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.

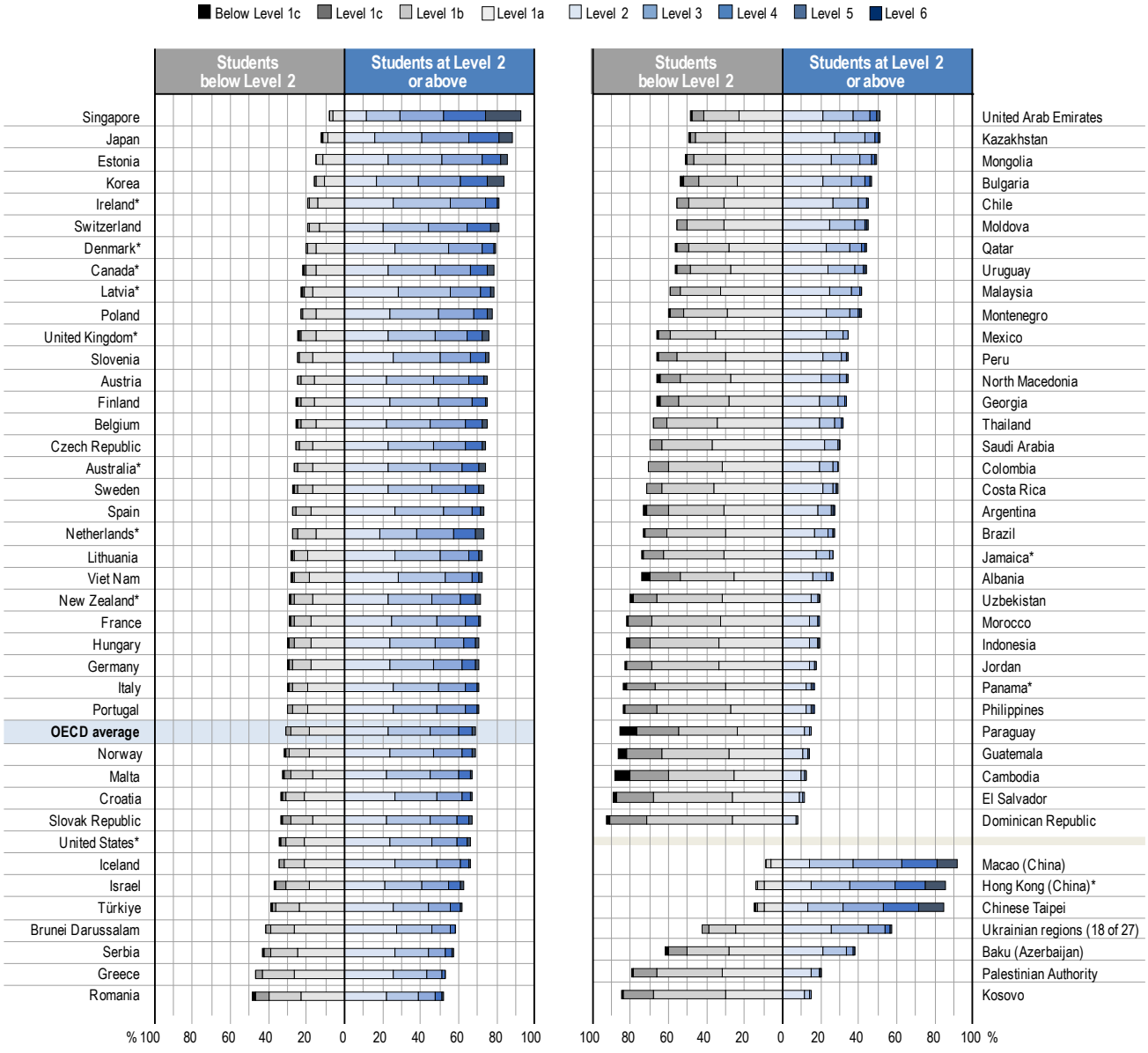
This chapter describes what students are able to do in mathematics, reading and science. Chapter 2 describes students' performance through their score on the PISA scale; scores, however, do not indicate what students are actually capable of accomplishing in each subject. This chapter translates PISA 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 effectively 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 clearly 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		

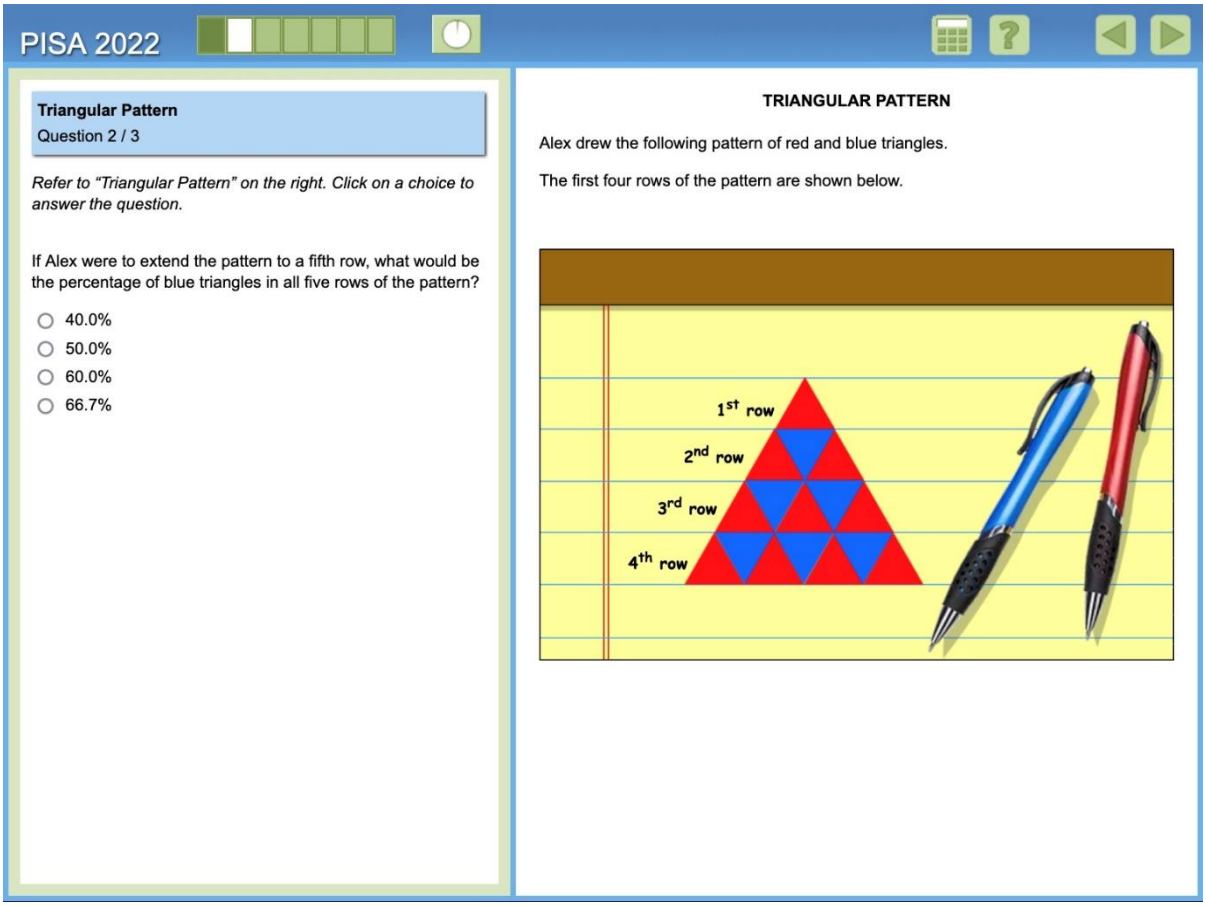
Note: Items with the label "Field Trial" in the Question difficulty column are items that were only used in the PISA 2022 field trial (i.e. not included in the main survey).

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.

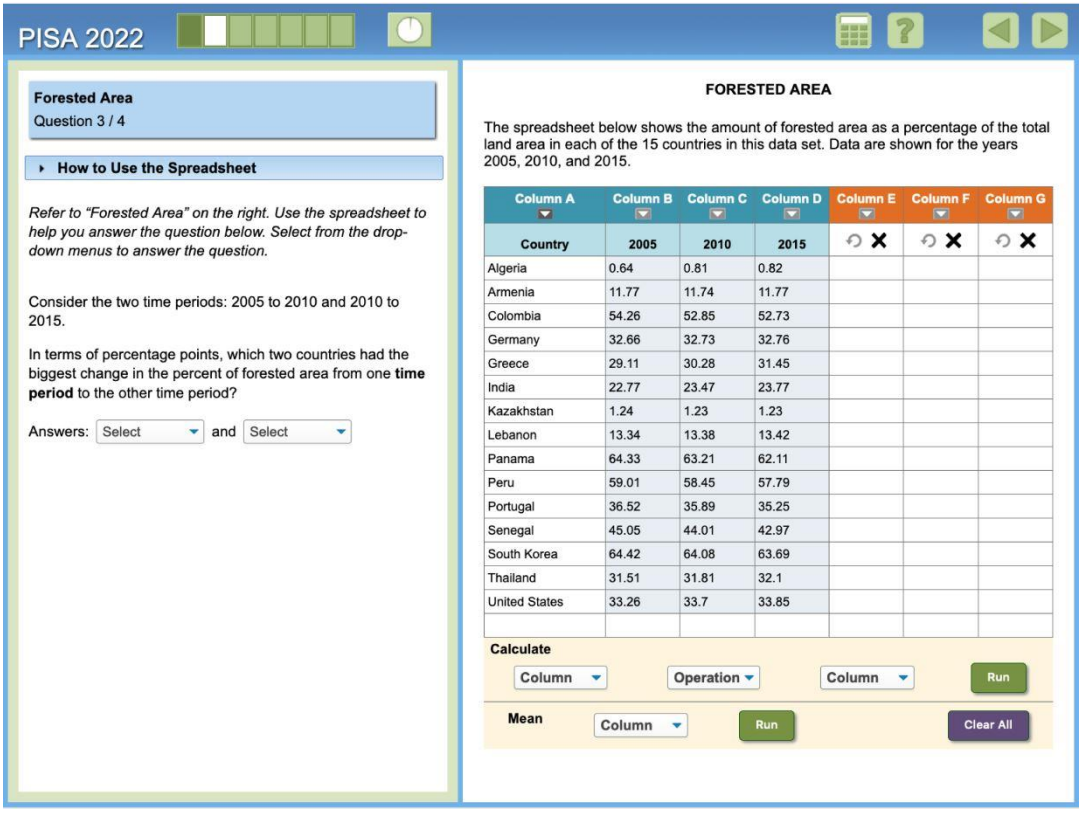
The FORESTED AREAS unit provides examples of tasks at proficiency Levels 5 and 6. The unit has an introduction screen that provides information about the context of the unit and lets students know that they will be using a

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).

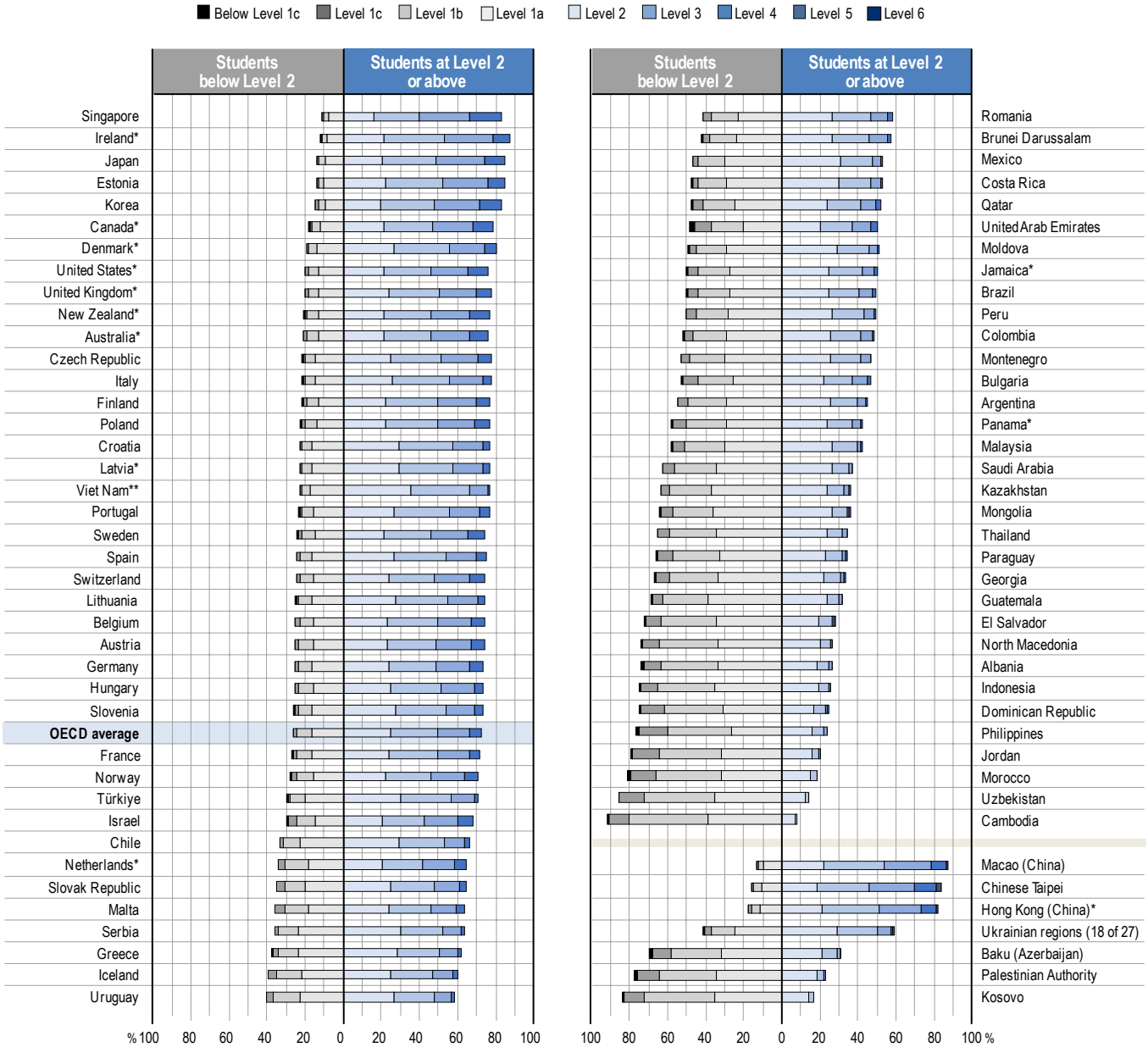
After the field trial, material is considered for rejection, revision or retention in the pool of potential items. The international expert group for each subject then formulates recommendations as to which items should be included in the main assessments. The final set of selected items is also subject 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.

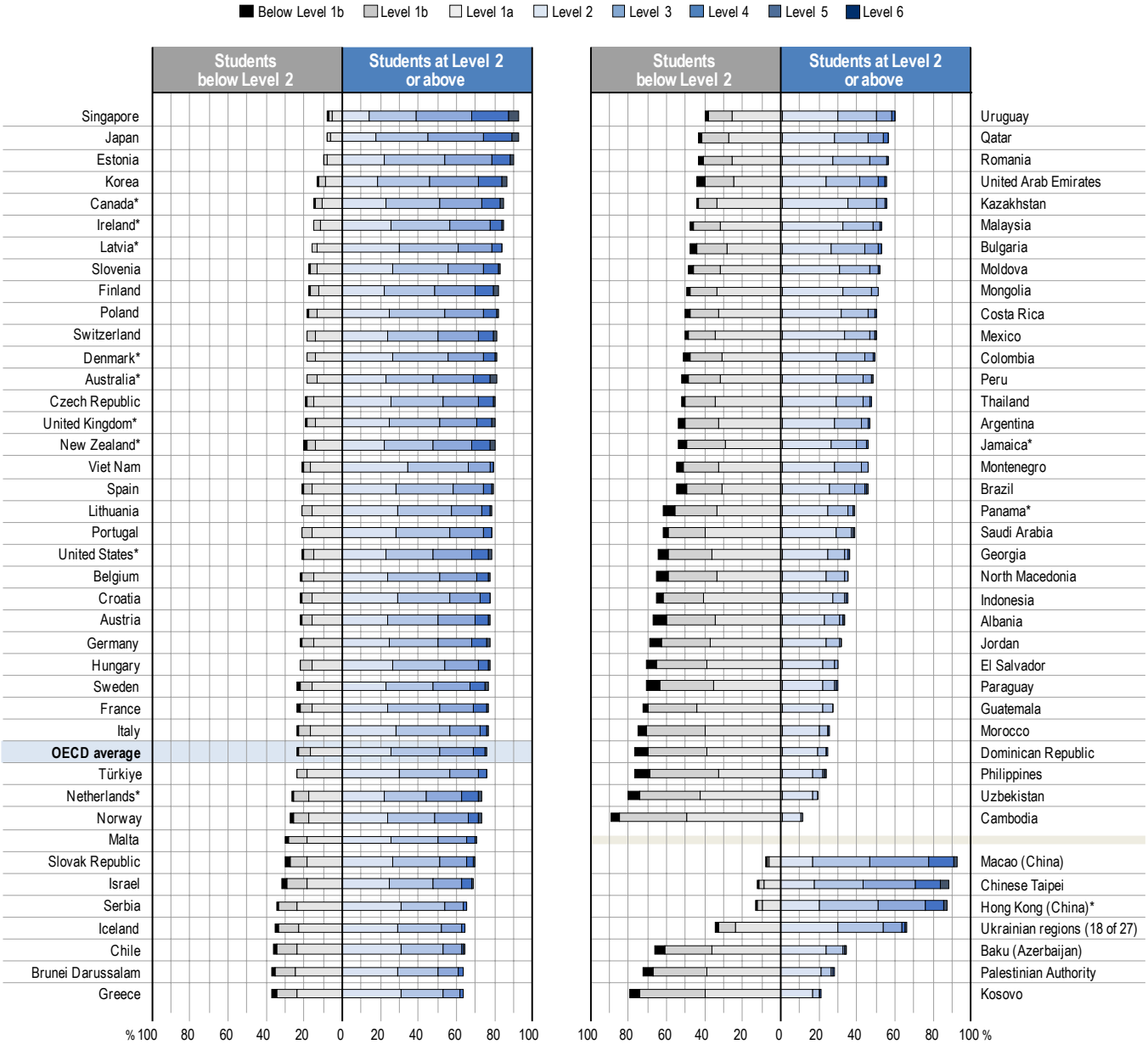
Source: OECD, PISA 2022 Database, Table I.B1.3.2.

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.

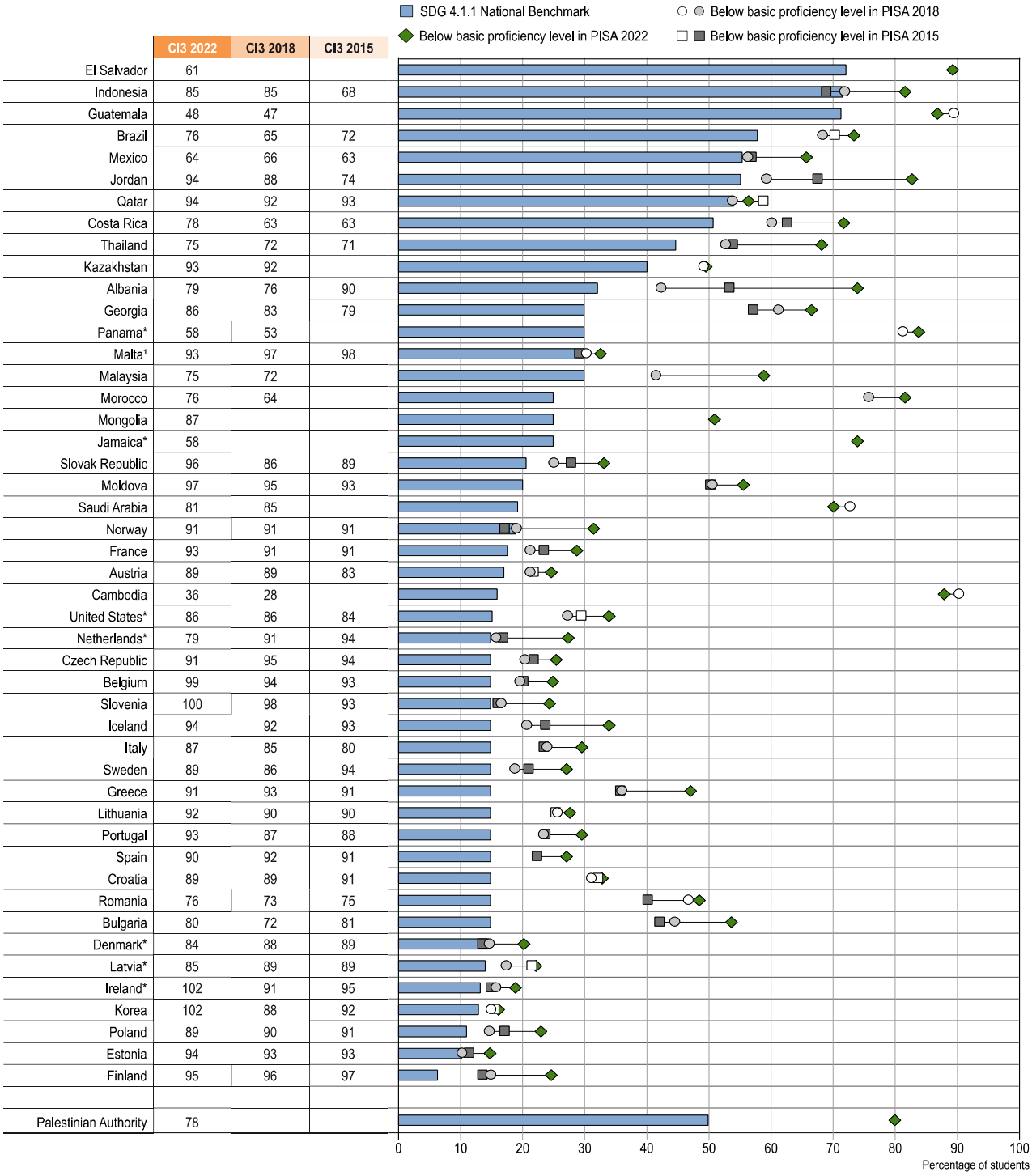
National benchmarks

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.

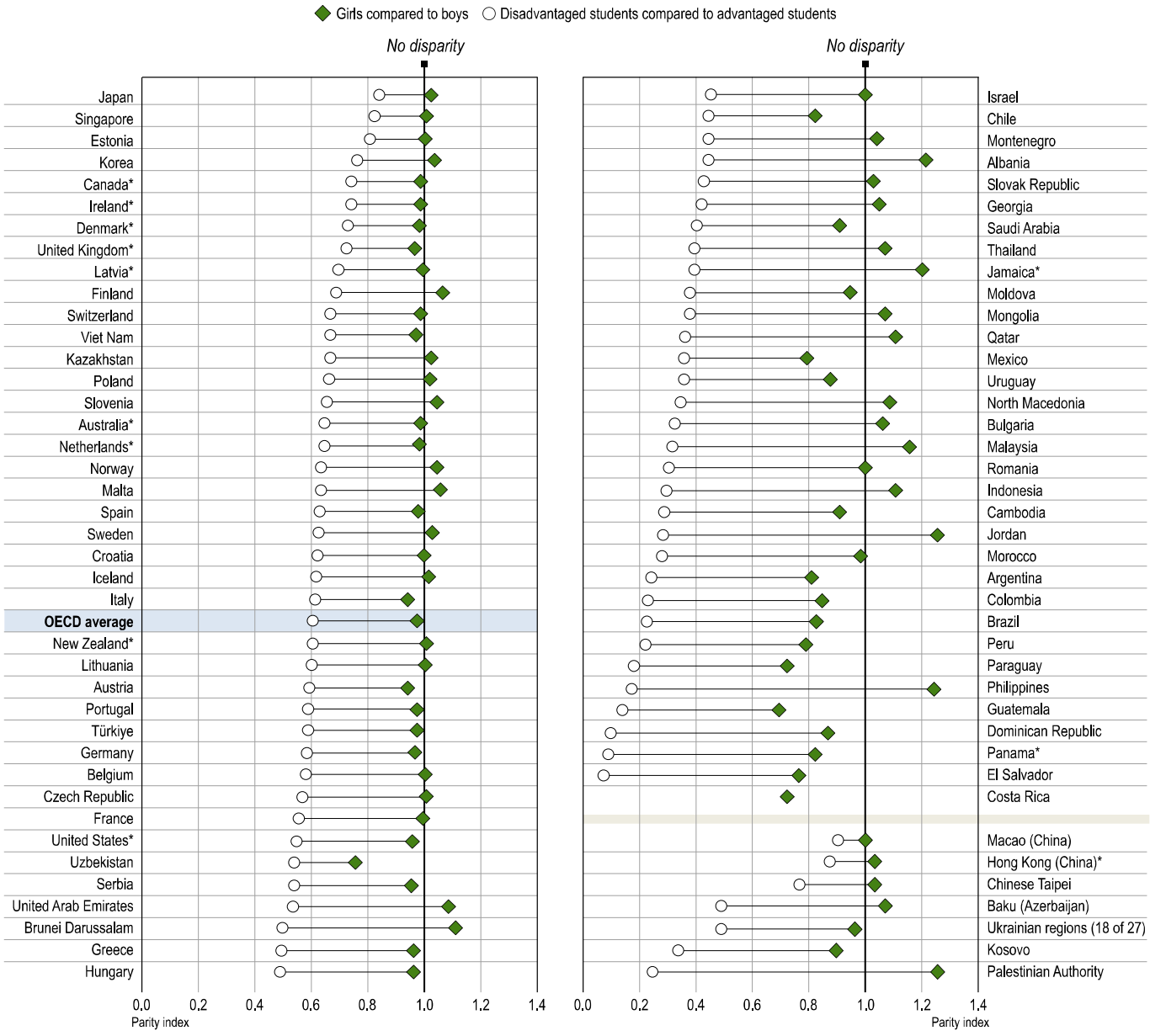
When analysing changes in the share of low performers across countries/economies, it is important to consider differences in the proportion of 15-year-olds represented by the PISA sample in each country in 2015, 2018 and 2022 (the Coverage Index 3, "CI3" in short). For example, in Indonesia, the percentage 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
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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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