What can we learn from PISA?

PISA 2012 results

Launch of the 2018 PISA in Ukraine

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OECD

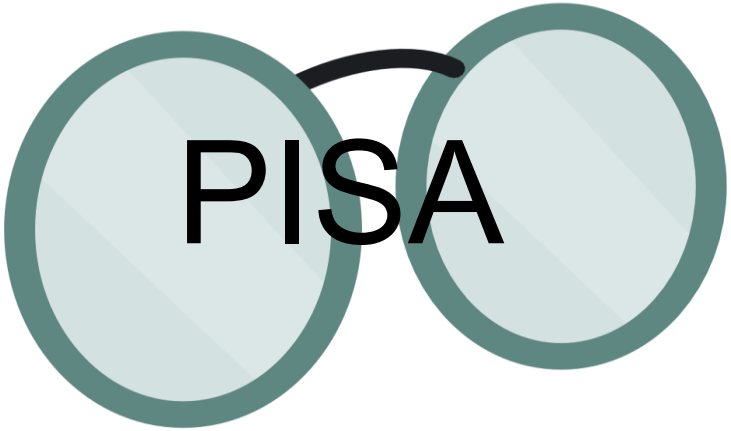
OECD
BETTER POLICIES FOR BETTER LIVES

International comparisons matter:

- To understand where you stand, how others are performing, and what strong performers are doing:

- By sailing to different countries…

and looking at the world through…



PISA 2012 in brief

- **Over half a million students…**
  - representing 28 million 15-year-olds in 65 countries/economies

… took an internationally agreed 2-hour test…

  - Goes beyond testing whether students can reproduce what they were taught…
  - … to assess students' capacity to extrapolate from what they know and creatively apply their knowledge in novel situations
  - Mathematics, reading, science, problem-solving, financial literacy
  - Total of 390 minutes of assessment material

… and responded to questions on…

  - their personal background, their schools and their engagement with learning and school

- **Parents, principals and system leaders provided data on…**
  - school policies, practices, resources and institutional factors that help explain performance differences .

PISA 2012 in brief

- **Key principles**
  - **'Crowd sourcing' and collaboration**
    - PISA draws together leading expertise and institutions from participating countries to develop instruments and methodologies…
    - … guided by governments on the basis of shared policy interests
  - **Cross-national relevance and transferability of policy experiences**
    - Emphasis on validity across cultures, languages and systems
    - Frameworks built on well-structured conceptual understanding of academic disciplines and contextual factors
  - **Triangulation across different stakeholder perspectives**
    - Systematic integration of insights from students, parents, school principals and system-leaders
  - **Advanced methods with different grain sizes**
    - A range of methods to adequately measure constructs with different grain sizes to serve different decision-making needs
    - Productive feedback to fuel improvement at every level of the system .

PISA 2012 Sample Question 1

Climbing Mount Fuji

Mount Fuji is a famous dormant volcano in Japan.

Mount Fuji is only open to the public for climbing from 1 July to 27 August each year. About 200 000 people climb Mount Fuji during this time.

- **On average, about how many people climb Mount Fuji each day?**

A. **340** (*answer code*: pisa1a)

B. **710** (*answer code*: pisa1b)

C. **3400** (*answer code:* pisa1c**)**

D. **7100** (*answer code:* pisa1d)

E. **7400** (*answer code:* pisa1e)

Correct Answer: C. 3400

This item belongs to the *quantity* category. The notion of quantity may be the most pervasive and essential mathematical aspect of engaging with, and functioning in, our world. It incorporates the quantification of attributes of objects, relationships, situations and entities in the world, understanding various representations of those quantifications, and judging interpretations and arguments based on quantity.

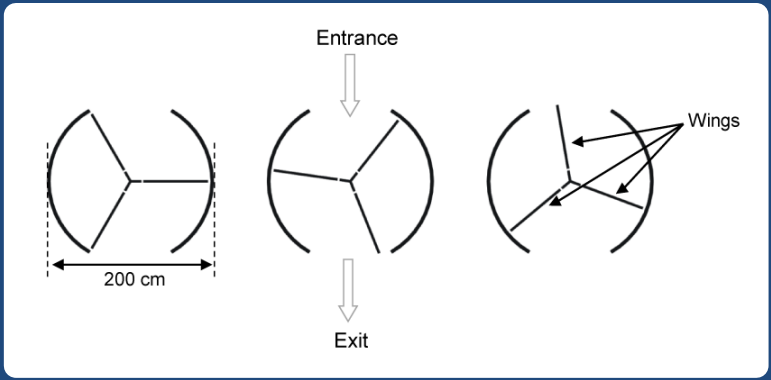
SCORING:	
Description:	Identify an average daily rate given a total number and a specific time period (dates provided)
Mathematical content area:	Quantity
Context:	Societal
Process:	Formulate

PISA 2012 Sample Question 2

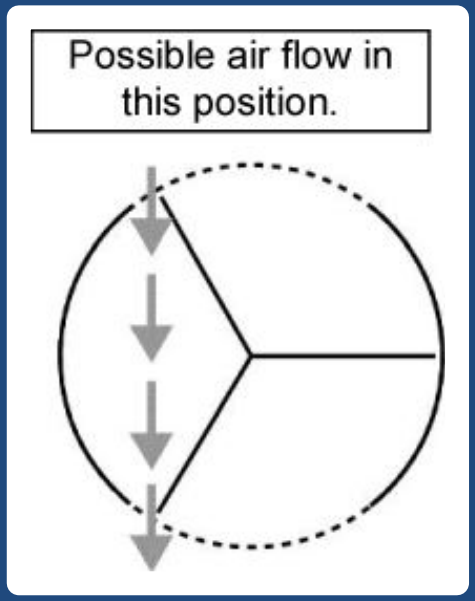
Revolving Door

A revolving door includes three wings which rotate within a circular-shaped space. The inside diameter of this space is 2 metres (200 centimetres). The three door wings divide the space into three equal sectors.

The plan below shows the door wings in three different positions viewed from the top.



The two door openings (the dotted arcs in the diagram) are the same size. If these openings are too wide the revolving wings cannot provide a sealed space and air could then flow freely between the entrance and the exit, causing unwanted heat loss or gain. This is shown in the diagram opposite.



What is the maximum arc length in centimetres (cm) that each door opening can have, so that air never flows freely between the entrance and the exit?

Maximum arc length: _____ cm

PISA 2012 Sample Question 3

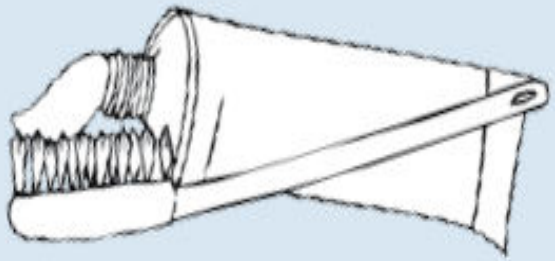
Figure I.2.40

BRUSHING YOUR TEETH

Do our teeth become cleaner and cleaner the longer and harder we brush them?

British researchers say no. They have actually tried out many different alternatives, and ended up with the perfect way to brush your teeth. A two minute brush, without brushing too hard, gives the best result. If you brush hard, you harm your tooth enamel and your gums without loosening food remnants or plaque.

Bente Hansen, an expert on tooth brushing, says that it is a good idea to hold the toothbrush the way you hold a pen. "Start in one corner and brush your way along the whole row," she says. "Don't forget your tongue either! It can actually contain loads of bacteria that may cause bad breath."



"Brushing your Teeth" is an article from a Norwegian magazine.

Use "Brushing Your Teeth" above to answer the questions that follow.

PISA 2012 Sample Question 3

What is this article about?

A. The best way to brush your teeth.

B. The best kind of toothbrush to use.

C. The importance of good teeth.

D. The way different people brush their teeth.

Points	*Level*
	Level 6
698	
	Level 5
626	
	Level 4
553	
	Level 3
480	
	Level 2
407	
	Level 1a
335	
	Level 1b
262	
	Below Level 1b

Difficulty: 358 (Level 1A item)

93.7% of students across OECD can perform tasks at least at this level

PISA 2012 Sample Question 4

■ Figure I.2.44 ■

MISER

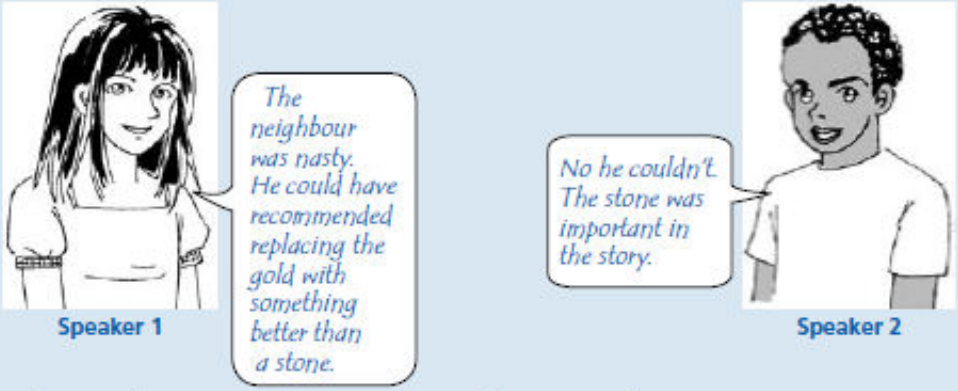
THE MISER AND HIS GOLD

A fable by Aesop

A miser sold all that he had and bought a lump of gold, which he buried in a hole in the ground by the side of an old wall. He went to look at it daily. One of his workmen observed the miser's frequent visits to the spot and decided to watch his movements. The workman soon discovered the secret of the hidden treasure, and digging down, came to the lump of gold, and stole it. The miser, on his next visit, found the hole empty and began to tear his hair and to make loud lamentations. A neighbour, seeing him overcome with grief and learning the cause, said, "Pray do not grieve so; but go and take a stone, and place it in the hole, and fancy that the gold is still lying there. It will do you quite the same service; for when the gold was there, you had it not, as you did not make the slightest use of it."

PISA 2012 Sample Question 4

Here is part of a conversation between two people who read "The Miser and his Gold".



What could Speaker 2 say to support his point of view?

.....

.....

Difficulty: 548 (Level 3 item)

Scoring

Full Credit

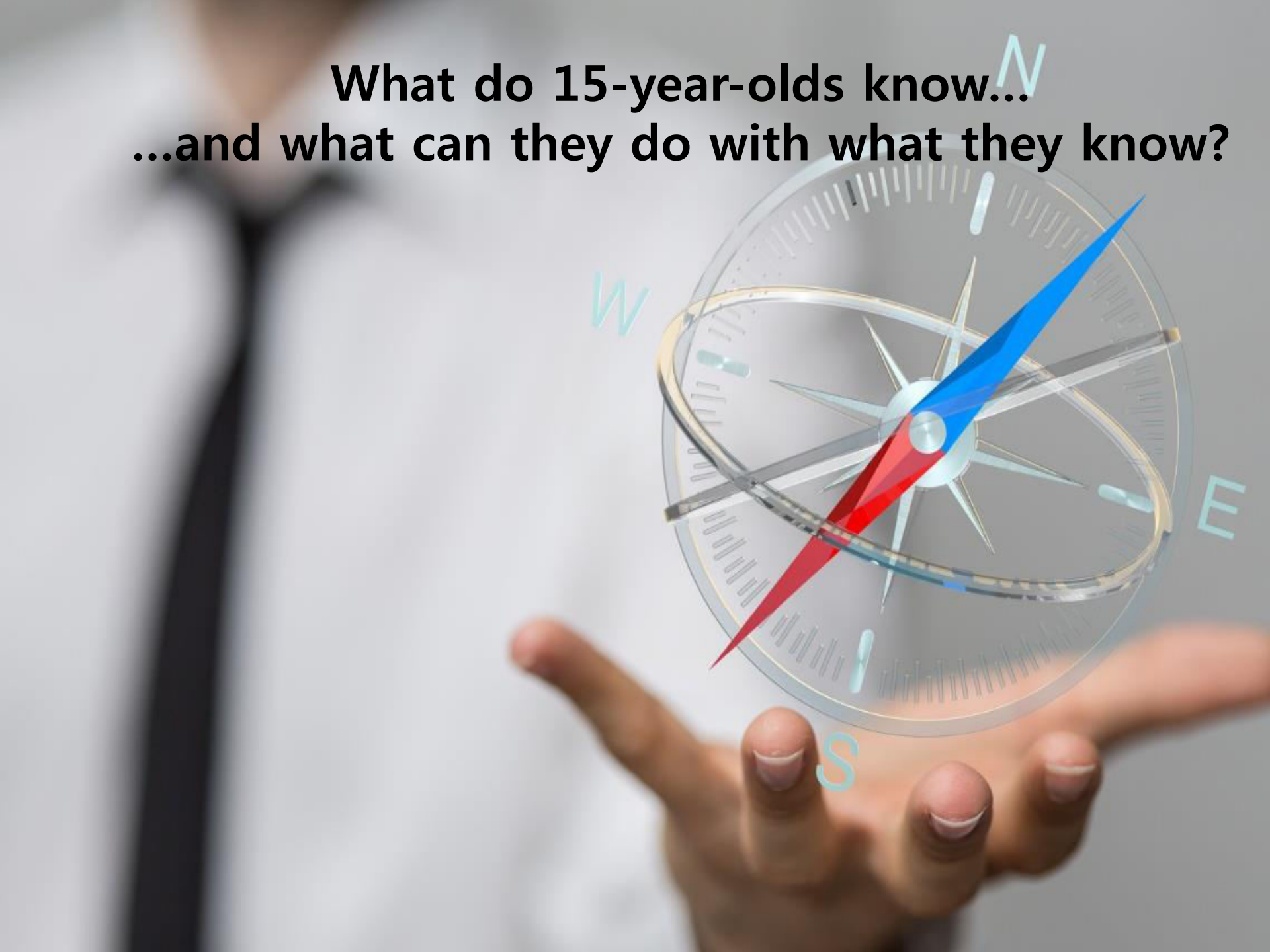
Recognises that the message of the story depends on the gold being replaced by something useless or worthless.

- It needed to be replaced by something worthless to make the point.
- The stone is important in the story, because the whole point is he might as well have buried a stone for all the good the gold did him.
- If you replaced it with something better than a stone, it would miss the point because the thing buried needs to be something really useless.
- A stone is useless, but for the miser, so was the gold!
- Something better would be something he could use – he didn't use the gold, that's what the guy was pointing out.
- Because stones can be found anywhere. The gold and the stone are the same to the miser. *["can be found anywhere" implies that the stone is of no special value]*

57.0% of students a cross OECD can per form tasks at least at this level

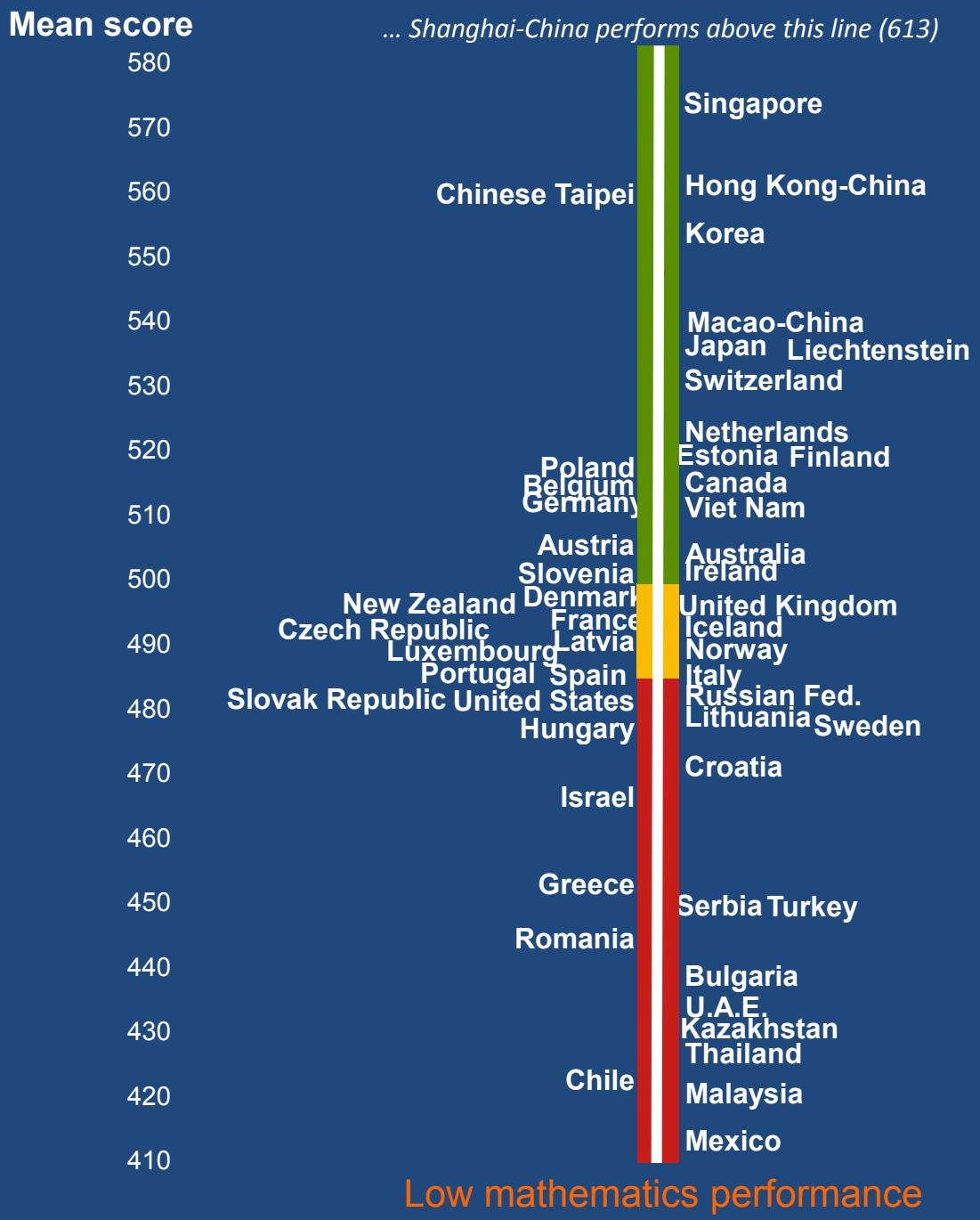
Points	*Level*
	Level 6
698	
	Level 5
626	
	Level 4
553	
	Level 3
480	
	Level 2
407	
	Level 1a
335	
	Level 1b
262	
	Below Level 1b

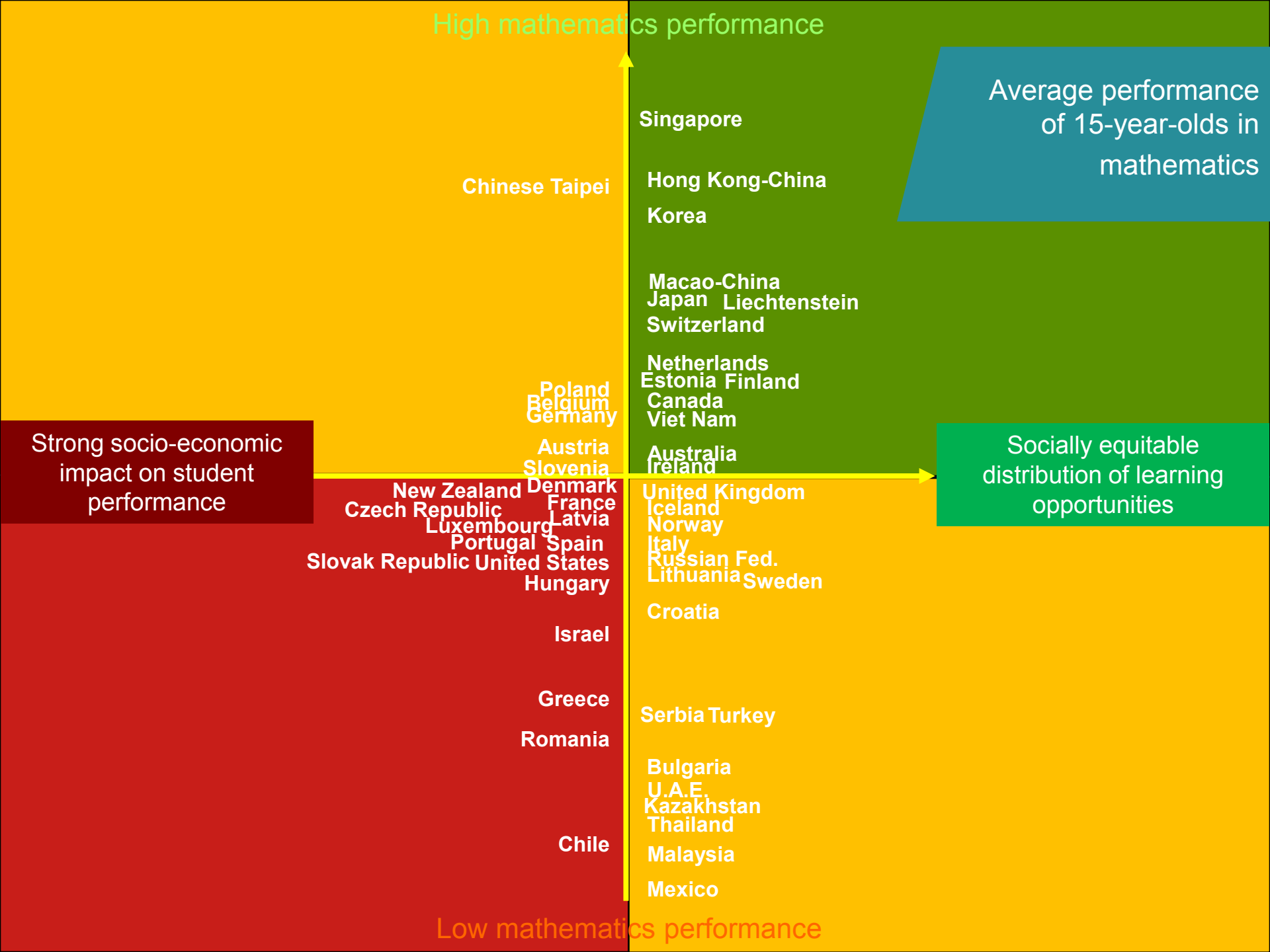
What do 15-year-olds know…
…and what can they do with what they know?

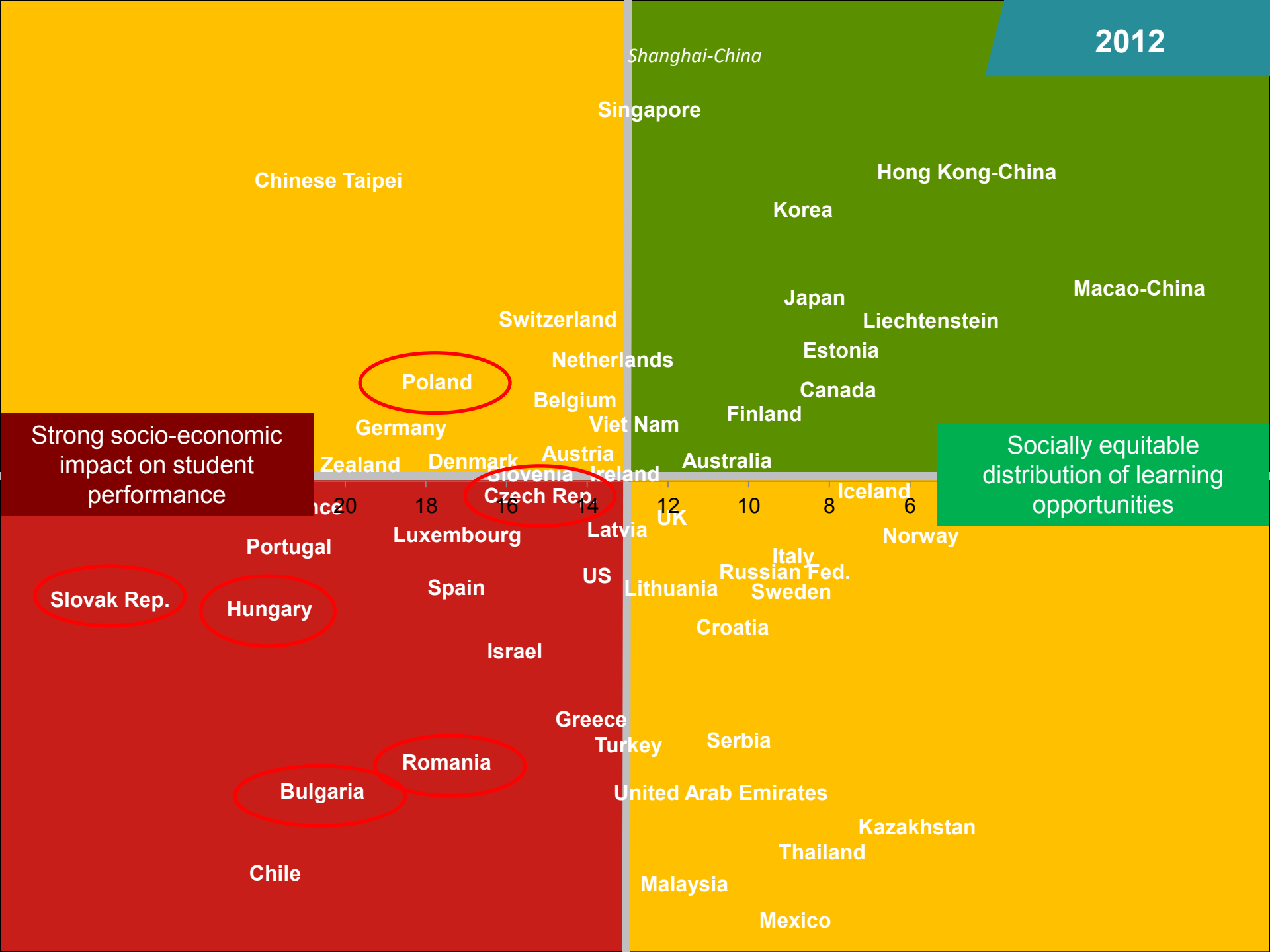


Average performance of 15-year-olds in Mathematics

Fig I.2.13




High mathematics performance
Average performance of 15-year-olds in mathematics
Strong socio-economic impact on student performance
Socially equitable distribution of learning opportunities
Low mathematics performance
Singapore
Chinese Taipei
Hong Kong-China
Korea
Macao-China
Japan
Liechtenstein
Switzerland
Netherlands
Estonia
Finland
Poland
Canada
Belgium
Viet Nam
Germany
Austria
Australia
Slovenia
Ireland
Denmark
New Zealand
United Kingdom
France
Czech Republic
Iceland
Latvia
Luxembourg
Norway
Portugal
Italy
Spain
Russian Fed.
Slovak Republic
United States
Lithuania
Sweden
Hungary
Croatia
Israel
Greece
Serbia
Turkey
Romania
Bulgaria
U.A.E.
Kazakhstan
Thailand
Chile
Malaysia
Mexico


2012
Shanghai-China
Singapore
Chinese Taipei
Hong Kong-China
Korea
Macao-China
Japan
Liechtenstein
Switzerland
Estonia
Netherlands
Poland
Canada
Belgium
Finland
Germany
Viet Nam
Zealand
Denmark
Austria
Australia
Slovenia
Ireland
Iceland
Czech Rep.
UK
Latvia
Norway
Luxembourg
Portugal
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Russian Fed.
US
Lithuania
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Hungary
Croatia
Israel
Greece
Turkey
Serbia
Romania
Bulgaria
United Arab Emirates
Kazakhstan
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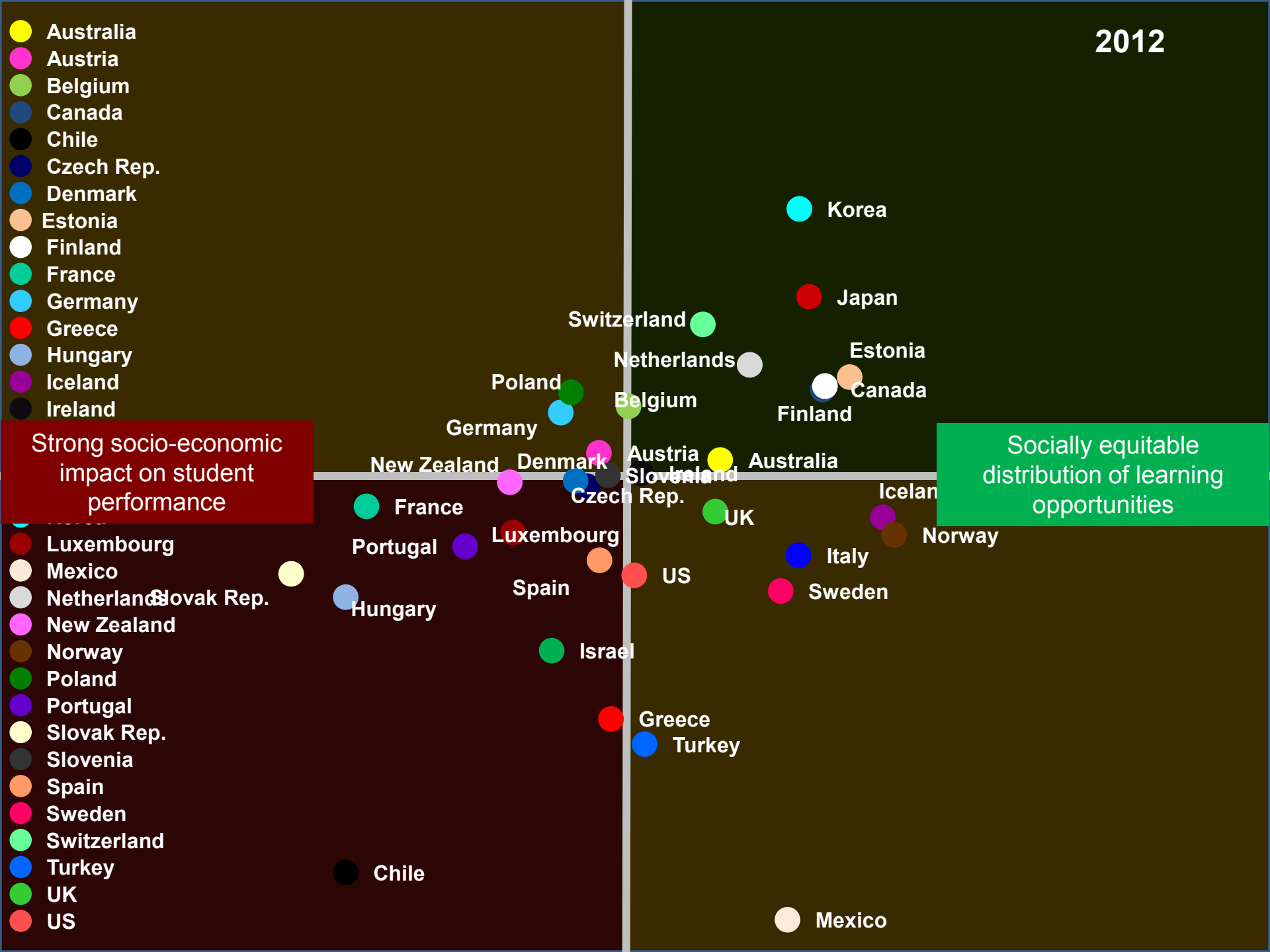
Strong socio-economic impact on student performance
Socially equitable distribution of learning opportunities


Australia
Austria
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Chile
Czech Rep.
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Mexico
Netherlands
New Zealand
Norway
Poland
Portugal
Slovak Rep.
Slovenia
Spain
Sweden
Switzerland
Turkey
UK
US
2012
Strong socio-economic impact on student performance
Socially equitable distribution of learning opportunities
Korea
Japan
Switzerland
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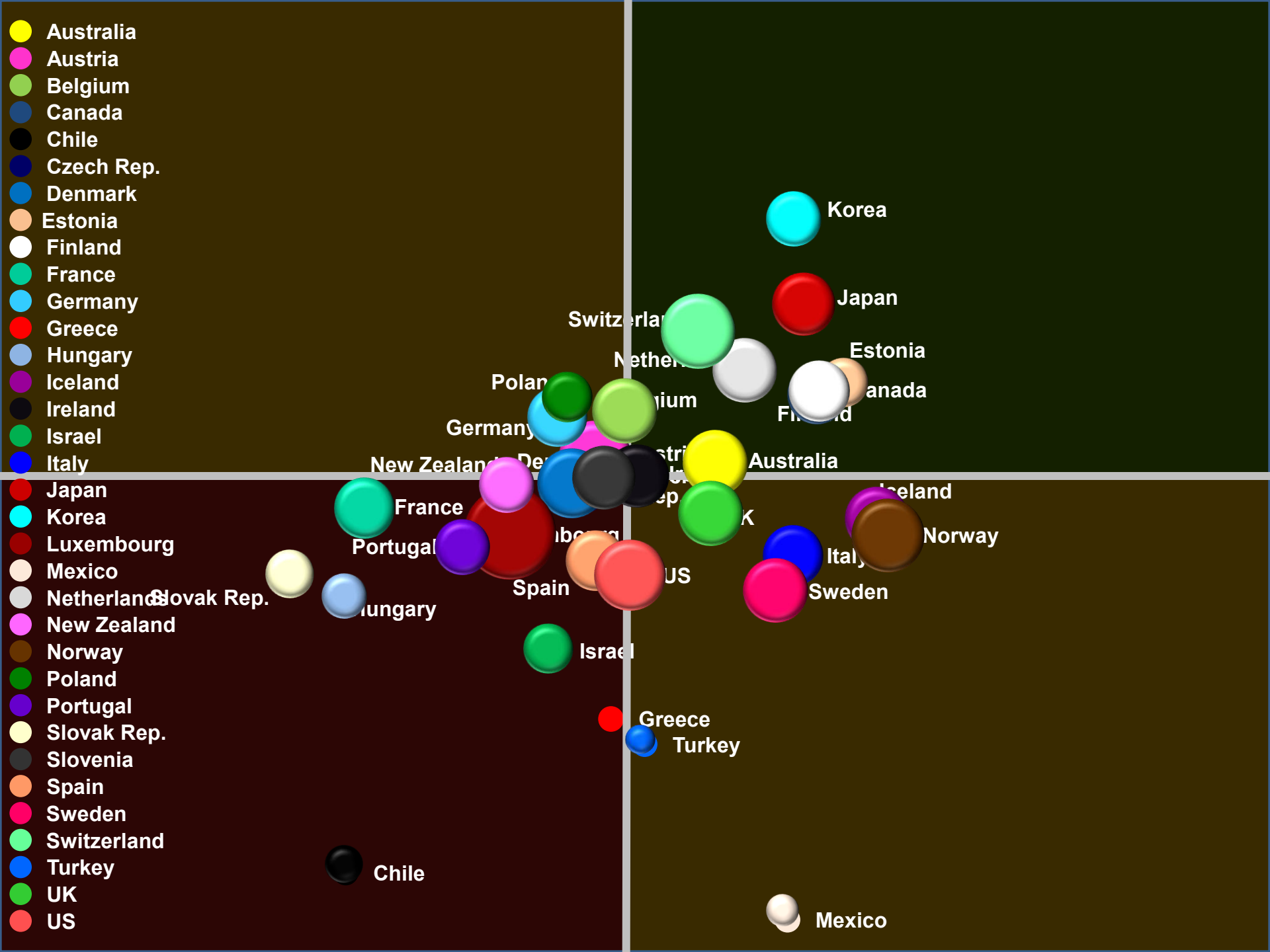
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Slovenia
Spain
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Switzerland
Turkey
UK
US
Korea
Japan
Estonia
Australia
France
Portugal
Spain
Slovak Rep.
Israel
Greece
Turkey
Chile
Mexico
Norway
Sweden

Who are doing better?

Of the 65 countries,

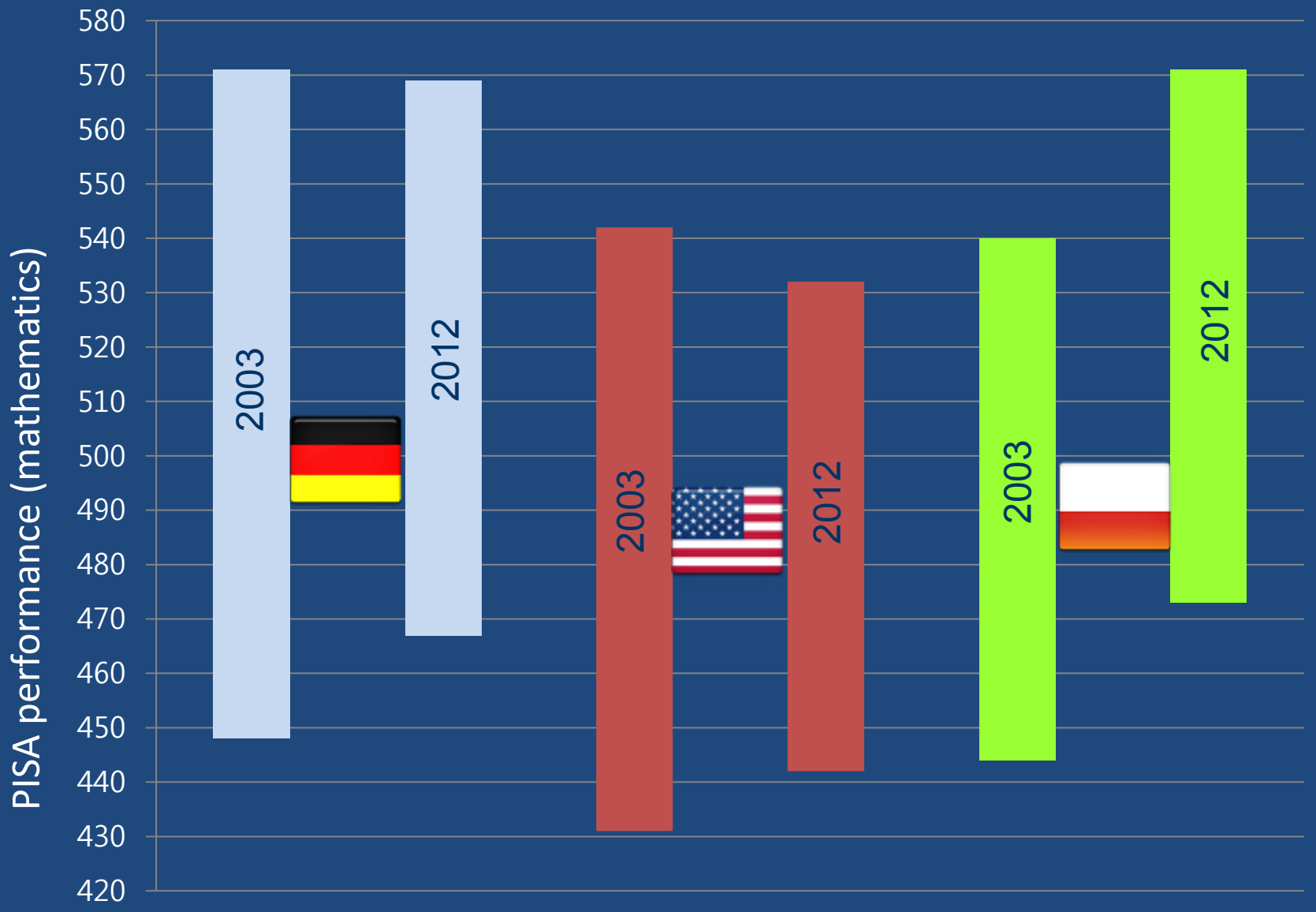
45 improved in at least one subject


Australia
Austria
Belgium
Canada
Chile
Czech Rep.
Denmark
Estonia
Finland
France
Germany
Greece
Hungary
Iceland
Ireland
Israel
Italy
Japan
Korea
Luxembourg
Mexico
Netherlands
New Zealand
Norway
Poland
Portugal
Slovak Rep.
Slovenia
Spain
Sweden
Switzerland
Turkey
UK
US
2003 - 2012
Singapore
Korea
Japan
Estonia
Canada
Iceland
Norway
Sweden
Turkey
Chile
Mexico
Germany, Turkey and Mexico saw significant improvements in both math performance and equity between 2003 and 2012


Australia
Austria
Belgium
Canada
Chile
Czech Rep.
Denmark
Estonia
Finland
France
Germany
Greece
Hungary
Iceland
Ireland
Israel
Italy
Japan
Korea
Luxembourg
Mexico
Netherlands
New Zealand
Norway
Poland
Portugal
Slovak Rep.
Slovenia
Spain
Sweden
Switzerland
Turkey
UK
US
2003 - 2012
Singapore
Korea
Japan
Estonia
Canada
Iceland
Norway
Italy
Portugal
Hungary
Chile
Mexico
Brazil, Italy, Macao-China, Poland, Portugal, Russian Federation, Thailand and Tunisia saw significant improvements in math performance between 2003 and 2012
(adding countries with more recent trends results in 25 countries with improvements in math)

Don’t close achievement gaps the wrong way

Performance differences between top and bottom quarter of socio-economic distribution



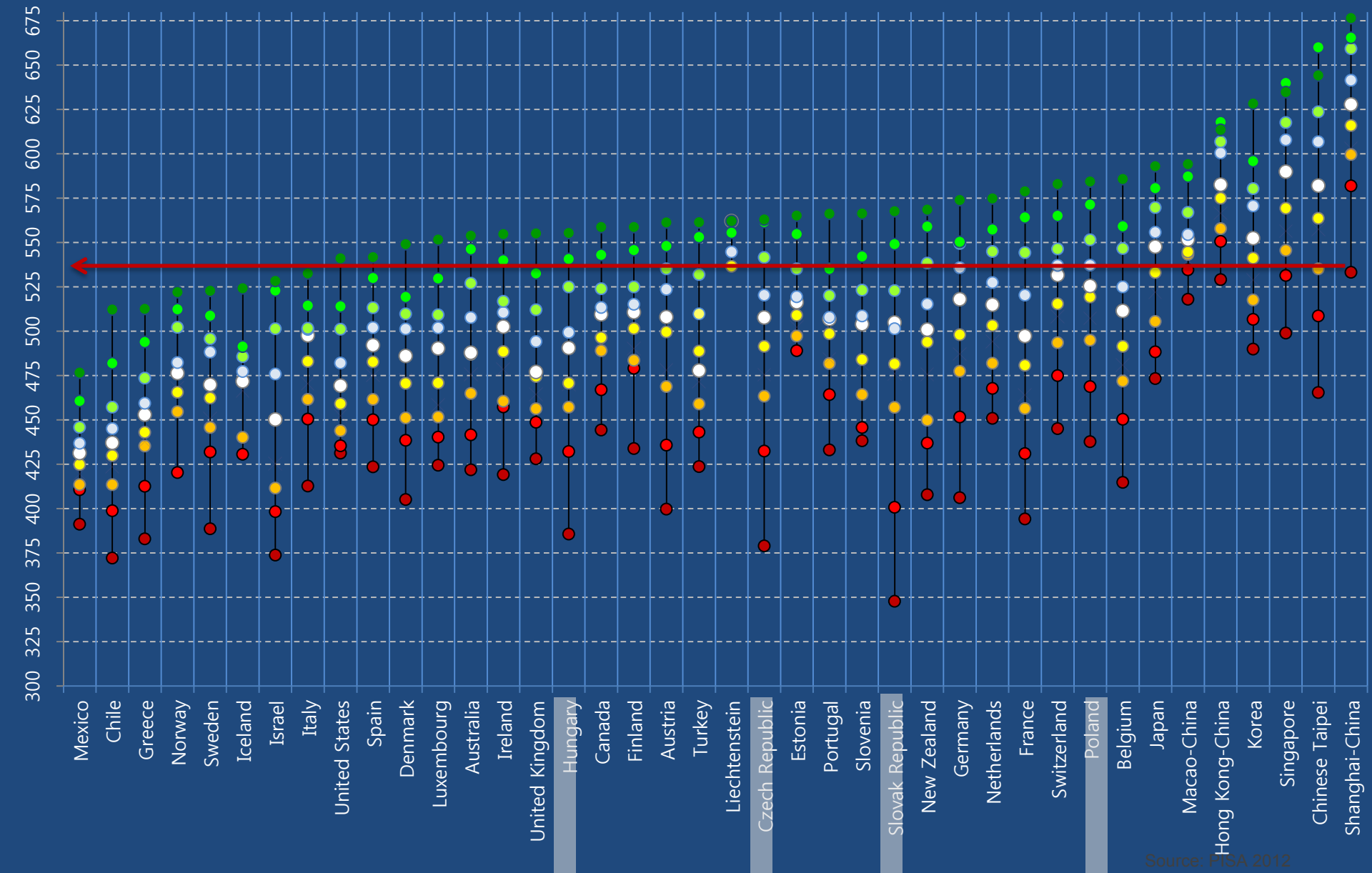
Source: PISA 2012

Improvement in mathematics, reading or science

Mathematics, reading and science	**Israel, Poland, Portugal, Turkey, Brazil, Dubai (UAE), Hong Kong-China, Macao-China, Qatar, Singapore, Tunisia**
Mathematics and reading	Chile, Germany, Mexico, Albania, Montenegro, Serbia, Shanghai-China
Mathematics and science	Italy, Kazakhstan, Romania
Reading and science	Japan, Korea, Latvia, Thailand
Mathematics only	Greece, Bulgaria, Malaysia, United Arab Emirates (ex. Dubai)
Reading only	Estonia, Hungary, Luxembourg, Switzerland, Colombia, Indonesia, Liechtenstein, Peru, Russian Federation, Chinese Taipei
Science only	Ireland

Excellence through equity

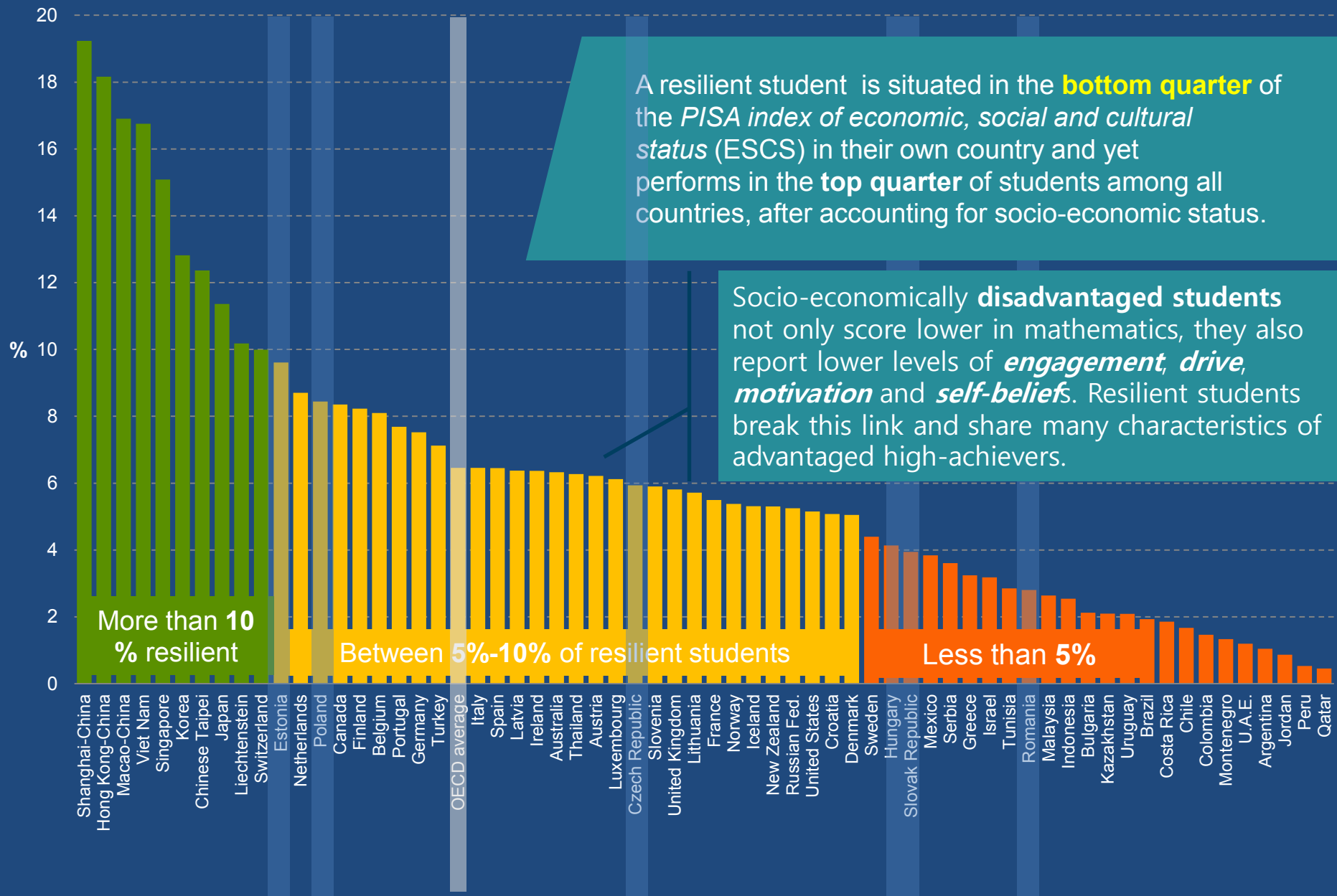
Poverty isn't destiny: PISA performance by decile of social background



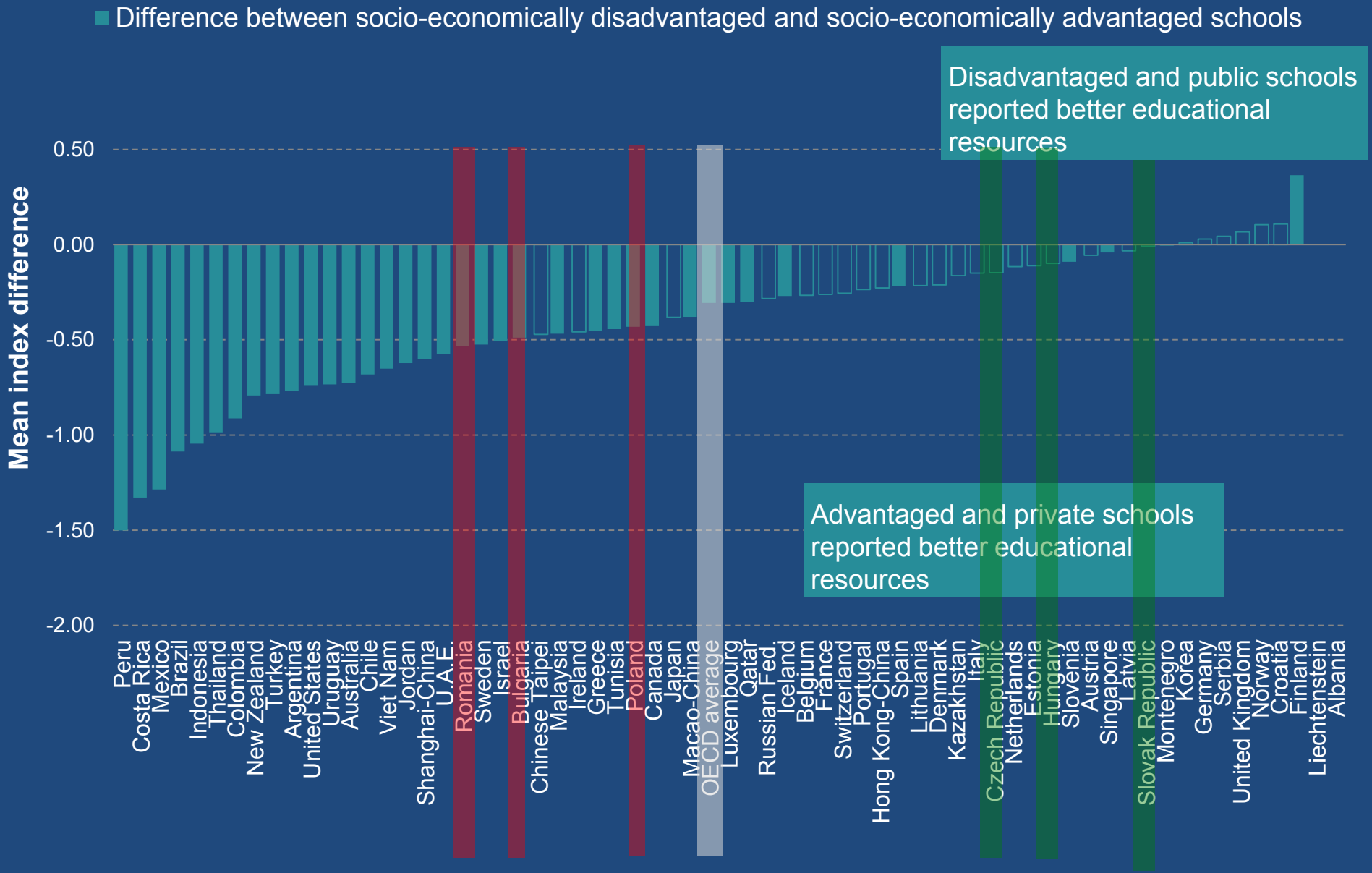
Source: PISA 2012

Percentage of resilient students

Fig II.2.4

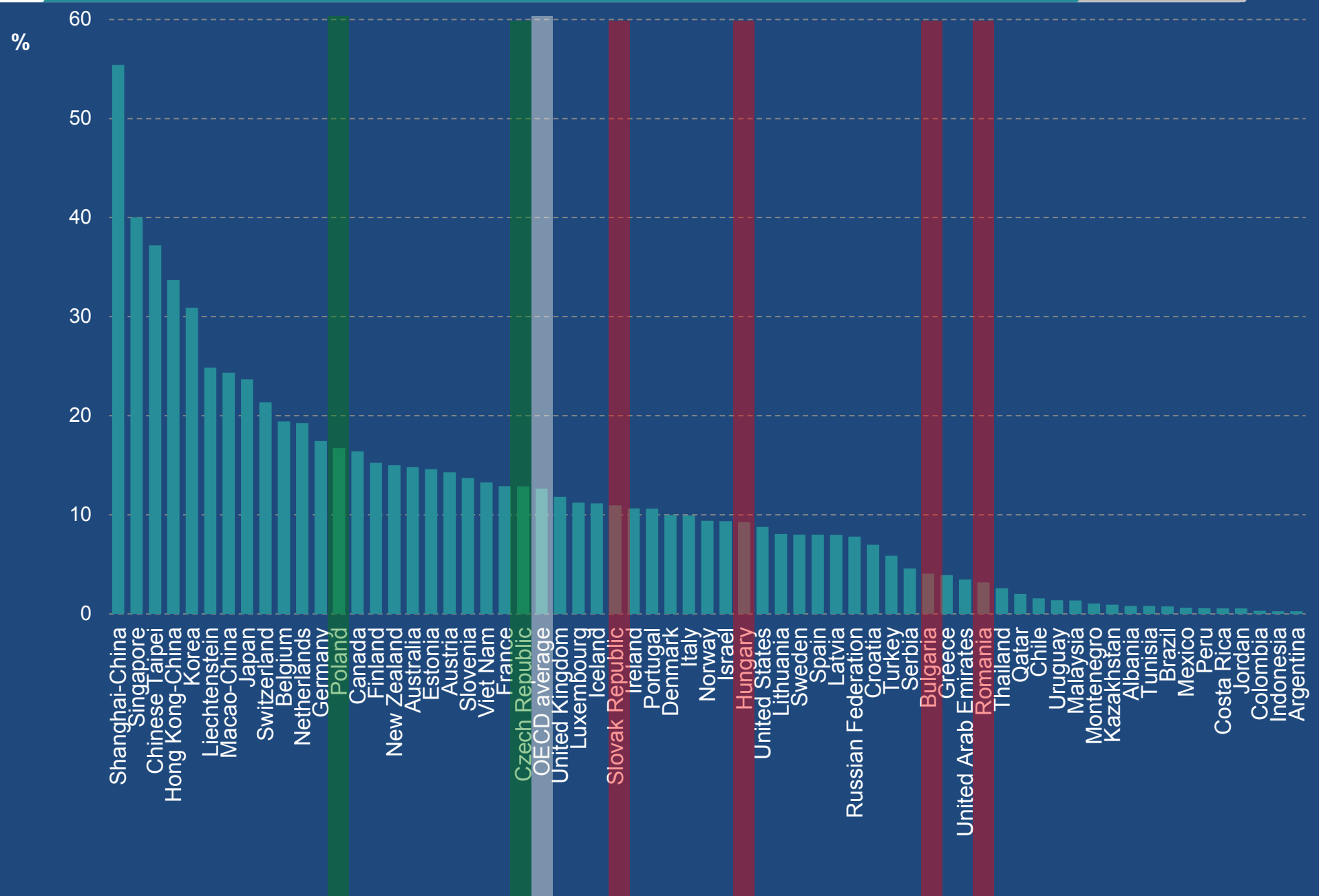


Educational resources are more problematic in disadvantaged schools, also in public schools in most countries

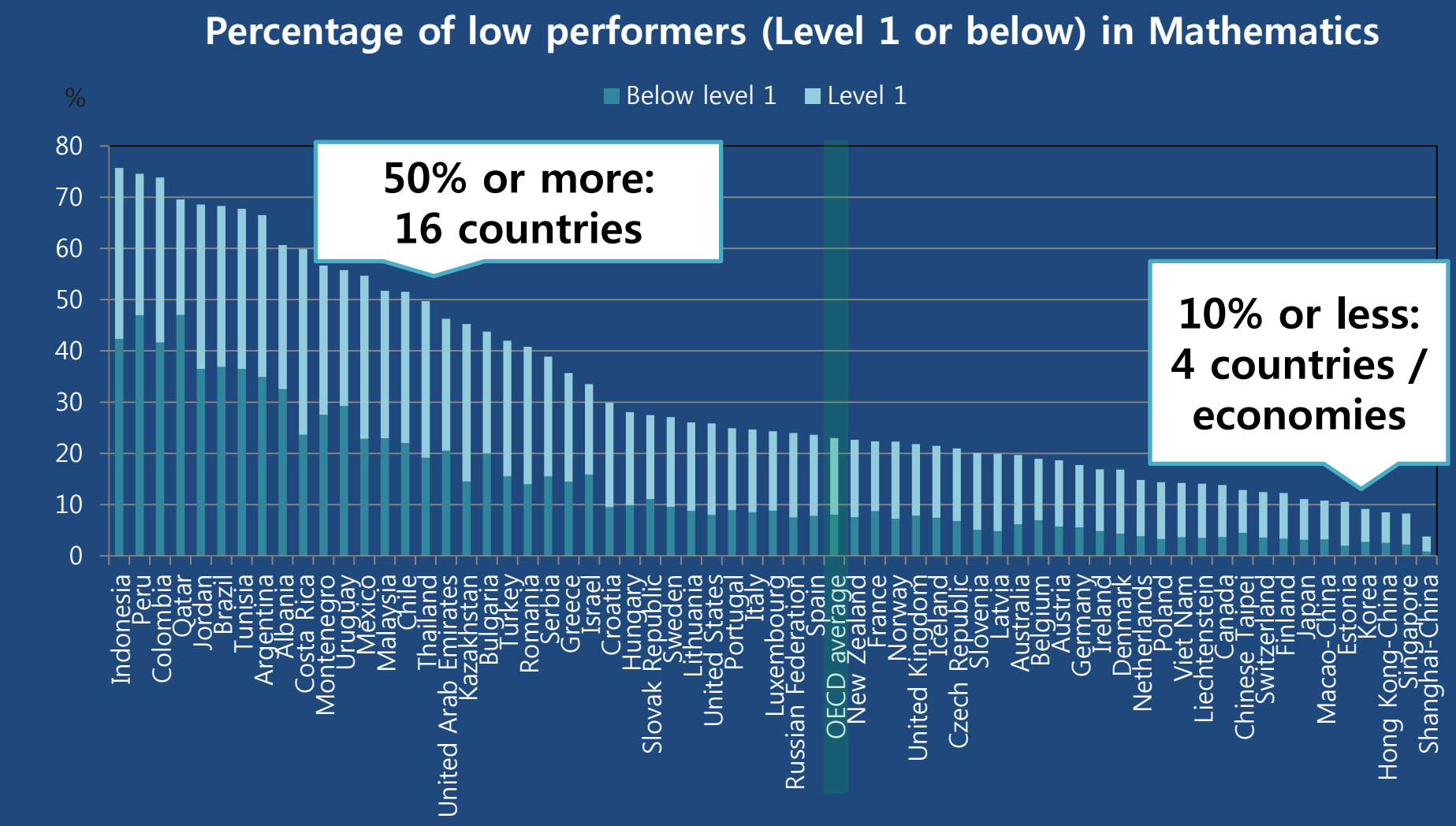


Percentage of top performers in mathematics

Tab I.2.1a

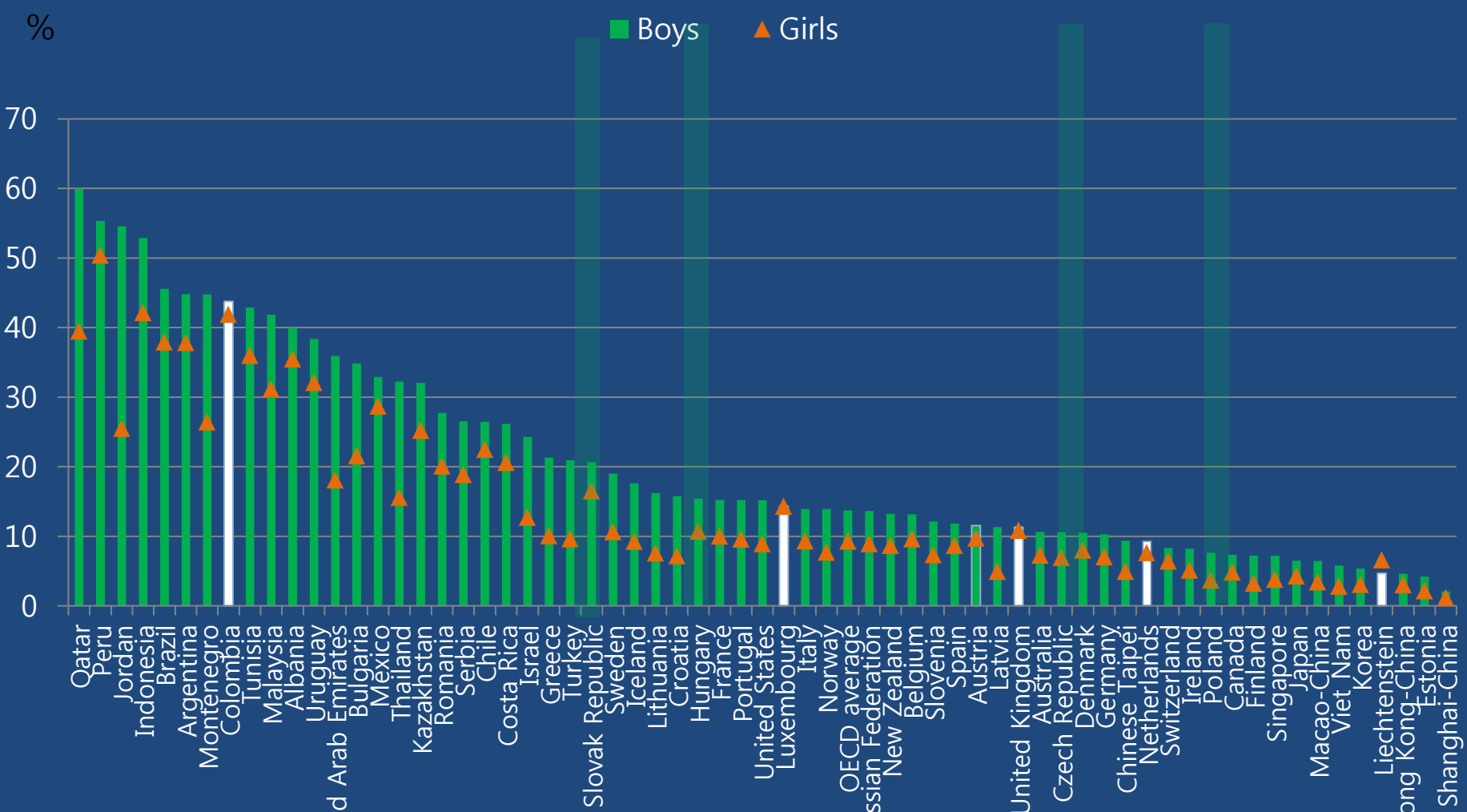


Low performance is an issues for all



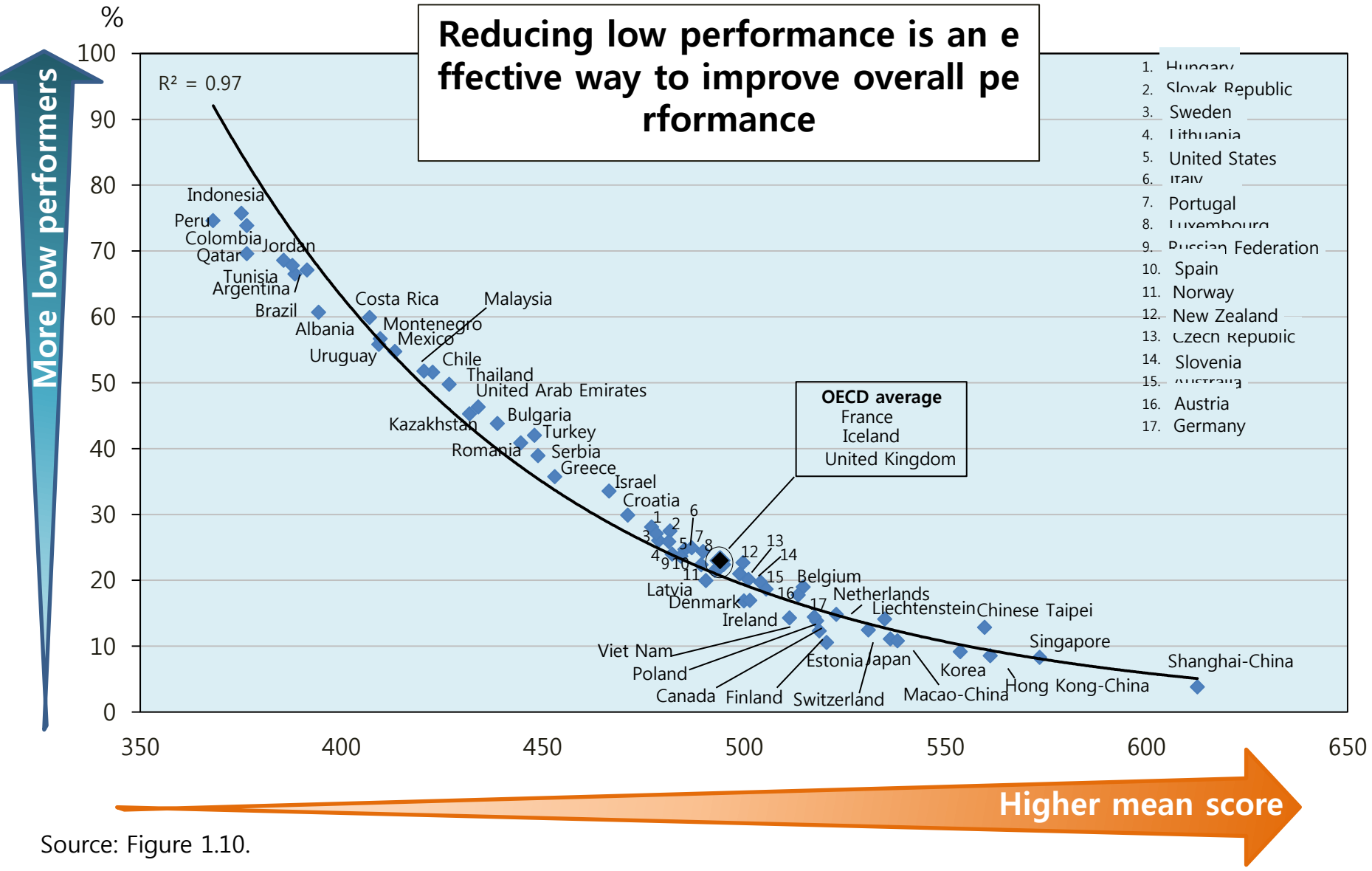
Source: Figure 1.5.

More boys than girls are all-round low-achievers



Source: Figure 1.2

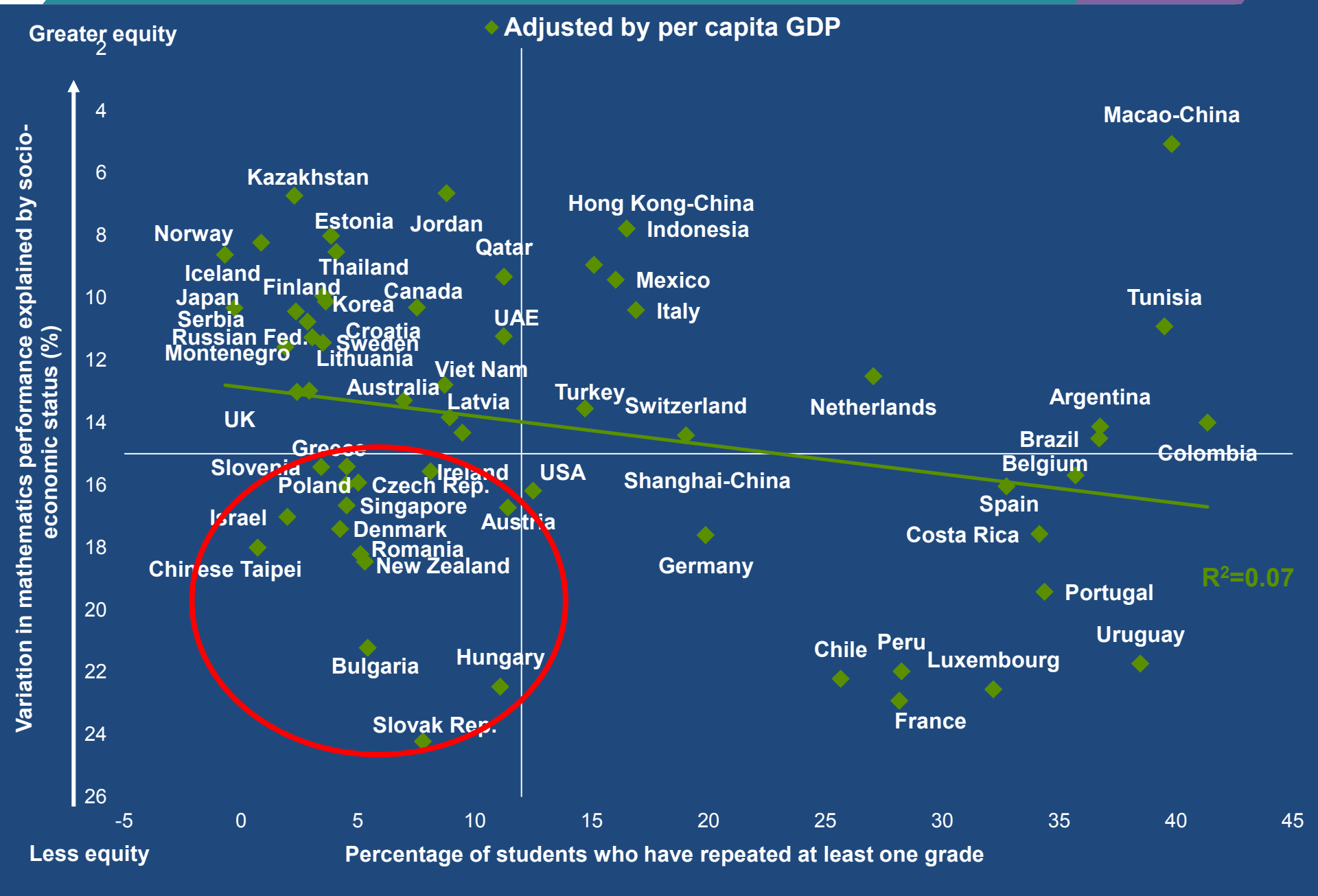
Consequences for education systems



Source: Figure 1.10.

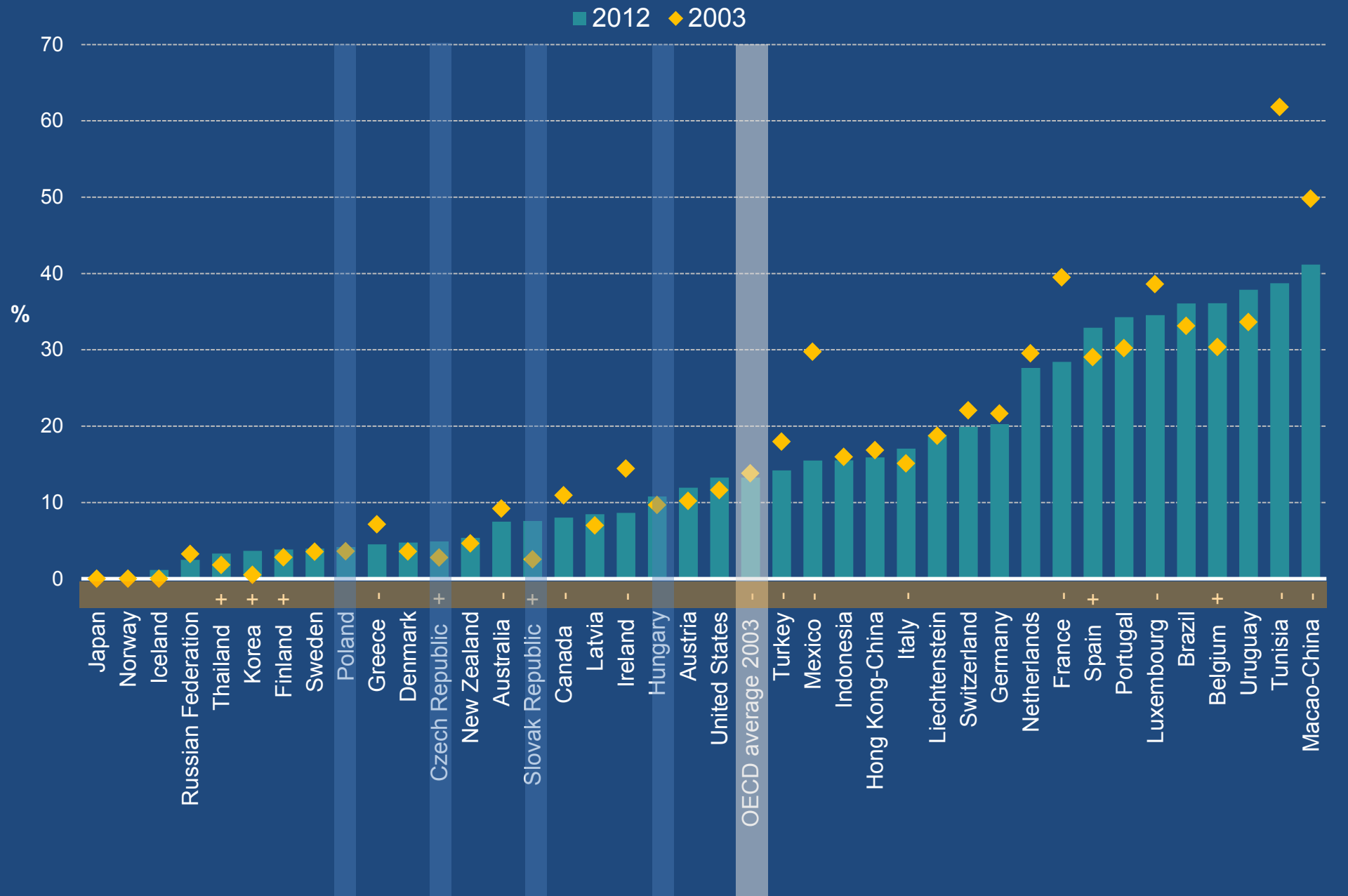
Grade repetition is negatively related to equity

Fig IV.1.4



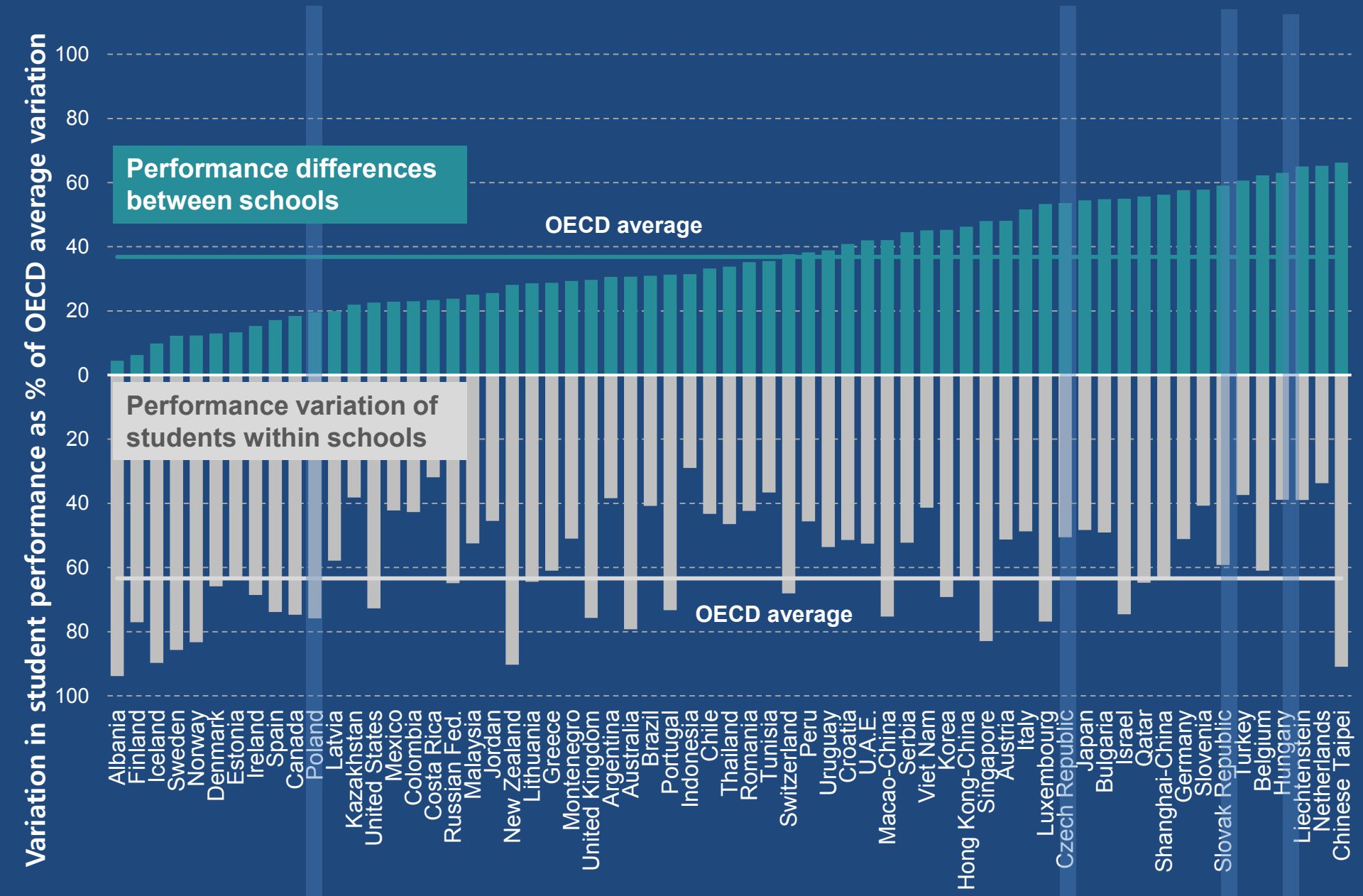
Percentage of repeaters in 2003 and 2012

Tab IV.2.18

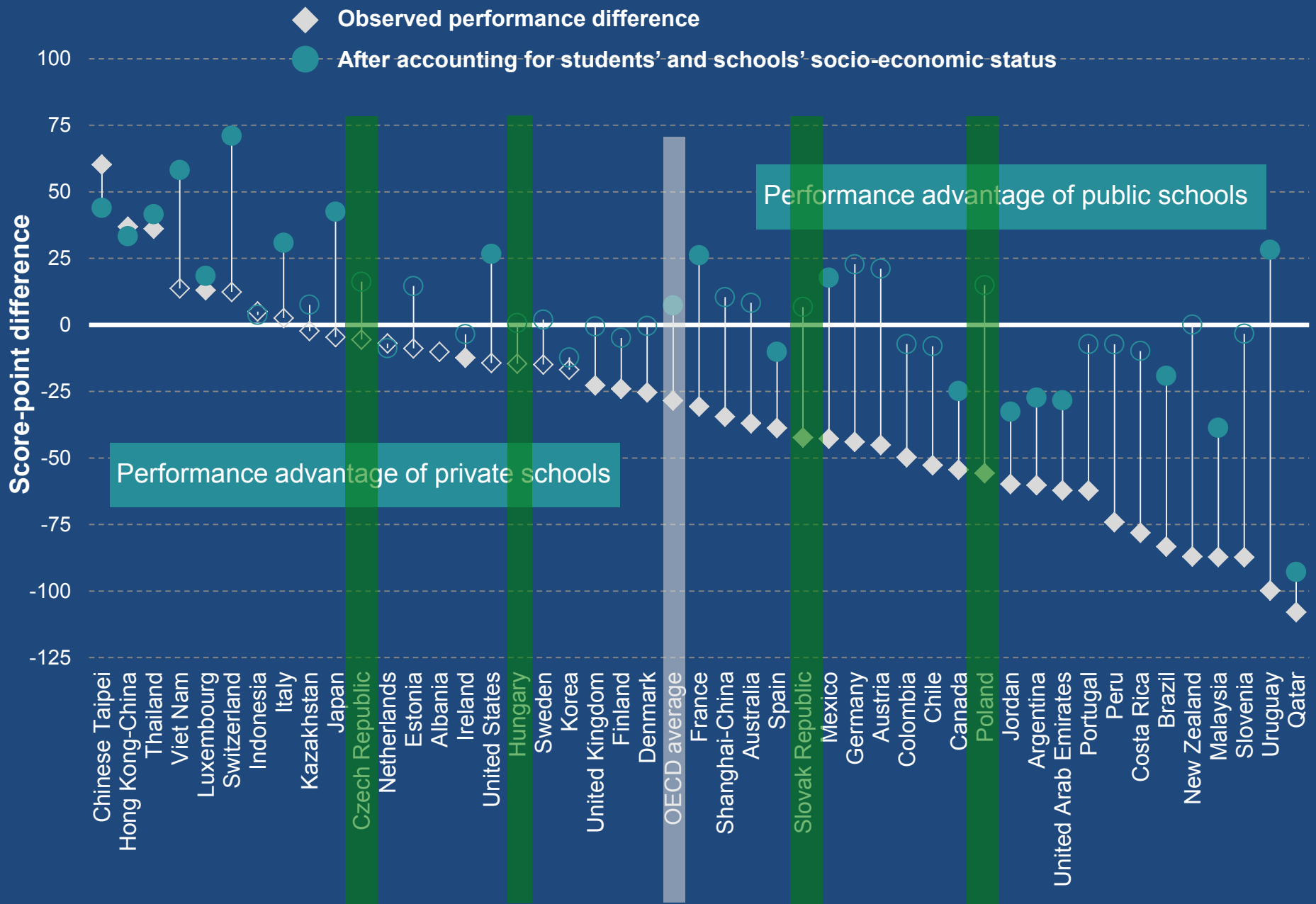


Variability in student mathematics performance between and within schools

Fig II.2.7

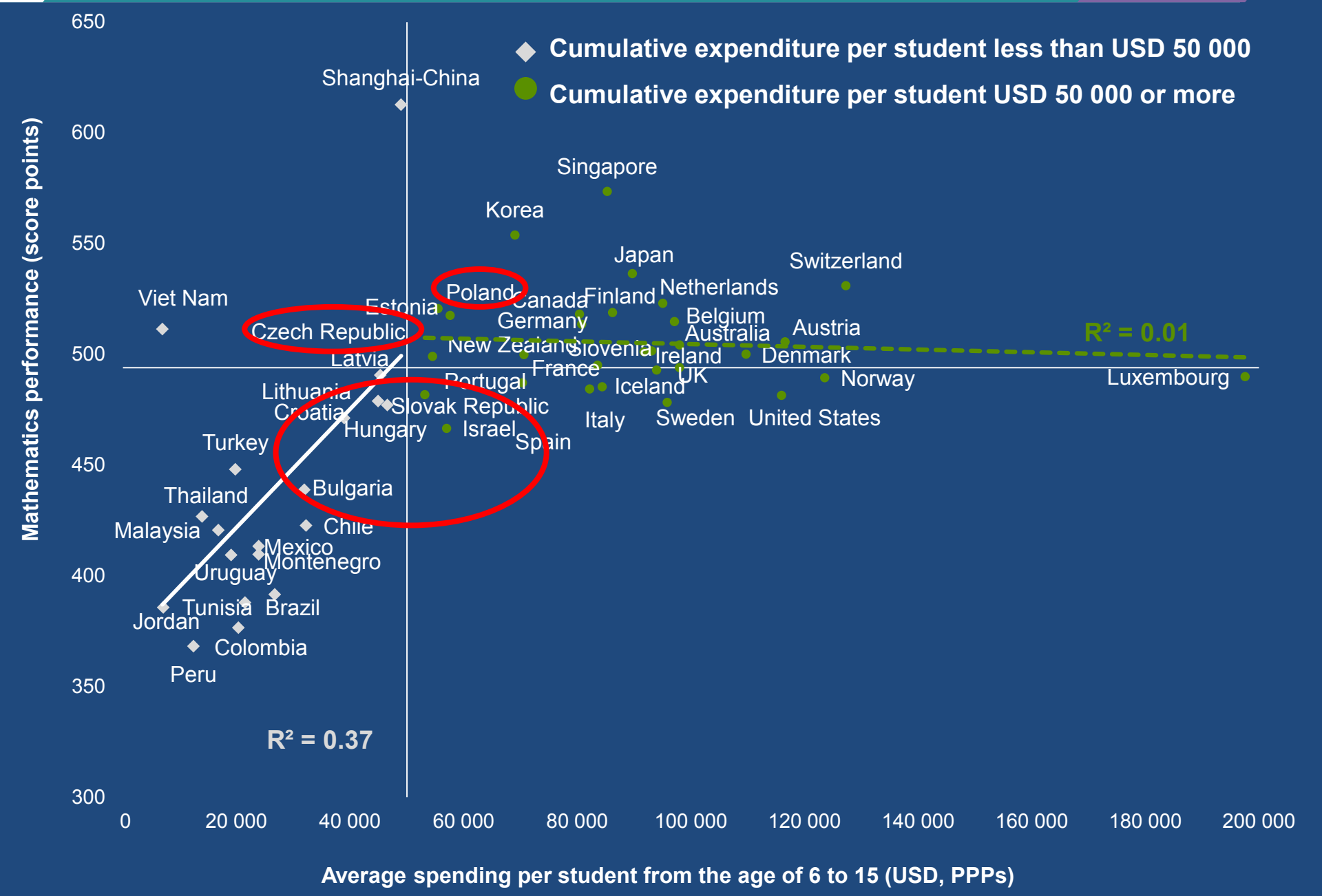


Differences in mathematics performance between private and public schools shrink considerably after accounting for socio-economic status



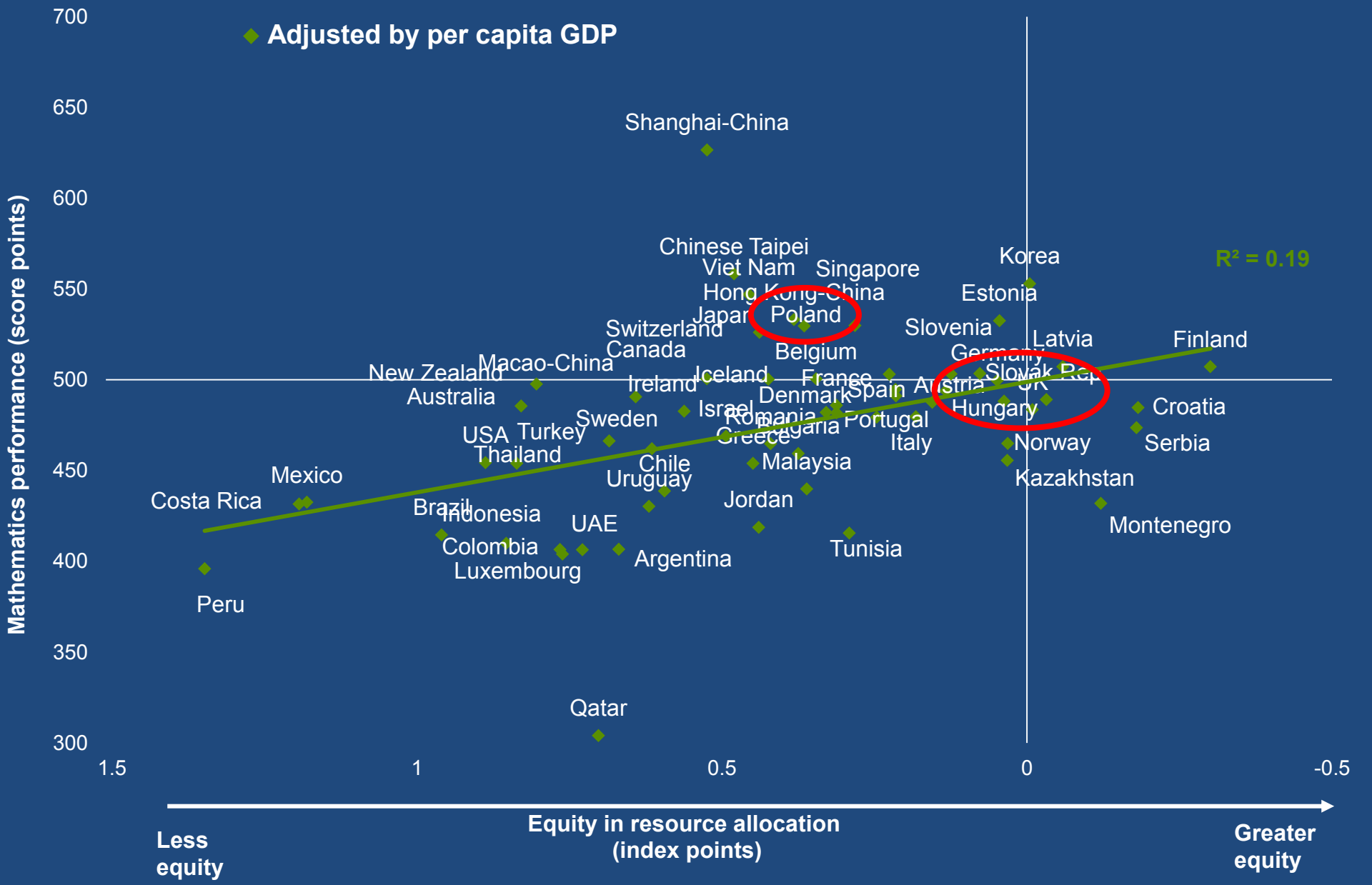
Spending per student from the age of 6 to 15 and mathematics performance in PISA 2012

Fig IV.1.8

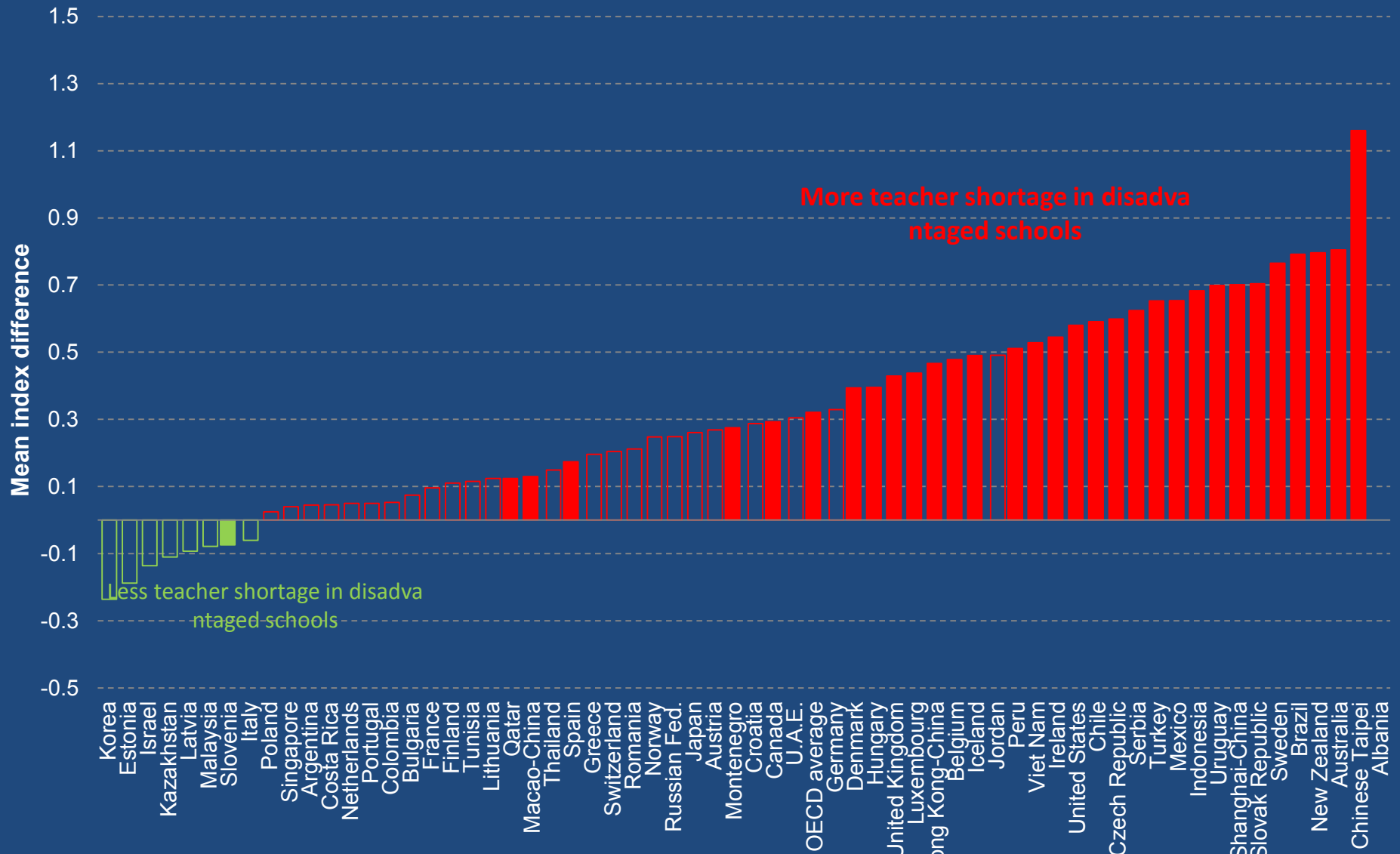


Countries with better performance in mathematics tend to allocate educational resources more equitably

Fig IV.1.11

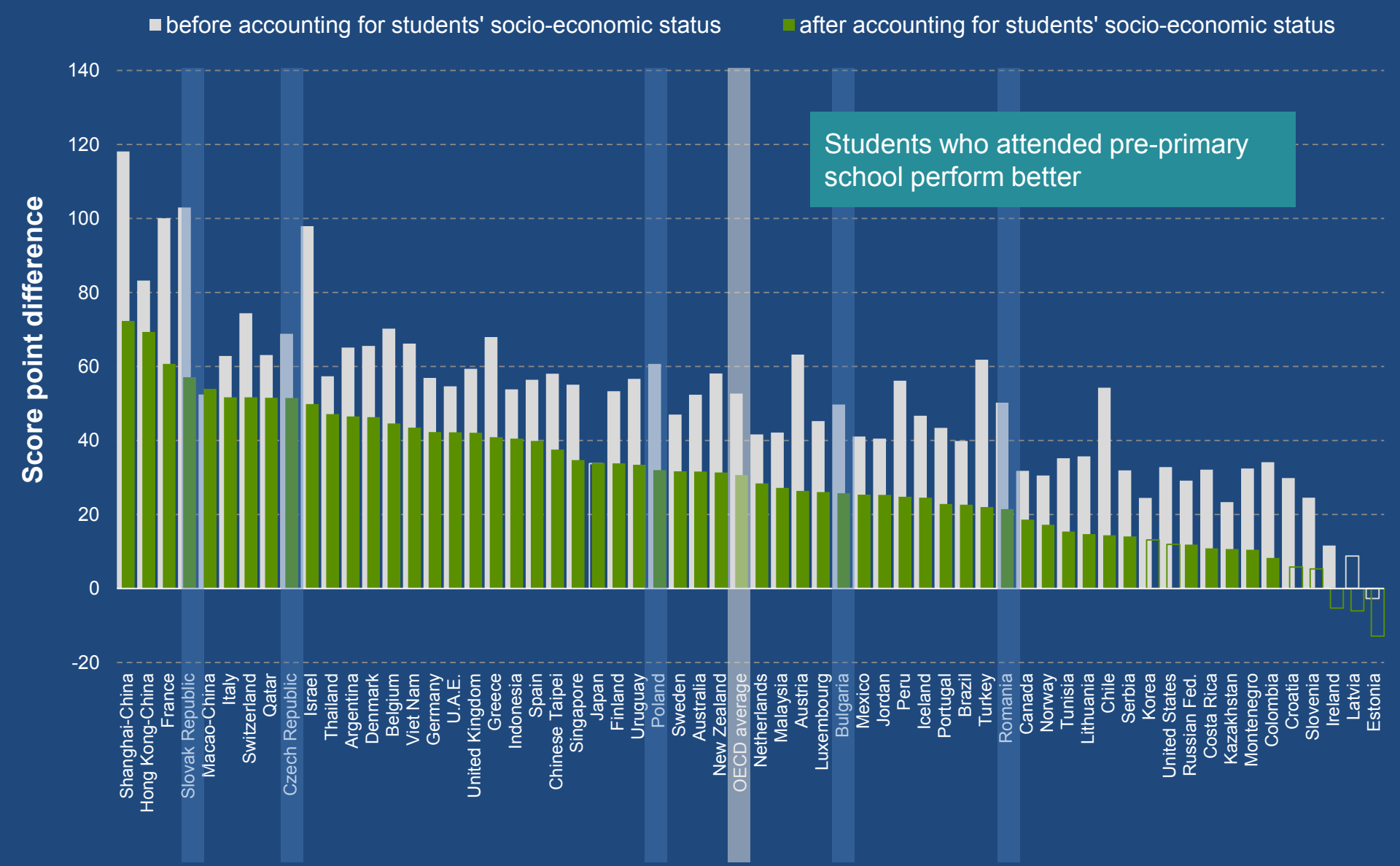


Few countries attract the most talented teachers to the most challenging classrooms



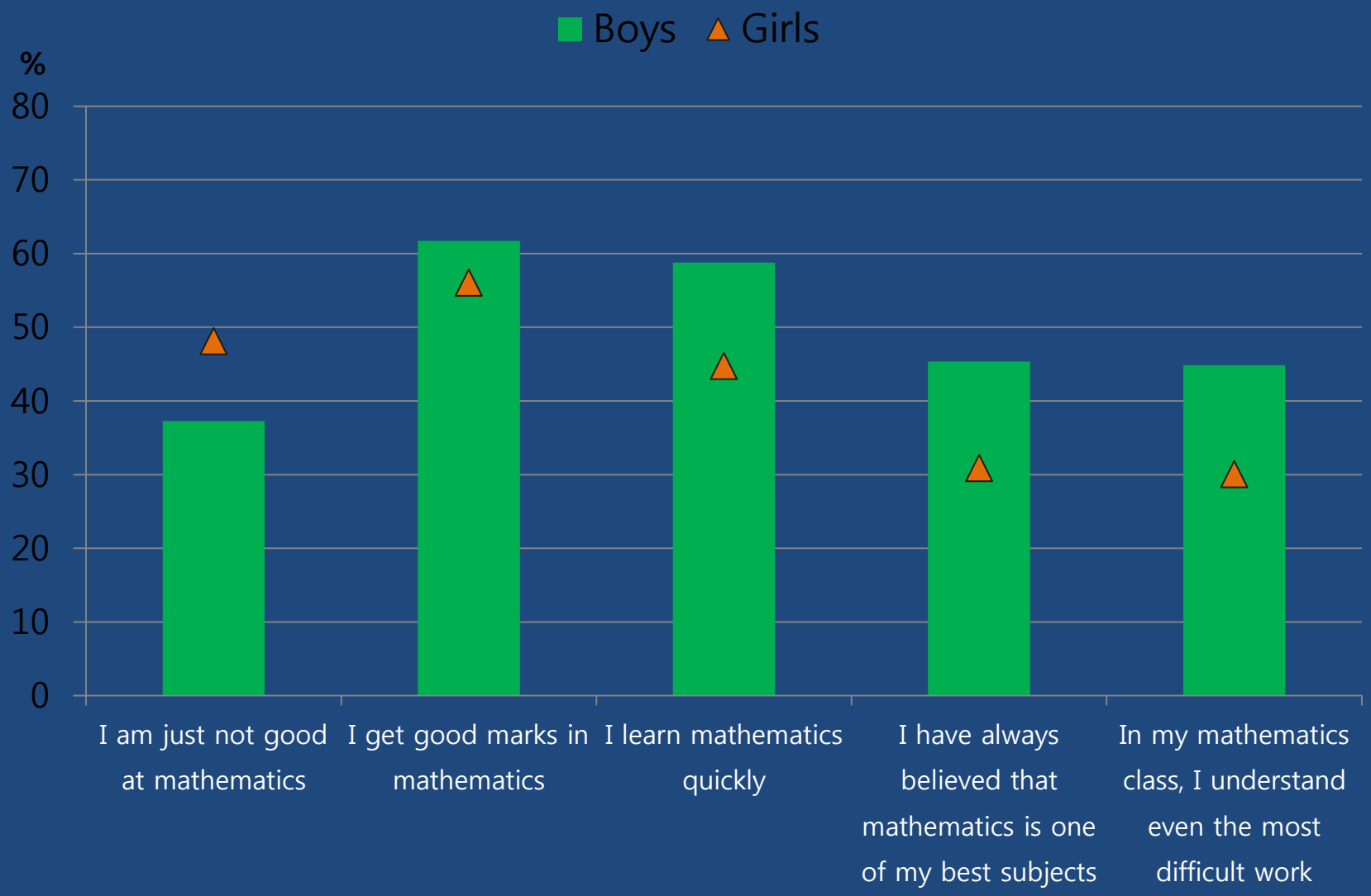
Difference in mathematics performance, by attendance at pre-primary school

Fig III.4.12



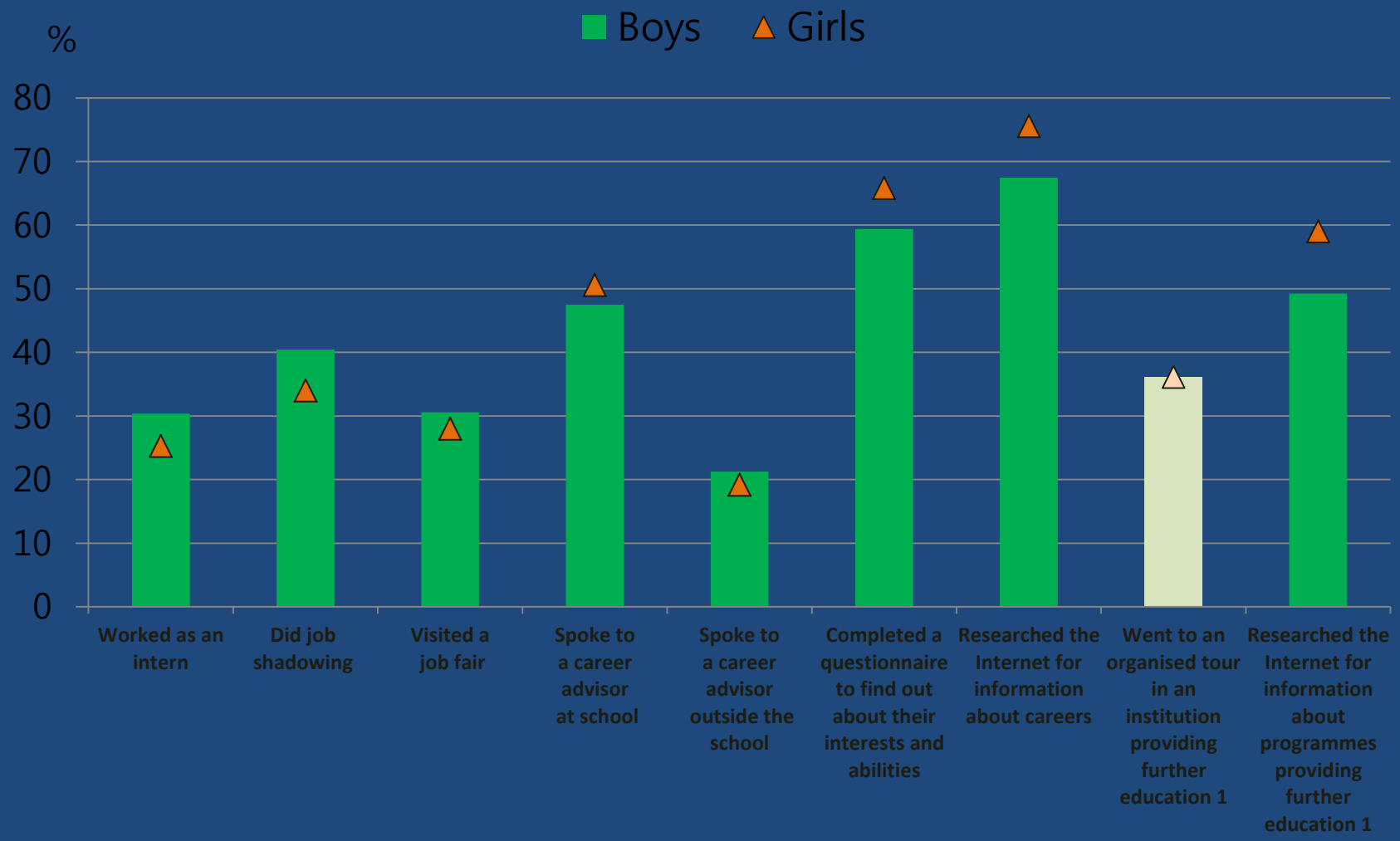
More about students' learning….

Girls are generally less confident in their ability in *mathematics* than boys



Source: Figure 3.9

Boys are more likely than girls to get "hands-on" experience in the working world (OECD countries)

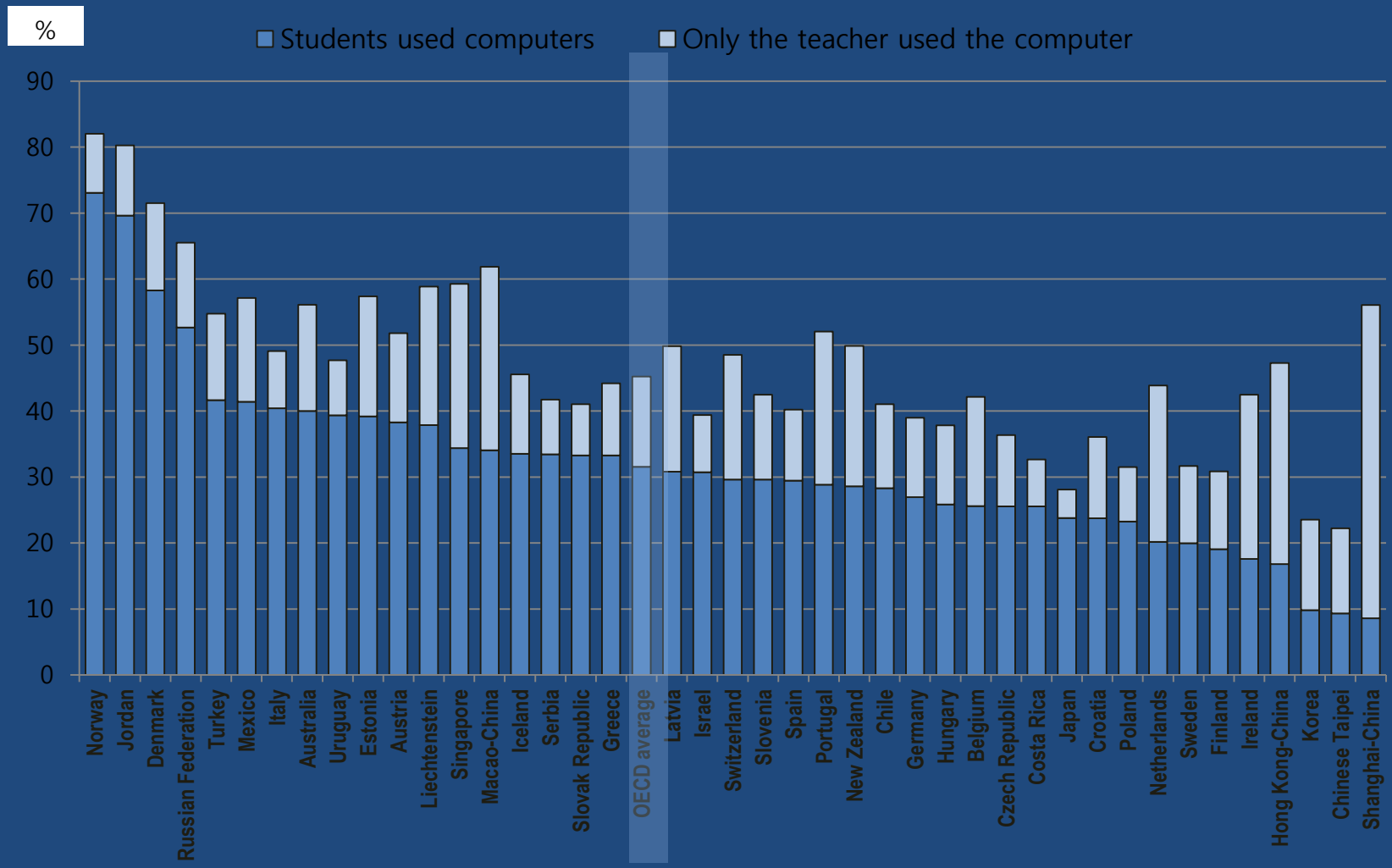


1. Institutions providing further education are ISCED 3-5 in the PISA 2012 questionnaire.

Source: Figure 4.2

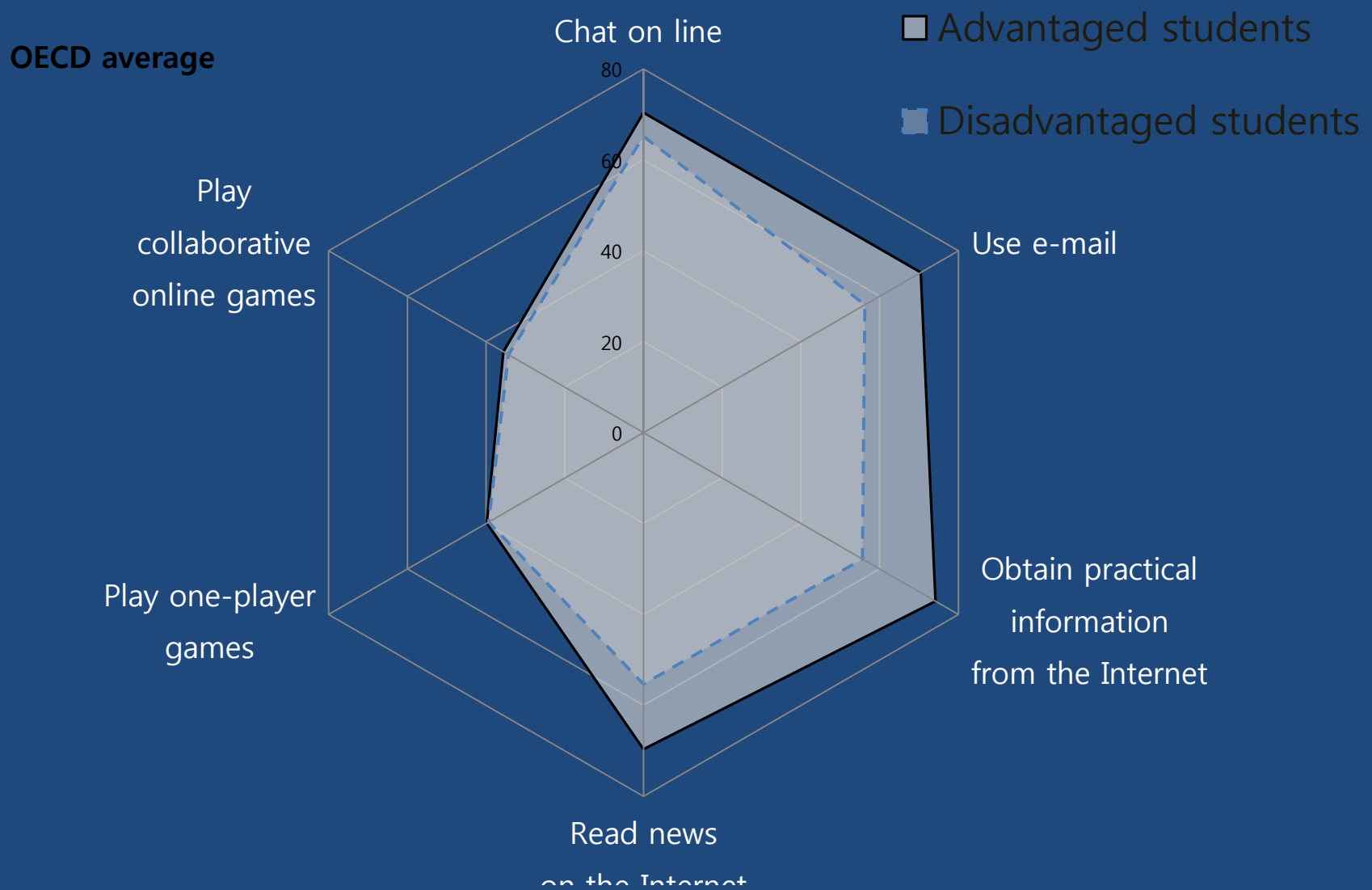
Students and teachers using computers during mathematics lessons

Percentage of students who reported that a computer was used in mathematics lessons in the month prior to the PISA test



Source: Figure 2.7

Common computer leisure activities outside of school, by students' socio-economic status



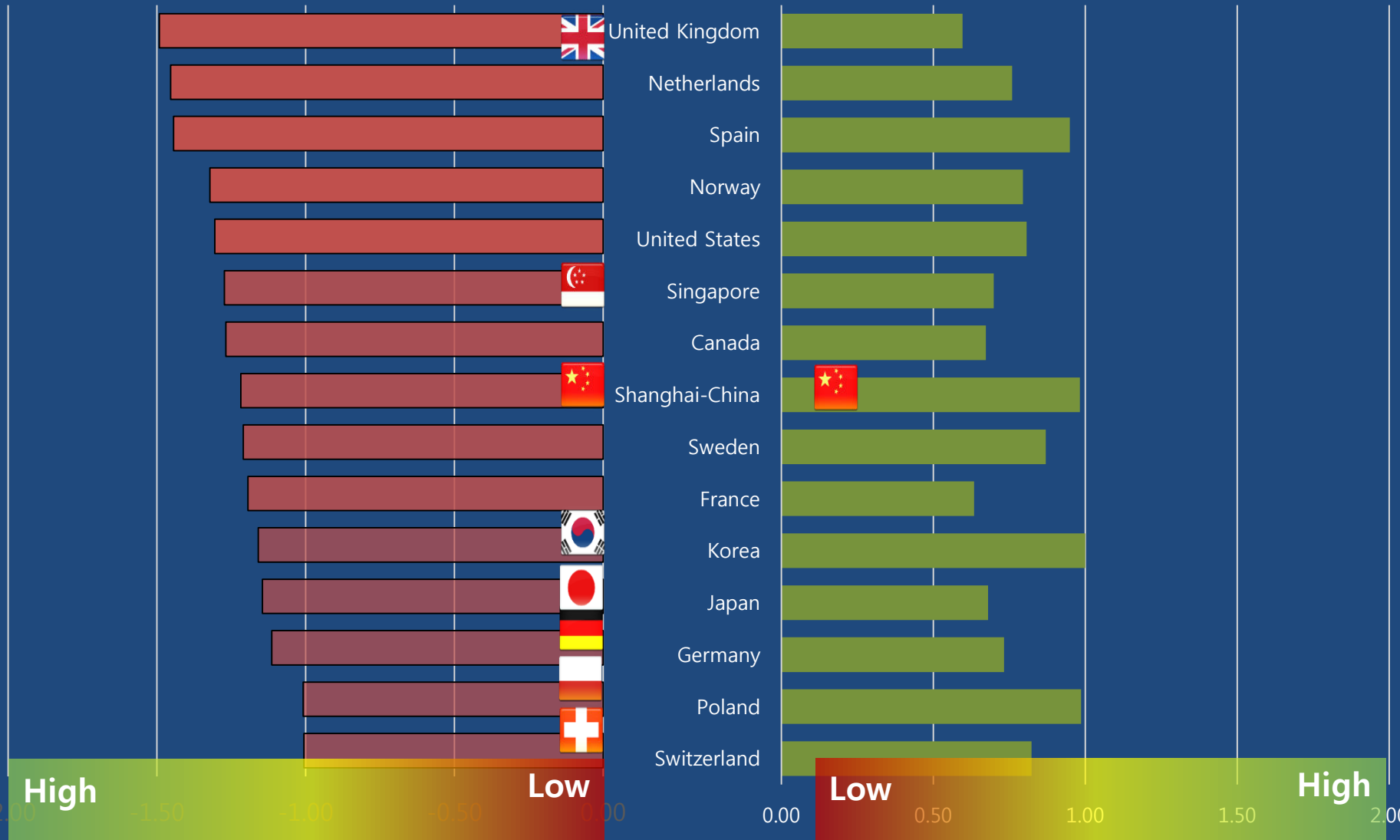
Source: Figure 5.8

Prevalence of memorisation

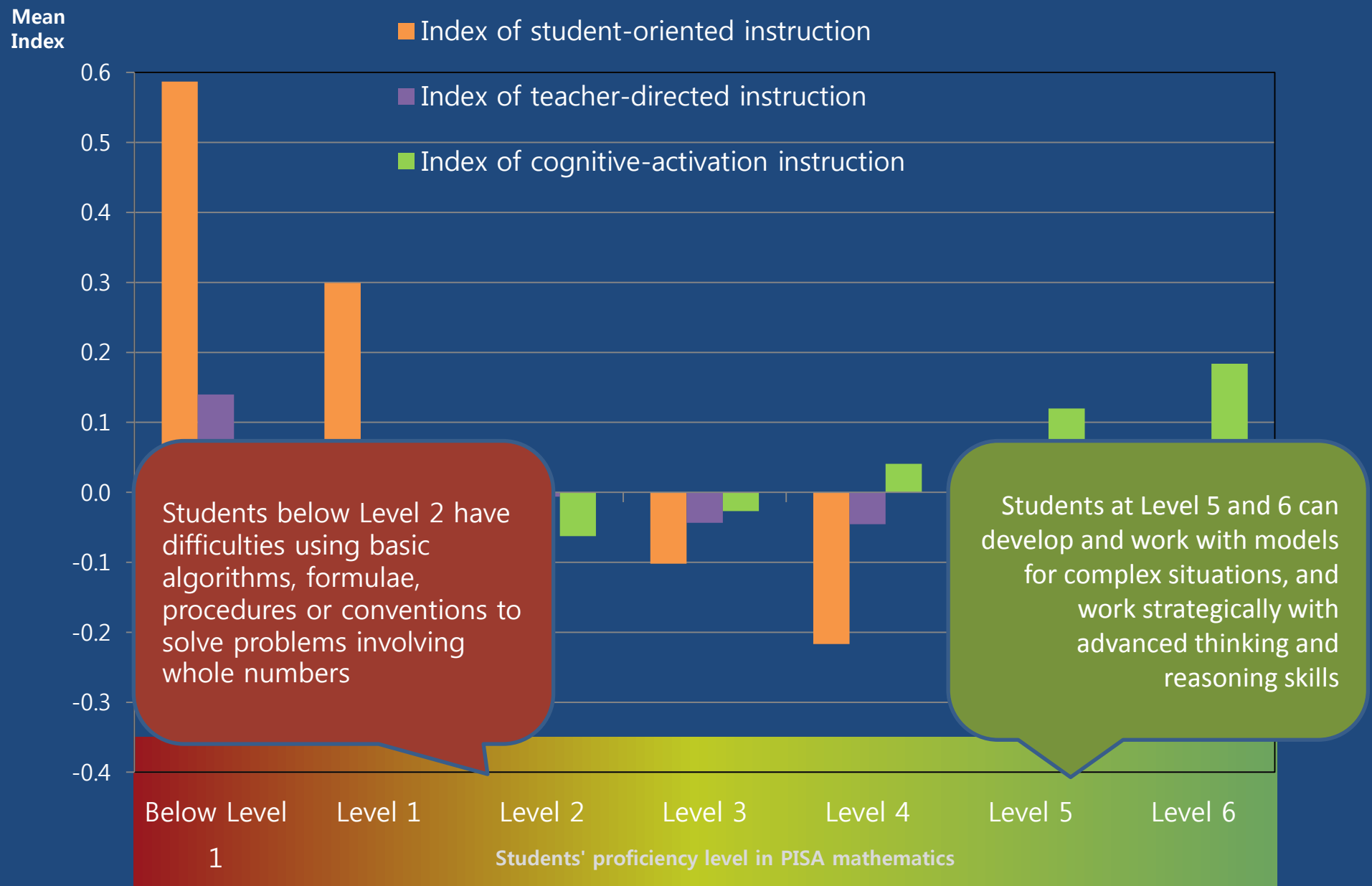
rehearsal, routine exercises, drill and practice and/or repetition

Prevalence of elaboration

reasoning, deep learning, intrinsic motivation, critical thinking, creativity, non-routine problems



Teaching strategies and learning outcomes



Summary of insights regarding teachers from countries with high performance and equity in PISA:

Attract

- Attract the best students to the teaching profession *(Examples*: Brazil, Korea, Israel, United Kingdom*)*
- Create incentives to encourage experienced teachers to work in disadvantaged schools (*Examples:* Brazil, Estonia, Shanghai*)*

Train

- Provide quality training that combines acquiring knowledge and skills (*Examples*: Finland, Japan, Turkey)
- Prepare teachers to address specific problems of students, assess and use appropriate remedial methods (*Examples:* Germany, Poland, Canada)

Accompany

- Provide mentoring programs for young teachers (*Examples*: Germany, Singapore)
- Give young teachers the opportunity early in their career to return to university and improve their skills *(Examples:* Finland, Germany*)*

Retain

- Develop continuous professional development, which is as important, if not more than initial training *(Examples:* Brazil, Canada, Mexico, Singapore*)*
- Provide career advancement opportunities (*Examples:* Quebec, Portugal)

What it all means

Average performers		Top performers
	Student inclusion	
Some students learn at high levels		**All** students need to learn at high levels
	Curriculum, instruction and assessment	
Routine cognitive skills, rote learning		Learning to learn, complex ways of thinking, ways of working
	Teacher quality	
Few years more than secondary		High-level professional knowledge workers
	Work organisation	
'Tayloristic', hierarchical		Flat, collegial
	Accountability	
Primarily to authorities		Primarily to peers and stakeholders

Thank you very much

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