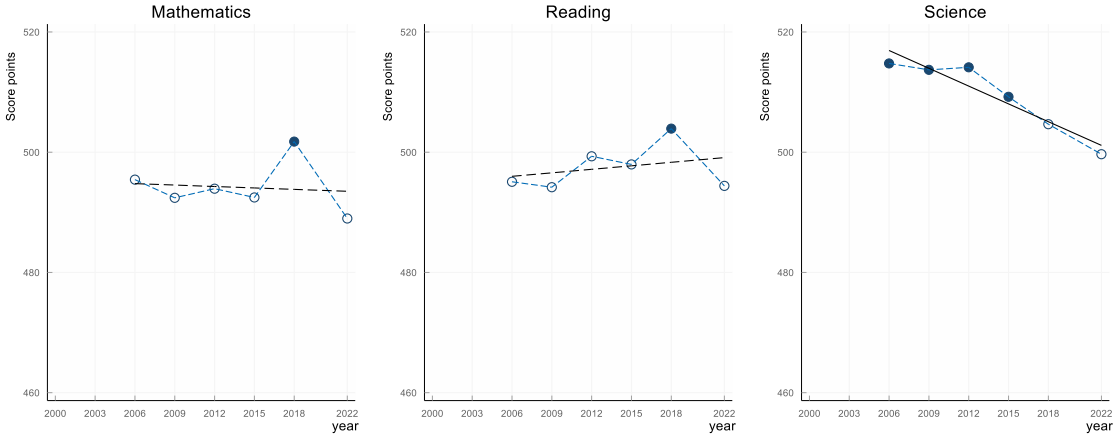
Snapshot of mathematics, reading and science results for United Arab Emirates

Mean performance	Mathematics	Reading	Science
PISA 2000		m	
PISA 2003	m	m	
PISA 2006	m	m	m
PISA 2009	421*	431*	438
PISA 2012	434	442*	448*
PISA 2015	427	434*	437
PISA 2018	435	432*	434
PISA 2022	431	417	432
Average 10-year trend in mean performance (2012 to 2022)	-0.2	-22.9*	-15.1*
Short-term change in mean performance (2018 to 2022)	-3.8	-14.4*	-1.7
Proficiency levels: Change between 2012 and 2022			
Percentage-point change in the share of top-performing students (Level 5 or 6)	+1.9*	+2.8*	+1.4*
Percentage-point change in the share of low-performing students (below Level 2)	+2.7	+12.5*	+9.9*
Variation in performance: Change between 2018 and 2022			
Average change among high-achieving students (90th percentile)	-4.2	+0.1	+9.8*
Average change among low-achieving students (10th percentile)	+7.0	-28.0*	-6.7
Gap in learning outcomes between high- and low-achieving students	narrowing gap	widening gap	widening gap
Trends by quarter of socio-economic status (ESCS): 2018-22 / average 10-year trend			
Performance among advantaged students (top quarter of ESCS)	-28.1* / -14.8*	-40.3* / -33.7*	-22.9* / -30.1*
Performance among disadvantaged students (bottom quarter of ESCS)	+7.0 / +1.6	-7.7* / -27.9*	+4.6 / -15.2*
Performance gap (top – bottom quarter)	narrowing / narrowing	narrowing / stable	narrowing / narrowing

Note: * indicates statistically significant trends and changes or mean-performance estimates that are significantly above or below PISA 2022 estimates.
Source: PISA 2022 Database, Tables I.B1.5.1-12, I.B1.5.19, I.B1.5.20 and I.B1.5.21.

Overview of performance trends in United Kingdom

Trends in mathematics, reading and science performance in United Kingdom



Note: White dots indicate mean-performance estimates that are not statistically significantly above/below PISA 2022 estimates. Black lines indicate the best-fitting trend.
Source: OECD, PISA 2022 Database, Tables I.B1.5.4, I.B1.5.5 and I.B1.5.6.

Snapshot of mathematics, reading and science results for United Kingdom

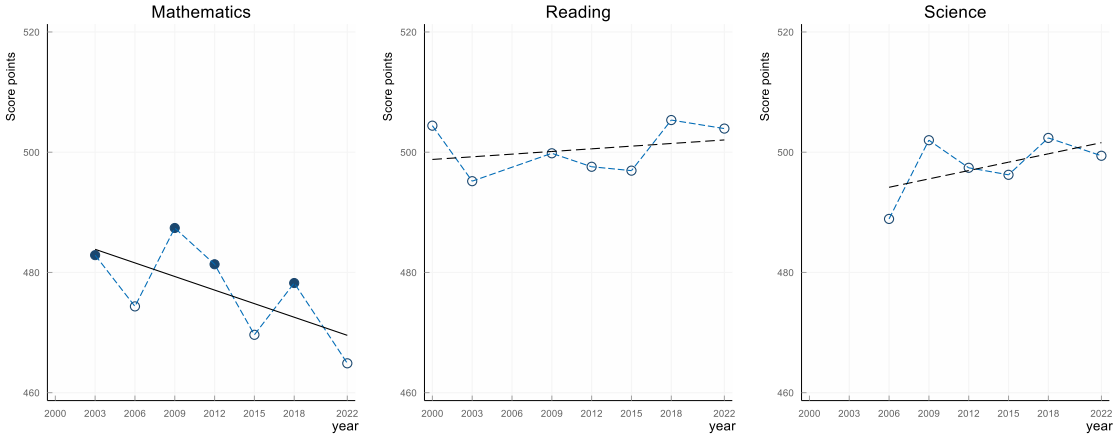
Mean performance	Mathematics	Reading	Science
PISA 2000		m	
PISA 2003	m	m	
PISA 2006	495	495	515*
PISA 2009	492	494	514*
PISA 2012	494	499	514*
PISA 2015	492	498	509*
PISA 2018	502*	504*	505
PISA 2022	489	494	500
Average 10-year trend in mean performance (2012 to 2022)	-2.4	-3.1	-15.1*
Short-term change in mean performance (2018 to 2022)	-12.8*	-9.5*	-5.0
Proficiency levels: Change between 2012 and 2022			
Percentage-point change in the share of top-performing students (Level 5 or 6)	-0.5	+1.3	-1.1
Percentage-point change in the share of low-performing students (below Level 2)	+2.5	+3.5	+5.1*
Variation in performance: Change between 2018 and 2022			
Average change among high-achieving students (90th percentile)	-6.3	-6.3	+2.0
Average change among low-achieving students (10th percentile)	-17.8*	-14.9*	-10.9*
Gap in learning outcomes between high- and low-achieving students	stable gap	stable gap	widening gap
Trends by quarter of socio-economic status (ESCS): 2018-22 / average 10-year trend			
Performance among advantaged students (top quarter of ESCS)	-4.7 / -2.3	-0.1 / -1.6	+5.3 / -14.7*
Performance among disadvantaged students (bottom quarter of ESCS)	-7.3 / +4.9	-1.9 / +8.2	-0.8 / -5.0
Performance gap (top – bottom quarter)	stable / stable	stable / stable	stable / stable

Note: * indicates statistically significant trends and changes or mean-performance estimates that are significantly above or below PISA 2022 estimates.
Source: PISA 2022 Database, Tables I.B1.5.1-12, I.B1.5.19, I.B1.5.20 and I.B1.5.21.

Note: In 2022, student response rates decreased slightly with respect to PISA 2018 and fell short of the target. School response rates also fell short of the target. An informative non-response bias analysis was submitted using external achievement data at student level as auxiliary information along with demographic characteristics; analyses were limited to England and Scotland as the largest subnational entities within the United Kingdom. The analysis provided evidence to suggest a small residual upwards bias, driven entirely by student non-response (school non-participation did not result in significant bias, in contrast). The bias associated with trend comparisons, however, might be smaller or entirely absent when considering the fact that response rates remained close to those observed in 2018.

Overview of performance trends in United States

Trends in mathematics, reading and science performance in United States



Note: White dots indicate mean-performance estimates that are not statistically significantly above/below PISA 2022 estimates. Black lines indicate the best-fitting trend.
Source: OECD, PISA 2022 Database, Tables I.B1.5.4, I.B1.5.5 and I.B1.5.6.

Snapshot of mathematics, reading and science results for United States

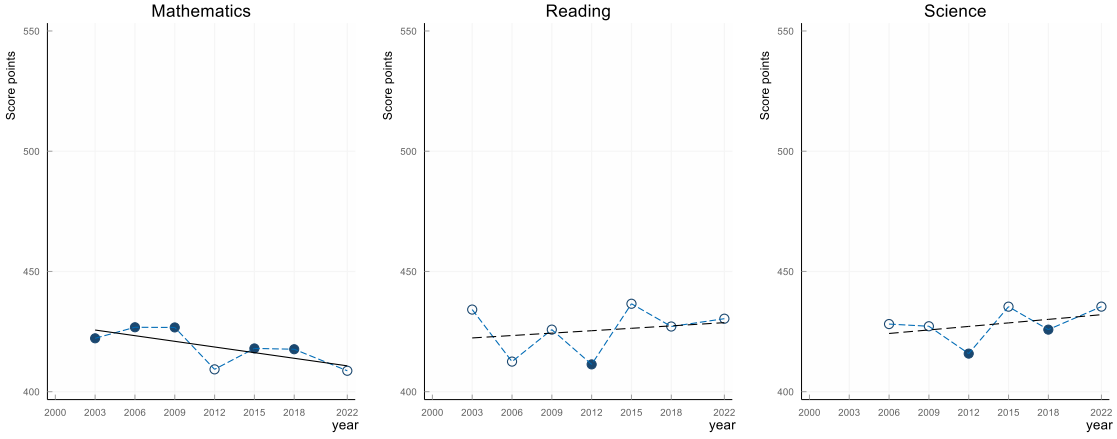
Mean performance	Mathematics	Reading	Science
PISA 2000		504	
PISA 2003	483*	495	
PISA 2006	474	m	489
PISA 2009	487*	500	502
PISA 2012	481*	498	497
PISA 2015	470	497	496
PISA 2018	478*	505	502
PISA 2022	465	504	499
Average 10-year trend in mean performance (2012 to 2022)	-13.1*	+8.4	+3.7
Short-term change in mean performance (2018 to 2022)	-13.4*	-1.4	-3.0
Proficiency levels: Change between 2012 and 2022			
Percentage-point change in the share of top-performing students (Level 5 or 6)	-1.4	+6.3*	+3.5*
Percentage-point change in the share of low-performing students (below Level 2)	+8.1*	+3.5	+3.8
Variation in performance: Change between 2018 and 2022			
Average change among high-achieving students (90th percentile)	-7.8	+5.3	+9.6
Average change among low-achieving students (10th percentile)	-12.4	-4.8	-14.0
Gap in learning outcomes between high- and low-achieving students	stable gap	stable gap	widening gap
Trends by quarter of socio-economic status (ESCS): 2018-22 / average 10-year trend			
Performance among advantaged students (top quarter of ESCS)	-7.4 / -6.4	+2.7 / +18.9*	+7.8 / +11.7*
Performance among disadvantaged students (bottom quarter of ESCS)	-12.3 / -17.4*	-1.6 / +0.3	-10.0 / -1.8
Performance gap (top – bottom quarter)	stable / stable	stable / widening	widening / stable

Note: * indicates statistically significant trends and changes or mean-performance estimates that are significantly above or below PISA 2022 estimates.
Source: PISA 2022 Database, Tables I.B1.5.1-12, I.B1.5.19, I.B1.5.20 and I.B1.5.21.

> *Note: In 2022, school participation rates missed the standard by a substantial margin, and participation rates were particularly low among private schools (representing about 7% of the student population). A non-response bias analysis was submitted, indicating that, after replacement schools and nonresponse adjustments are taken into account, a number of characteristics (not including direct measures of school performance) are balanced across respondents and non-respondents. Exclusions from the sample also showed a marked increase, with respect to 2018, and exceeded the acceptable rate by a small margin; finally, the response rate for students was only slightly above the target (80%). Based on the available information, it is not possible to exclude the possibility of bias, nor to determine its most likely direction.*

Overview of performance trends in Uruguay

Trends in mathematics, reading and science performance in Uruguay



Note: White dots indicate mean-performance estimates that are not statistically significantly above/below PISA 2022 estimates. Black lines indicate the best-fitting trend.
Source: OECD, PISA 2022 Database, Tables I.B1.5.4, I.B1.5.5 and I.B1.5.6.

Snapshot of mathematics, reading and science results for Uruguay

Mean performance	Mathematics	Reading	Science
PISA 2000		m	
PISA 2003	422*	434	
PISA 2006	427*	413	428
PISA 2009	427*	426	427
PISA 2012	409	411*	416*
PISA 2015	418*	437	435
PISA 2018	418*	427	426*
PISA 2022	409	430	435
Average 10-year trend in mean performance (2012 to 2022)	-1.5	+13.4*	+14.5*
Short-term change in mean performance (2018 to 2022)	-8.9*	+3.2	+9.6*
Proficiency levels: Change between 2012 and 2022			
Percentage-point change in the share of top-performing students (Level 5 or 6)	-0.4	+1.1*	+0.5
Percentage-point change in the share of low-performing students (below Level 2)	+0.7	-5.9*	-6.4*
Variation in performance: Change between 2018 and 2022			
Average change among high-achieving students (90th percentile)	-8.7	+6.9	+16.3*
Average change among low-achieving students (10th percentile)	-4.1	-0.1	+4.0
Gap in learning outcomes between high- and low-achieving students	stable gap	stable gap	stable gap
Trends by quarter of socio-economic status (ESCS): 2018-22 / average 10-year trend			
Performance among advantaged students (top quarter of ESCS)	-3.7 / -11.3*	+4.9 / +4.1	+16.2* / +4.6
Performance among disadvantaged students (bottom quarter of ESCS)	-3.2 / +7.1	+12.7* / +17.9*	+14.1* / +20.6*
Performance gap (top – bottom quarter)	stable / narrowing	stable / stable	stable / narrowing

Note: * indicates statistically significant trends and changes or mean-performance estimates that are significantly above or below PISA 2022 estimates.
Source: PISA 2022 Database, Tables I.B1.5.1-12, I.B1.5.19, I.B1.5.20 and I.B1.5.21.

Annex E. The development and implementation of PISA: A collaborative effort

PISA is a collaborative effort, bringing together experts from the participating countries, steered jointly by their governments based on shared, policy-driven interests.

A PISA Governing Board, on which each country is represented, determines the policy priorities for PISA, in the context of OECD objectives, and oversees adherence to these priorities during the implementation of the programme. This includes setting priorities for the development of indicators, for establishing the assessment instruments, and for reporting the results.

Experts from participating countries also serve on working groups that are charged with linking policy objectives with the best internationally available technical expertise. By participating in these expert groups, countries ensure that the instruments are internationally valid and take into account the cultural and educational contexts in OECD member and partner countries and economies, that the assessment materials have strong measurement properties, and that the instruments place emphasise authenticity and educational validity.

Through National Project Managers, participating countries and economies implement PISA at the national level subject to the agreed administration procedures. National Project Managers play a vital role in ensuring that the implementation of the survey is of high quality, and verify and evaluate the survey results, analyses, reports and publications.

The design and implementation of the surveys, within the framework established by the PISA Governing Board, is the responsibility of external contractors. For PISA 2022, the overall management of contractors and implementation was carried out Educational Testing Service (ETS) in the United States as the Core A contractor. Tasks under Core A also included the instrument development, development of the computer platform, survey operations and meetings, scaling, analysis and data products. These tasks were implemented in cooperation from the following subcontractors: i) the University of Luxembourg for support with test development, ii) the Unité d'analyse des systèmes et des pratiques d'enseignement (aSPe) at the University of Liège in Belgium for test development and coding training for open-constructed items, iii) the International Association for Evaluation of Educational Achievement (IEA) in the Netherlands for the data management software, iv) Westat in the United States for survey operations, and v) HallStat SPRL in Belgium for translation referee.

The remaining tasks related to the implementation of PISA 2022 were implemented through three additional contractors – Cores B to DP. The development of the cognitive assessment frameworks for mathematics and creative thinking and of the framework for questionnaires was carried out by RTI in the United States as the Core B contractor. Core C focused on sampling and weighting and was the responsibility of Westat in the United States in co-operation with the Australian Council for Educational Research (ACER) for the sampling software ACER Maple. Linguistic quality control and the development of the French source version for Core D were undertaken by cApStAn, who worked in collaboration with BranTra as a subcontractor.

The OECD Secretariat has overall managerial responsibility for the programme, monitors its implementation daily, acts as the secretariat for the PISA Governing Board, builds consensus among countries and serves as the interlocutor between the PISA Governing Board and the international Consortium charged with implementing the activities. The OECD Secretariat also produces the indicators and analyses and prepares the international reports and publications in co-operation with the PISA Consortium and in close consultation with member and partner

countries and economies both at the policy level (PISA Governing Board) and at the level of implementation (National Project Managers).

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(*Former PGB representative who was involved in PISA 2022)

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PISA 2022 Results (Volume I)

THE STATE OF LEARNING AND EQUITY IN EDUCATION

The OECD Programme for International Student Assessment (PISA) examines what students know in mathematics, reading and science, and what they can do with what they know. It provides the most comprehensive and rigorous international assessment of student learning outcomes to date. Results from PISA indicate the quality and equity of learning outcomes attained around the world, and allow educators and policy makers to learn from the policies and practices applied in other countries. This is one of five volumes that present the results of the eighth round of assessment, PISA 2022. Volume I, The State of Learning and Equity in Education, describes students' performance in mathematics, reading and science; examines gender differences in performance; and investigates how performance relates to students' socio-economic status and immigrant background. It also describes how the quality and equity of learning outcomes have evolved since previous PISA assessments.

PRINT ISBN 978-92-64-99796-7
PDF ISBN 978-92-64-35128-8