PISA

Low-Performing Students

WHY THEY FALL BEHIND AND HOW TO HELP THEM SUCCEED

Programme for International Student Assessment

OECD

PISA

Low-Performing Students

WHY THEY FALL BEHIND

AND HOW TO HELP THEM SUCCEED

OECD
BETTER POLICIES FOR BETTER LIVES

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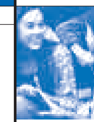


Foreword

Far too many students around the world are trapped in a vicious circle of poor performance and demotivation that leads only to more bad marks and further disengagement from school. This report provides the first comprehensive analysis of the problem and how it can be tackled.

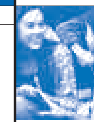
It shows that more than one in four 15-year-old students in OECD countries have not attained a baseline level of proficiency in at least one of the three core subjects PISA assesses: reading, mathematics and science. In absolute numbers, this means that about 13 million 15-year-old students in the 64 countries and economies that participated in PISA 2012 were low performers in at least one subject; in some countries, more than one in two students were.

One can question whether it makes sense to establish global benchmarks for low performance in a highly diverse set of countries that place different demands on individuals' skills. But this report sets the bar at a very basic level of performance that we should expect all young people in the 21st century to attain. In reading, it is crossing the threshold from being able to read to using reading for learning. In mathematics, it involves a basic understanding of fundamental mathematical concepts and operations.

As this report shows, it is education policy and practice that can help students clear this bar, not just per capita income. The policy agenda to tackle low performance needs to include multiple dimensions, such as: creating demanding and supportive learning environments; involving parents and local communities; inspiring students to make the most of available education opportunities; identifying low performers and providing targeted support for students, schools and families; offering special programmes for immigrant, minority-language and rural students; tackling gender stereotypes; and reducing inequalities in access to early education and limiting the use of student sorting.

It is urgent to get this right. Poor performance at school has long-term consequences for both individuals and nations. Students who perform poorly at age 15 face a high risk of dropping out of school altogether; and when a large share of the population lacks basic skills, a country's long-term economic growth is severely compromised. In fact, the economic output that is lost because of poor education policies and practices leaves many countries in what amounts to a permanent state of economic recession – and one that can be larger and deeper than the one that resulted from the financial crisis at the beginning of the millennium, out of which many countries are still struggling to climb. Or put the other way round, for lower middle-income countries, the discounted present value of economic future gains from ensuring that all 15-year-olds attain at least the PISA baseline level of performance would be 13 times the current GDP and would average out to a 28% higher GDP over the next 80 years. For upper middle-income countries, which generally show higher learning outcomes, the gains would average out to a 16% higher GDP. In other words, the gains from tackling low performance dwarf any conceivable cost of improvement.

Andreas Schleicher
Director for Education and Skills



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Executive Summary

Far too many students around the world are trapped in a vicious circle of poor performance and demotivation that leads only to more bad marks and further disengagement from school. Worse, poor performance at school has long-term consequences, both for the individual and for society as a whole. Students who perform poorly at age 15 face a high risk of dropping out of school altogether. When a large share of the population lacks basic skills, a country's long-term economic growth is severely compromised.

Results from PISA 2012 show that more than one in four 15-year-old students in OECD countries did not attain a baseline level of proficiency in at least one of the three core subjects PISA assesses: reading, mathematics and science. In absolute numbers, this means that about 13 million 15-year-old students in the 64 countries and economies that participated in PISA 2012 were low performers in at least one subject.

Reducing the number of low-performing students is not only a goal in its own right but also an effective way to improve an education system's overall performance – and equity, since low performers are disproportionately from socio-economically disadvantaged families. Brazil, Germany, Italy, Mexico, Poland, Portugal, the Rusian Federation, Tunisia and Turkey, for example, improved their performance in mathematics between 2003 and 2012 by reducing the share of low performers in this subject. What do these countries have in common? Not very much; as a group, they are about as socio-economically and culturally diverse as can be. But therein lies the lesson: all countries can improve their students' performance, given the right policies and the will to implement them.

Multiple risk factors acting in concert

Analyses show that poor performance at age 15 is not the result of any single risk factor, but rather of a combination and accumulation of various barriers and disadvantages that affect students throughout their lives. Who is most likely to be a low performer in mathematics? On average across OECD countries, a socio-economically disadvantaged girl who lives in a single-parent family in a rural area, has an immigrant background, speaks a different language at home from the language of instruction, had not attended pre-primary school, had repeated a grade, and is enrolled in a vocational track has an 83% probability of being a low performer.

While these background factors can affect all students, among low performers the combination of risk factors is more detrimental to disadvantaged than to advantaged students. Indeed, all of the demographic characteristics considered in the report, as well as the lack of pre-primary education, increase the probability of low performance by a larger margin among disadvantaged than among advantaged students, on average across OECD countries. Only repeating a grade and enrolment in a vocational track have greater penalties for advantaged students. In other words, disadvantaged students tend not only to be encumbered with more risk factors, but those risk factors have a stronger impact on these students' performance.

Less positive attitudes towards school and learning

Low performers tend to have less perseverance, motivation and self-confidence in mathematics than better-performing students, and they skip classes or days of school more. Students who have skipped school at least once in the two weeks prior to the PISA test are almost three times more likely to be low performers in mathematics than students who did not skip school.

Perhaps surprisingly, however, low performers in mathematics spend a similar amount of time as better-performing students in some mathematics activities, such as programming computers or taking part in mathematics competitions. They are more likely to participate in a mathematics club and play chess after school, perhaps because these activities are presented as recreational and are based on social interactions.

Less supportive teachers and schools

Students attending schools where teachers are more supportive and have better morale are less likely to be low performers, while students whose teachers have low expectations for them and are absent more often are more likely to be low performers in mathematics, even after accounting for the socio-economic status of students and schools.

In addition, in schools with larger concentrations of low performers, the quality of educational resources is lower, and the incidence of teacher shortage is higher, on average across OECD countries, even after accounting for students' and schools' socio-economic status. In countries and economies where educational resources are distributed more equitably across schools, there is less incidence of low performance in mathematics, and a larger share of top performers, even when comparing school systems whose educational resources are of similar quality.

Analysis also shows that the degree to which advantaged and disadvantaged students attend the same school (social inclusion) is more strongly related to smaller proportions of low performers in a school system than to larger proportions of top performers. These findings suggest that systems that distribute both educational resources and students more equitably across schools might benefit low performers without undermining better-performing students.

Policies that can help to break the cycle of disengagement and low performance

The first step for policy makers is to make tackling low performance a priority in their education policy agenda – and translate that priority into additional resources. Given the extent to which the

profile of low performers varies across countries, tackling low performance requires a multi-pronged approach, tailored to national and local circumstances. An agenda to reduce the incidence of low performance can include several actions:

- Dismantle the multiple barriers to learning.
- Create demanding and supportive learning environments at school.
- Provide remedial support as early as possible.
- Encourage the involvement of parents and local communities.
- Inspire students to make the most of available education opportunities.
- Identify low performers and design a tailored policy strategy.
- Provide targeted support to disadvantaged schools and/or families.
- Offer special programmes for immigrant, minority-language and rural students.
- Tackle gender stereotypes and assist single-parent families.
- Reduce inequalities in access to early education and limit the use of student sorting.

The statistical data for Israel are supplied by and under the responsibility of the relevant Israeli authorities. The use of such data by the OECD is without prejudice to the status of the Golan Heights, East Jerusalem and Israeli settlements in the West Bank under the terms of international law.

■ Table 0.1 [Part 1/2] ■
PERCENTAGE OF LOW PERFORMERS IN MATHEMATICS, READING AND SCIENCE

(grey)	Countries/economies where the percentage of low performers is **below** the OECD average
(white)	Countries/economies where the percentage of low performers is not statistically different from the OECD average
(blue)	Countries/economies where the percentage of low performers is **above** the OECD average

	Percentage of low-performing students in:													
	Mathematics				Reading					Science				
	2012			Total: Change between 2003 and 2012	2012				Total: Change between 2003 and 2012	2012			Total: Change between 2006 and 2012
	Total	Below Level 1	Level 1		Total	Below Level 1b	Level 1b	Level 1a		Total	Below Level 1	Level 1	
	%	%	%	% dif.	%	%	%	%	% dif.	%	%	%	% dif.
OECD average	23.0	8.0	15.0	**0.7**	18.0	1.3	4.4	12.3	**-1.7**	17.8	4.8	13.0	**-2.1**
Shanghai-China	3.8	0.8	2.9	m	2.9	0.1	0.3	2.5	m	2.7	0.3	2.4	m
Singapore	8.3	2.2	6.1	m	9.9	0.5	1.9	7.5	m	9.6	2.2	7.4	m
Hong Kong-China	8.5	2.6	5.9	-1.9	6.8	0.2	1.3	5.3	**-5.3**	5.6	1.2	4.4	**-3.2**
Korea	9.1	2.7	6.4	-0.4	7.6	0.4	1.7	5.5	0.9	6.6	1.2	5.5	**-4.6**
Estonia	10.5	2.0	8.6	m	9.1	0.2	1.3	7.7	m	5.0	0.5	4.5	**-2.6**
Macao-China	10.8	3.2	7.6	-0.4	11.5	0.3	2.1	9.0	1.8	8.8	1.4	7.4	-1.5
Japan	11.1	3.2	7.9	-2.3	9.8	0.6	2.4	6.7	**-9.3**	8.5	2.0	6.4	**-3.6**
Finland	12.3	3.3	8.9	**5.5**	11.3	0.7	2.4	8.2	**5.6**	7.7	1.8	5.9	**3.6**
Switzerland	12.4	3.6	8.9	-2.1	13.7	0.5	2.9	10.3	-3.0	12.8	3.0	9.8	**-3.2**
Chinese Taipei	12.8	4.5	8.3	m	11.5	0.6	2.5	8.4	m	9.8	1.6	8.2	-1.8
Canada	13.8	3.6	10.2	**3.7**	10.9	0.5	2.4	8.0	1.4	10.4	2.4	8.0	0.4
Liechtenstein	14.1	3.5	10.6	1.8	12.4	0.0	1.9	10.5	2.0	10.4	0.8	9.6	-2.5
Viet Nam	14.2	3.6	10.6	m	9.4	0.1	1.5	7.8	m	6.7	0.9	5.8	m
Poland	14.4	3.3	11.1	**-7.7**	10.6	0.3	2.1	8.1	**-6.2**	9.0	1.3	7.7	**-8.0**
Netherlands	14.8	3.8	11.0	**3.9**	14.0	0.9	2.8	10.3	2.5	13.1	3.1	10.1	0.2
Denmark	16.8	4.4	12.5	1.4	14.6	0.8	3.1	10.7	-1.9	16.7	4.7	12.0	-1.7
Ireland	16.9	4.8	12.1	0.1	9.6	0.3	1.9	7.5	-1.4	11.1	2.6	8.5	**-4.4**
Germany	17.7	5.5	12.2	**-3.9**	14.5	0.5	3.3	10.7	**-7.8**	12.2	2.9	9.3	-3.2
Austria	18.7	5.7	13.0	-0.1	19.5	0.8	4.8	13.8	-1.2	15.8	3.6	12.2	-0.6
Belgium	19.0	7.0	12.0	**2.5**	16.1	1.6	4.1	10.4	-1.8	17.7	5.9	11.8	0.7
Australia	19.7	6.1	13.5	**5.3**	14.2	0.9	3.1	10.2	2.3	13.6	3.4	10.2	0.8
Latvia	19.9	4.8	15.1	-3.8	17.0	0.7	3.7	12.6	-1.1	12.4	1.8	10.5	**-5.1**
Slovenia	20.1	5.1	15.0	m	21.1	1.2	4.9	15.0	m	12.9	2.4	10.4	-1.0
Czech Republic	21.0	6.8	14.2	**4.4**	16.9	0.6	3.5	12.7	-2.4	13.8	3.3	10.5	-1.8
Iceland	21.5	7.5	14.0	**6.5**	21.0	2.3	5.4	13.3	2.5	24.0	8.0	16.0	**3.4**
United Kingdom	21.8	7.8	14.0	m	16.6	1.5	4.0	11.2	m	15.0	4.3	10.7	-1.8
Norway	22.3	7.2	15.1	1.5	16.2	1.7	3.7	10.8	-1.9	19.6	6.0	13.6	-1.4
France	22.4	8.7	13.6	**5.7**	18.9	2.1	4.9	11.9	1.4	18.7	6.1	12.6	-2.4
New Zealand	22.6	7.5	15.1	**7.6**	16.3	1.3	4.0	11.0	1.8	16.3	4.7	11.6	2.6
Spain	23.6	7.8	15.8	0.6	18.3	1.3	4.4	12.6	-2.8	15.7	3.7	12.0	**-3.9**
Russian Federation	24.0	7.5	16.5	**-6.3**	22.3	1.1	5.2	16.0	**-11.7**	18.8	3.6	15.1	-3.5
Luxembourg	24.3	8.8	15.5	**2.6**	22.2	2.0	6.3	13.8	-0.6	22.2	7.2	15.1	0.1

Note: Values that are statistically significant are indicated in bold.
Countries/economies are ranked in ascending order of the percentage of low performing students in mathematics.
Source: OECD, PISA 2012 Database, Tables 1.1, 1.2, 1.9, 1.11 and 1.12.
StatLink http://dx.doi.org/10.1787/888933315931

■ Table 0.1 [Part 2/2] ■
PERCENTAGE OF LOW PERFORMERS IN MATHEMATICS, READING AND SCIENCE

- Countries/economies where the percentage of low performers is **below** the OECD average
- Countries/economies where the percentage of low performers is not statistically different from the OECD average
- Countries/economies where the percentage of low performers is **above** the OECD average

	Percentage of low-performing students in:												
	Mathematics				Reading					Science			
	2012			Total: Change between 2003 and 2012	2012				Total: Change between 2003 and 2012	2012			Total: Change between 2006 and 2012
	Total	Below Level 1	Level 1		Total	Below Level 1b	Level 1b	Level 1a		Total	Below Level 1	Level 1	
	%	%	%	% dif.	%	%	%	%	% dif.	%	%	%	% dif.
OECD average	23.0	8.0	15.0	**0.7**	18.0	1.3	4.4	12.3	**-1.7**	17.8	4.8	13.0	**-2.1**
Italy	24.7	8.5	16.1	**-7.3**	19.5	1.6	5.2	12.7	**-4.4**	18.7	4.9	13.8	**-6.6**
Portugal	24.9	8.9	16.0	**-5.2**	18.8	1.3	5.1	12.3	-3.1	19.0	4.7	14.3	**-5.5**
United States	25.8	8.0	17.9	0.1	16.6	0.8	3.6	12.3	-2.8	18.1	4.2	14.0	**-6.2**
Lithuania	26.0	8.7	17.3	m	21.2	1.0	4.6	15.6	m	16.1	3.4	12.7	**-4.3**
Sweden	27.1	9.5	17.5	**9.8**	22.7	2.9	6.0	13.9	**9.5**	22.2	7.3	15.0	**5.9**
Slovak Republic	27.5	11.1	16.4	**7.5**	28.2	4.1	7.9	16.2	3.3	26.9	9.2	17.6	**6.7**
Hungary	28.1	9.9	18.2	**5.1**	19.7	0.7	5.2	13.8	-0.8	18.0	4.1	14.0	3.0
Croatia	29.9	9.5	20.4	m	18.7	0.7	4.0	13.9	m	17.3	3.2	14.0	0.3
Israel	33.5	15.9	17.6	m	23.6	3.8	6.9	12.9	m	28.9	11.2	17.7	**-7.3**
Greece	35.7	14.5	21.2	-3.3	22.6	2.6	5.9	14.2	-2.6	25.5	7.4	18.1	1.5
Serbia	38.9	15.5	23.4	m	33.1	2.6	9.3	21.3	m	35.0	10.3	24.7	-3.5
Romania	40.8	14.0	26.8	m	37.3	2.5	10.3	24.4	m	37.3	8.7	28.7	**-9.6**
Turkey	42.0	15.5	26.5	**-10.2**	21.6	0.6	4.5	16.6	**-15.2**	26.4	4.4	21.9	**-20.2**
Bulgaria	43.8	20.0	23.8	m	39.4	8.0	12.8	18.6	m	36.9	14.4	22.5	-5.7
Kazakhstan	45.2	14.5	30.7	m	57.1	4.2	17.3	35.6	m	41.9	11.3	30.7	m
United Arab Emirates	46.3	20.5	25.8	m	35.5	3.3	10.4	21.8	m	35.2	11.3	23.8	m
Thailand	49.7	19.1	30.6	-4.2	33.0	1.2	7.7	24.1	**-11.0**	33.6	7.0	26.6	**-12.5**
Chile	51.5	22.0	29.5	m	33.0	1.0	8.1	23.9	m	34.5	8.1	26.3	-5.2
Malaysia	51.8	23.0	28.8	m	52.7	5.8	16.4	30.5	m	45.5	14.5	31.0	m
Mexico	54.7	22.8	31.9	**-11.2**	41.1	2.6	11.0	27.5	**-10.9**	47.0	12.6	34.4	-3.9
Uruguay	55.8	29.2	26.5	**7.7**	47.0	6.4	14.7	25.9	**7.3**	46.9	19.7	27.2	**4.8**
Montenegro	56.6	27.5	29.1	m	43.3	4.4	13.2	25.7	m	50.7	18.7	32.0	0.5
Costa Rica	59.9	23.6	36.2	m	32.4	0.8	7.3	24.3	m	39.3	8.6	30.7	m
Albania	60.7	32.5	28.1	m	52.3	12.0	15.9	24.4	m	53.1	23.5	29.6	m
Argentina	66.5	34.9	31.6	m	53.6	8.1	17.7	27.7	m	50.9	19.8	31.0	-5.4
Tunisia	67.7	36.5	31.3	**-10.2**	49.3	6.2	15.5	27.6	**-13.4**	55.3	21.3	34.0	**-7.4**
Brazil	68.3	36.9	31.4	**-8.1**	50.8	4.6	15.8	30.4	-0.8	55.2	19.9	35.4	**-7.3**
Jordan	68.6	36.5	32.1	m	50.7	7.5	14.9	28.3	m	49.6	18.2	31.4	**5.2**
Qatar	69.6	47.0	22.6	m	57.1	13.6	18.9	24.6	m	62.6	34.6	28.0	**-16.5**
Colombia	73.8	41.6	32.2	m	51.4	5.0	15.4	31.0	m	56.2	19.8	36.3	-4.0
Peru	74.6	47.0	27.6	m	59.9	9.8	20.6	29.5	m	68.5	31.5	37.0	m
Indonesia	75.7	42.3	33.4	-2.4	55.2	4.1	16.3	34.8	-8.0	66.6	24.7	41.9	5.0

Note: Values that are statistically significant are indicated in bold.
Countries/economies are ranked in ascending order of the percentage of low performing students in mathematics.
Source: OECD, PISA 2012 Database, Tables 1.1, 1.2, 1.9, 1.11 and 1.12.
StatLink http://dx.doi.org/10.1787/888933315931

■ Table 0.2 [Part 1/2] ■
OVERLAPPING OF LOW PERFORMANCE ACROSS SUBJECTS

Countries/economies where the percentage of low performers is **below** the OECD average
Countries/economies where the percentage of low performers is not statistically different from the OECD average
Countries/economies where the percentage of low performers is **above** the OECD average

	Above baseline in all subjects	Low performers in: Mathematics only	Reading only	Science only	Mathematics and reading	Mathematics and science	Reading and science	All subjects
	%	%	%	%	%	%	%	%
OECD average	71.6	5.5	2.6	1.5	2.5	3.4	1.2	11.6
Shanghai-China	95.0	1.1	0.6	0.3	0.5	0.6	0.2	1.6
Hong Kong-China	89.4	2.6	1.3	0.4	1.2	0.8	0.4	3.9
Korea	88.2	2.4	1.4	0.7	1.3	1.0	0.6	4.4
Singapore	86.7	1.0	2.0	1.4	0.7	1.0	1.6	5.6
Estonia	85.7	3.8	2.8	0.5	2.6	0.9	0.5	3.2
Japan	85.3	2.9	1.9	0.9	1.5	1.2	0.9	5.5
Chinese Taipei	83.9	2.7	1.8	0.6	1.7	1.2	0.8	7.2
Macao-China	83.6	2.7	3.1	1.0	1.9	1.2	1.5	5.0
Finland	83.5	3.5	3.0	0.5	2.3	1.1	0.7	5.3
Viet Nam	82.9	5.6	2.0	0.5	2.8	1.6	0.3	4.3
Poland	81.9	4.8	2.1	1.0	2.2	1.7	0.6	5.7
Canada	81.8	4.2	2.1	1.2	1.5	2.0	1.1	6.2
Ireland	80.8	5.7	0.9	0.8	1.4	3.0	0.5	6.8
Switzerland	80.7	1.9	3.1	2.0	1.4	1.7	1.7	7.5
Liechtenstein	80.5	3.6	3.0	1.2	2.5	2.3	1.3	5.7
Netherlands	80.3	2.6	2.4	1.2	1.6	2.0	1.4	8.6
Germany	78.5	4.4	2.3	0.6	2.6	2.0	0.8	8.8
Denmark	76.6	3.2	2.3	2.4	1.1	3.1	1.9	9.3
Australia	76.3	5.8	2.1	1.0	2.1	2.7	0.9	9.1
Belgium	75.9	3.3	1.8	1.9	1.3	2.8	1.4	11.5
United Kingdom	74.7	5.5	1.8	1.0	3.0	2.2	0.6	11.2
Latvia	74.2	5.6	3.9	1.1	3.9	2.1	0.8	8.3
Austria	73.7	3.6	4.6	1.2	2.4	2.0	1.9	10.7
Czech Republic	73.3	6.0	3.5	1.2	3.4	2.7	1.0	8.9
New Zealand	73.2	6.2	2.1	1.2	2.2	3.1	0.8	11.1
France	71.9	4.4	2.7	1.7	2.2	3.1	1.3	12.7
Slovenia	71.9	5.3	6.3	0.4	3.6	1.2	1.3	9.9
Norway	71.6	5.0	2.1	2.4	1.6	4.7	1.5	11.0
United States	71.0	7.2	1.4	1.0	2.2	4.2	0.7	12.2
Spain	70.9	6.4	3.2	1.3	3.8	3.0	1.0	10.4
Portugal	69.9	6.0	2.4	1.6	2.6	3.7	1.2	12.6
Italy	69.0	6.0	3.2	1.8	3.1	3.7	1.4	11.9
Iceland	68.8	2.4	3.2	4.0	1.7	3.8	2.6	13.6

Countries/economies are ranked in descending order of the percentage of students who are above baseline in all subjects.
Source: OCD, PISA 2012 Database, Table 1.3.
StatLink http://dx.doi.org/10.1787/888933315940

■ Table 0.2 [Part 2/2] ■
OVERLAPPING OF LOW PERFORMANCE ACROSS SUBJECTS

Countries/economies where the percentage of low performers is **below** the OECD average
Countries/economies where the percentage of low performers is not statistically different from the OECD average
Countries/economies where the percentage of low performers is **above** the OECD average

	Above baseline in all subjects	Low performers in: Mathematics only	Reading only	Science only	Mathematics and reading	Mathematics and science	Reading and science	All subjects
	%	%	%	%	%	%	%	%
OECD average	71.6	5.5	2.6	1.5	2.5	3.4	1.2	11.6
Lithuania	68.6	7.2	3.6	0.8	4.5	2.2	1.0	12.1
Hungary	68.4	7.5	2.1	0.8	3.9	3.6	0.6	13.1
Luxembourg	68.0	4.0	3.5	2.2	2.3	3.7	2.0	14.4
Russian Federation	66.8	6.0	4.9	1.8	3.5	3.1	2.5	11.4
Sweden	66.3	5.5	3.0	2.0	3.1	3.6	1.7	15.0
Croatia	66.3	10.0	2.4	0.9	4.0	4.1	0.6	11.7
Slovak Republic	63.2	3.2	4.5	2.2	2.2	3.3	2.7	18.8
Israel	61.2	6.2	1.9	2.1	1.9	6.9	1.3	18.5
Greece	58.2	10.6	2.6	2.4	3.1	6.2	1.2	15.7
Turkey	53.8	14.6	1.6	1.7	3.6	8.2	0.8	15.6
Serbia	51.0	6.4	4.0	3.4	3.6	6.1	2.7	22.8
United Arab Emirates	48.3	9.5	2.5	1.6	4.6	5.2	1.4	27.0
Bulgaria	48.0	7.0	4.0	1.5	4.1	4.1	2.8	28.6
Romania	46.8	6.5	4.7	3.7	4.6	5.7	3.9	24.0
Thailand	44.2	13.7	2.8	1.9	5.7	7.2	1.4	23.1
Chile	44.1	13.8	2.2	1.3	5.4	7.7	0.9	24.6
Montenegro	36.3	7.5	2.6	2.5	3.0	10.4	2.0	35.8
Mexico	36.1	8.7	2.9	4.4	5.3	9.7	1.9	31.0
Malaysia	35.8	6.0	7.3	1.6	5.3	3.9	3.5	36.5
Uruguay	35.4	8.3	3.8	2.7	5.7	6.6	2.4	35.2
Costa Rica	35.2	17.2	1.8	2.4	6.5	12.8	0.7	23.4
Kazakhstan	32.9	4.9	10.9	2.9	9.3	2.2	8.0	28.8
Albania	27.9	7.9	4.4	3.9	6.7	8.1	3.2	38.0
Argentina	27.4	10.8	3.5	1.3	7.4	6.9	1.3	41.4
Jordan	26.8	14.0	2.6	1.0	7.0	7.4	1.0	40.1
Brazil	26.5	10.4	2.2	1.9	5.7	10.4	1.1	41.8
Qatar	25.4	6.3	1.9	2.0	3.8	9.2	1.2	50.3
Tunisia	24.9	11.5	2.4	3.2	5.8	11.0	1.7	39.4
Colombia	22.9	13.0	1.5	1.3	6.4	11.3	0.5	43.0
Peru	19.7	6.2	1.3	3.1	4.3	11.1	1.3	53.0
Indonesia	18.5	9.1	1.5	2.8	4.3	14.4	1.6	47.9

Countries/economies are ranked in descending order of the percentage of students who are above baseline in all subjects.
Source: OCD, PISA 2012 Database, Table 1.3.
StatLink http://dx.doi.org/10.1787/888933315940

■ Table 0.3 [Part 1/2] ■
STUDENT BACKGROUND AND LOW PERFORMANCE

	Percentage of low performers in mathematics according to their…					
	... socio-economic status		… gender		… immigrant background	
	Socio-economically disadvantaged students	Difference between socio-economically advantaged and disadvantaged students	Girls	Difference between girls and boys	Student has an immigrant background	Difference between immigrant students and students without an immigrant background
	%	% dif.	%	% dif.	%	% dif.
OECD average	37.2	**-27.7**	23.9	**1.8**	36.0	**14.2**
Uruguay	77.4	**-50.7**	58.5	**5.7**	50.2	-4.8
Chile	75.0	**-50.1**	57.5	**12.2**	51.7	0.5
Bulgaria	68.0	**-49.6**	42.3	-2.9	74.5	**32.2**
Costa Rica	80.4	**-45.8**	66.6	**14.3**	76.5	**17.9**
Romania	60.7	**-44.0**	41.2	0.8	c	c
Peru	94.5	**-44.0**	77.5	**6.0**	89.9	**15.9**
Hungary	50.6	**-42.5**	28.5	0.9	17.0	-10.8
Slovak Republic	51.7	**-42.3**	27.3	-0.3	31.6	4.9
Israel	55.8	**-41.4**	33.4	-0.2	27.7	**-5.3**
Brazil	85.0	**-40.1**	72.0	**7.8**	83.2	**15.9**
Montenegro	74.4	**-40.0**	56.5	-0.3	45.5	**-11.1**
Argentina	82.4	**-39.4**	69.7	**6.7**	83.1	**17.8**
Malaysia	69.5	**-39.2**	49.6	**-4.5**	64.6	**13.9**
Greece	53.3	**-36.6**	36.9	2.4	57.7	**25.1**
France	40.3	**-35.6**	22.4	0.0	43.3	**25.6**
Portugal	42.2	**-35.1**	25.9	1.9	42.4	**20.0**
Colombia	88.3	**-34.5**	79.6	**12.2**	97.3	**24.0**
Luxembourg	42.5	**-34.5**	28.7	**8.6**	32.8	**16.7**
Tunisia	80.9	**-34.2**	71.3	**7.7**	65.4	-2.0
Turkey	56.9	**-34.2**	43.2	2.5	49.1	7.6
United Arab Emirates	67.1	**-34.1**	44.3	-4.0	31.3	**-31.4**
Mexico	70.7	**-34.1**	58.5	**7.8**	87.7	**34.1**
Serbia	53.6	**-33.1**	40.4	3.1	33.4	-5.3
New Zealand	41.0	**-33.0**	23.6	1.8	24.8	3.9
Jordan	82.6	**-32.0**	64.8	**-7.7**	58.9	**-9.5**
United States	41.0	**-31.5**	25.2	-1.3	29.8	**6.3**
Lithuania	42.8	**-31.4**	24.3	**-3.3**	25.8	0.3
Spain	39.7	**-31.4**	25.1	**3.0**	42.7	**22.1**
Thailand	60.2	**-29.6**	46.3	**-7.7**	73.7	24.7
Kazakhstan	60.6	**-29.4**	45.0	-0.5	48.4	4.0
Czech Republic	37.5	**-29.3**	22.7	3.5	30.3	9.8
Croatia	43.4	**-28.9**	31.0	2.1	35.5	**6.6**
Belgium	34.0	**-28.5**	19.3	0.7	38.7	**24.3**
Austria	**33.9**	**-27.5**	21.2	**5.1**	36.8	**22.1**
Indonesia	**84.8**	**-27.1**	76.9	2.3	c	c
Slovenia	**33.4**	**-26.6**	19.8	-0.6	37.0	**18.9**
Sweden	**40.1**	**-26.3**	26.0	-2.2	47.2	**25.1**
Russian Federation	**37.9**	**-26.1**	23.3	-1.4	29.6	**6.9**
Italy	**38.4**	**-25.9**	26.7	**3.9**	42.3	**19.7**
Latvia	**33.1**	**-25.6**	18.3	-3.2	22.3	2.7
Qatar	**85.6**	**-25.5**	68.2	-2.6	50.9	**-36.1**
Australia	**32.9**	**-25.2**	21.1	**2.9**	15.4	**-3.6**
Germany	**31.1**	**-25.2**	18.7	**1.9**	31.1	**17.4**
Ireland	**29.7**	**-24.9**	18.7	**3.5**	17.6	1.2
Denmark	**30.1**	**-24.4**	18.6	**3.5**	41.7	**28.3**
United Kingdom	**32.0**	**-23.6**	23.8	**4.1**	27.4	**7.4**
Chinese Taipei	**26.6**	**-23.1**	11.4	-2.9	15.9	3.6
Poland	**26.5**	**-22.7**	13.8	-1.2	c	c
Norway	**33.5**	**-21.8**	22.0	-0.6	41.0	**21.4**
Iceland	**31.3**	**-20.2**	19.7	**-3.5**	39.3	**19.5**
Viet Nam	**24.8**	**-19.2**	14.3	0.1	c	c
Netherlands	**24.9**	**-18.9**	15.8	1.9	28.8	**16.5**
Switzerland	**22.8**	**-18.2**	13.1	1.4	24.6	**16.6**
Canada	**21.7**	**-16.5**	14.3	0.9	14.0	1.8
Liechtenstein	**24.1**	**-16.0**	17.3	6.1	22.1	**12.4**
Finland	**20.1**	**-15.5**	10.4	**-3.7**	44.9	**34.4**
Japan	**19.0**	**-14.5**	11.2	0.3	c	c
Singapore	**16.6**	**-14.4**	6.7	**-3.1**	4.6	**-4.1**
Estonia	**15.9**	**-12.6**	10.4	-0.2	19.0	**9.7**
Korea	**14.0**	**-9.5**	9.1	-0.1	c	c
Hong Kong-China	**13.1**	**-8.9**	8.5	-0.1	8.0	-0.1
Shanghai-China	**8.1**	**-7.2**	3.6	-0.3	20.8	**17.3**
Macao-China	**13.9**	**-6.7**	10.0	-1.6	9.2	**-3.7**
Albania	m	m	60.3	-0.7	c	c

Note: Values that are statistically significant are indicated in bold.
Countries/economies are ranked in ascending order of the difference in the percentage of low performers in mathematics between socio-economically advantaged and disadvantaged students.
Source: OECD, PISA 2012 Database, Tables 2.1, 2.3a, 2.6, 2.14, 2.16 and 2.18.
StatLink http://dx.doi.org/10.1787/888933315951

■ Table 0.3 [Part 2/2] ■
STUDENT BACKGROUND AND LOW PERFORMANCE

	Percentage of low performers in mathematics according to their…					
	… pre-primary education		… grade repetition		… study programme	
	No pre-primary education	Difference between students with no pre-primary education and students with more than a year of pre-primary education	Repeated a grade	Difference between students who had repeated a grade and students who had had never repeated a grade	Enrolled in a vocational programme[1]	Difference between students enrolled in a vocational programme and students enrolled in a general programme
	%	% dif.	%	% dif.	%	% dif.
OECD average	41.5	**21.7**	54.5	**36.3**	40.6	**20.4**
Uruguay	75.2	**27.3**	85.8	**49.0**	78.4	**23.2**
Chile	74.1	**27.9**	81.1	**40.0**	49.6	-2.0
Bulgaria	64.2	**25.0**	90.6	**50.1**	53.2	**15.9**
Costa Rica	73.1	**18.4**	82.9	**35.0**	46.3	**-15.0**
Romania	64.1	**26.3**	70.9	**31.7**	c	c
Peru	90.8	**22.3**	92.8	**25.4**	c	c
Hungary	56.0	**29.3**	71.1	**48.6**	68.3	**46.9**
Slovak Republic	65.7	**43.0**	82.1	**59.5**	30.6	4.7
Israel	69.2	**40.5**	71.6	**40.6**	91.5	**59.8**
Brazil	79.8	**19.6**	87.3	**31.4**	c	c
Montenegro	65.4	**17.8**	77.7	**22.1**	70.5	**40.8**
Argentina	87.4	**27.4**	87.2	**33.3**	63.5	-3.5
Malaysia	62.2	**20.4**	c	c	58.4	7.7
Greece	63.1	**31.8**	87.2	**54.2**	75.7	**46.3**
France	62.7	**43.4**	57.1	**49.1**	31.7	**11.1**
Portugal	33.6	**15.2**	56.1	**48.8**	49.3	**29.3**
Colombia	83.9	**14.2**	85.7	**20.2**	64.1	**-13.0**
Luxembourg	40.1	**19.2**	47.8	**36.3**	35.3	**14.0**
Tunisia	75.5	**18.4**	93.1	**42.2**	c	c
Turkey	48.0	**21.7**	77.4	**41.5**	57.4	**24.9**
United Arab Emirates	64.0	**27.4**	78.8	**37.3**	33.9	**-12.7**
Mexico	73.4	**21.7**	83.6	**34.6**	45.2	**-12.7**
Serbia	45.6	**13.6**	86.5	**49.1**	47.3	**32.6**
New Zealand	40.8	**22.4**	45.4	**24.6**	c	c
Jordan	77.7	**21.2**	92.3	**26.7**	c	c
United States	40.9	**16.9**	53.6	**33.2**	c	c
Lithuania	34.1	**13.4**	77.7	**53.2**	70.1	**44.3**
Spain	44.3	**24.1**	51.7	**42.5**	64.6	**41.3**
Thailand	72.6	**25.4**	64.6	**15.5**	74.3	**30.6**
Kazakhstan	49.1	**14.2**	65.6	**20.7**	53.0	8.4
Czech Republic	46.4	**27.4**	76.4	**58.3**	20.4	-0.9
Croatia	35.1	**11.3**	49.1	**20.1**	40.9	**37.0**
Belgium	48.2	**31.6**	39.9	**33.1**	31.4	**22.3**
Austria	35.8	**18.5**	38.0	**22.1**	20.6	**6.2**
Indonesia	86.6	**25.0**	90.0	**17.0**	71.2	-5.7
Slovenia	25.1	**7.9**	66.6	**48.4**	30.8	**22.8**
Sweden	46.7	**23.9**	69.7	**45.4**	c	c
Russian Federation	32.7	**12.2**	64.5	**41.6**	29.3	5.6
Italy	47.6	**25.6**	50.9	**31.9**	34.1	**18.7**
Latvia	22.5	3.9	68.8	**53.7**	c	c
Qatar	82.2	**26.7**	86.1	**19.6**	c	c
Australia	36.7	**20.4**	38.1	**20.5**	27.0	**8.2**
Germany	31.7	**18.2**	39.4	**28.3**	21.8	4.1
Ireland	21.0	4.4	33.5	**18.3**	71.3	**54.8**
Denmark	43.6	**30.6**	48.5	**33.8**	c	c
United Kingdom	43.3	**25.4**	58.3	**38.2**	55.0	**33.6**
Chinese Taipei	28.8	**17.6**	53.7	**41.2**	19.9	**10.8**
Poland	28.4	**17.3**	59.6	**47.2**	c	c
Norway	32.7	**12.7**	c	c	c	c
Iceland	35.2	**15.1**	46.7	**26.0**	c	c
Viet Nam	35.8	**25.0**	57.4	**46.9**	c	c
Netherlands	28.2	**14.2**	26.8	**17.1**	49.5	**44.6**
Switzerland	39.6	**27.6**	31.2	**23.6**	2.6	**-11.0**
Canada	18.3	**8.2**	36.1	**25.2**	13.8	c
Liechtenstein	c	c	24.3	12.5	c	c
Finland	34.5	**24.8**	54.0	**44.0**	c	c
Japan	28.3	**18.2**	c	c	17.0	**7.8**
Singapore	20.1	**13.0**	27.9	**20.9**	c	c
Estonia	12.0	**2.4**	46.0	**37.1**	c	c
Korea	15.3	**7.1**	17.6	**9.0**	21.2	**15.1**
Hong Kong-China	30.7	**23.3**	21.0	**15.2**	c	c
Shanghai-China	18.1	**15.7**	17.1	**14.7**	6.7	**3.7**
Macao-China	19.5	**11.0**	21.5	**18.5**	9.9	-0.9
Albania	62.0	1.3	51.8	**-9.7**	64.4	4.1

Note: Values that are statistically significant are indicated in bold.
1. This category includes students enrolled in pre-vocational, vocational and modular programmes.
Countries/economies are ranked in ascending order of the difference in the percentage of low performers in mathematics between socio-economically advantaged and disadvantaged students.
Source: OECD, PISA 2012 Database, Tables 2.1, 2.3a, 2.6, 2.14, 2.16 and 2.18.
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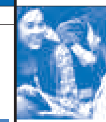
■ Table 0.4 [Part 1/2] ■

ENGAGEMENT, PERSEVERANCE AND SELF-CONFIDENCE AMONG LOW PERFORMERS IN MATHEMATICS

	Low performers in mathematics					Difference between low performers in mathematics and students scoring above the baseline in mathematics				
	Skipped school at least once in the two weeks prior to the PISA test	Index of sense of belonging at school	Hours spent doing homework	Index of perseverance	Index of mathematics self-efficacy	Skipped school at least once in the two weeks prior to the PISA test	Index of sense of belonging at school	Hours spent doing homework	Index of perseverance	Index of mathematics self-efficacy
	%	Mean index	Mean hours	Mean index	Mean index	% dif.	Mean index dif.	Mean hours dif.	Mean index dif.	Mean index dif.
OECD average	22.6	-0.1	3.5	-0.3	-0.7	**10.2**	**-0.15**	**-1.8**	**-0.34**	**-0.83**
Argentina	62.6	-0.3	3.2	-0.1	-0.5	**13.2**	**-0.16**	**-1.5**	**-0.25**	**-0.34**
Italy	59.4	-0.2	5.6	-0.1	-0.6	**14.9**	0.03	**-4.1**	**-0.25**	**-0.64**
Turkey	52.0	0.1	3.7	0.3	-0.4	**-3.9**	-0.08	**-1.0**	**-0.31**	**-0.65**
United Arab Emirates	47.8	-0.1	4.4	0.2	-0.3	**16.0**	**-0.24**	**-3.2**	**-0.48**	**-0.58**
Jordan	47.4	-0.1	3.6	0.2	-0.2	**12.6**	**-0.26**	**-1.6**	**-0.55**	**-0.53**
Australia	44.5	-0.3	3.5	-0.3	-0.7	**15.6**	**-0.24**	**-3.1**	**-0.50**	**-0.94**
Romania	43.4	-0.4	5.0	-0.1	-0.4	**15.4**	**-0.15**	**-3.8**	**-0.19**	**-0.40**
Spain	42.8	0.3	4.7	-0.1	-0.5	**19.2**	**-0.15**	**-2.3**	**-0.31**	**-0.73**
Latvia	41.6	-0.2	4.8	-0.1	-0.6	**23.6**	-0.01	**-1.7**	**-0.33**	**-0.57**
Bulgaria	38.3	-0.3	3.8	0.3	-0.3	**23.2**	**-0.26**	**-3.0**	**-0.42**	**-0.39**
Lithuania	36.7	-0.2	4.9	-0.1	-0.5	**23.9**	**-0.44**	**-2.3**	**-0.27**	**-0.79**
Malaysia	36.4	-0.2	3.1	0.1	-0.5	**16.4**	**-0.08**	**-3.4**	**-0.20**	**-0.51**
Israel	35.6	0.4	3.7	0.3	-0.4	**7.6**	-0.05	**-1.3**	-0.02	**-0.76**
New Zealand	35.1	-0.2	2.7	-0.3	-0.8	**23.1**	-0.04	**-1.9**	**-0.43**	**-0.76**
Costa Rica	34.7	0.4	2.7	0.4	-0.5	**8.1**	-0.03	**-1.9**	**-0.18**	**-0.32**
Estonia	33.7	-0.4	5.0	0.2	-0.7	**20.6**	-0.09	**-2.1**	-0.10	**-0.72**
Russian Federation	33.4	-0.2	7.8	0.3	-0.6	**15.9**	-0.08	**-2.5**	**-0.20**	**-0.63**
Canada	31.6	-0.2	3.7	-0.2	-0.7	**10.9**	**-0.15**	**-2.0**	**-0.46**	**-0.95**
Portugal	30.4	-0.1	2.4	-0.1	-0.5	**14.6**	**-0.20**	**-1.8**	**-0.55**	**-1.03**
Slovenia	30.1	-0.1	3.3	0.0	-0.3	**19.9**	-0.07	-0.5	**-0.16**	**-0.73**
Montenegro	29.5	0.0	3.5	0.2	-0.5	**11.1**	0.13	**-1.9**	**-0.37**	**-0.49**
Greece	28.7	-0.2	3.6	-0.4	-0.7	**10.9**	-0.07	**-2.5**	**-0.42**	**-0.77**
Uruguay	28.3	0.2	4.0	0.1	-0.5	**10.6**	0.01	**-1.5**	**-0.26**	**-0.45**
United States	27.8	-0.2	3.7	0.1	-0.5	**9.0**	**-0.19**	**-3.2**	**-0.42**	**-0.83**
United Kingdom	27.1	-0.1	3.1	-0.3	-0.7	**11.7**	**-0.14**	**-2.3**	**-0.50**	**-0.97**
Singapore	26.7	-0.3	3.8	0.1	-0.5	**13.3**	**-0.15**	**-6.1**	**-0.21**	**-1.06**
Poland	26.6	-0.3	5.0	-0.4	-0.7	**12.6**	0.01	**-1.8**	**-0.48**	**-0.97**
Croatia	25.6	0.1	4.3	0.0	-0.5	**18.3**	-0.03	**-2.2**	**-0.14**	**-0.79**
Kazakhstan	25.3	0.3	7.4	0.6	-0.1	**10.2**	**-0.15**	**-2.5**	**-0.33**	**-0.36**
Mexico	25.2	0.0	4.0	0.2	-0.4	**9.4**	**-0.13**	**-2.7**	**-0.34**	**-0.43**
Tunisia	24.0	-0.2	3.3	0.0	-0.5	**10.2**	**-0.12**	**-0.6**	**-0.39**	**-0.52**

Note: Values that are statistically significant are indicated in bold.
Countries/economies are ranked in descending order of the percentage of low performers in mathematics who had skipped school at least once in the two weeks prior to the PISA test.
Source: OECD, PISA 2012 Database, Tables 3.1, 3.3, 3.8, 3.12 and 3.15.
StatLink http://dx.doi.org/10.1787/888933315961



■ Table 0.4 [Part 2/2] ■
ENGAGEMENT, PERSEVERANCE AND SELF-CONFIDENCE AMONG LOW PERFORMERS IN MATHEMATICS

	Low performers in mathematics					Difference between low performers in mathematics and students scoring above the baseline in mathematics				
	Skipped school at least once in the two weeks prior to the PISA test	Index of sense of belonging at school	Hours spent doing homework	Index of perseverance	Index of mathematics self-efficacy	Skipped school at least once in the two weeks prior to the PISA test	Index of sense of belonging at school	Hours spent doing homework	Index of perseverance	Index of mathematics self-efficacy
	%	Mean index	Mean hours	Mean index	Mean index	% dif.	Mean index dif.	Mean hours dif.	Mean index dif.	Mean index dif.
OECD average	22.6	-0.1	3.5	-0.3	-0.7	**10.2**	**-0.15**	**-1.8**	**-0.34**	**-0.83**
Thailand	23.9	-0.2	3.9	0.1	-0.4	**11.4**	**-0.25**	**-3.4**	**-0.25**	**-0.22**
Viet Nam	23.8	-0.2	3.6	0.4	-0.6	**17.0**	0.02	**-2.6**	-0.09	**-0.43**
Brazil	21.3	-0.2	2.9	0.1	-0.6	**3.0**	-0.04	**-1.3**	**-0.25**	**-0.49**
Finland	20.4	-0.4	2.4	-0.4	-1.0	**11.3**	**-0.16**	**-0.5**	**-0.50**	**-0.78**
Serbia	19.6	0.0	3.7	0.1	-0.6	**10.9**	-0.03	**-1.2**	**-0.24**	**-0.59**
Denmark	18.9	-0.2	3.9	-0.5	-0.8	**11.1**	**-0.13**	**-0.4**	**-0.46**	**-0.79**
France	18.0	-0.3	3.3	-0.7	-0.6	**10.9**	**-0.27**	**-2.2**	**-0.34**	**-0.77**
Peru	16.7	-0.1	4.8	0.3	-0.3	**9.9**	**-0.13**	**-2.6**	**-0.26**	**-0.34**
Qatar	16.2	-0.3	3.6	0.1	-0.3	-0.4	**-0.32**	**-2.1**	**-0.48**	**-0.59**
Chinese Taipei	15.6	-0.2	1.9	-0.4	-1.1	**13.0**	-0.02	**-4.0**	**-0.34**	**-1.51**
Hungary	15.6	-0.1	4.0	-0.2	-0.6	**12.2**	**-0.25**	**-3.0**	**-0.22**	**-0.96**
Slovak Republic	15.5	-0.5	2.5	-0.7	-0.5	**8.4**	**-0.19**	**-0.9**	**-0.31**	**-0.79**
Norway	14.9	-0.1	3.8	-0.8	-0.8	**10.0**	**-0.17**	**-1.2**	**-0.64**	**-1.04**
Luxembourg	14.1	0.0	3.4	-0.2	-0.6	**9.2**	**-0.32**	**-1.5**	**-0.22**	**-0.91**
Sweden	14.0	-0.1	3.3	-0.6	-0.5	**9.2**	**-0.14**	**-0.4**	**-0.43**	**-0.77**
Macao-China	13.8	-0.5	2.9	-0.1	-0.6	**10.0**	0.00	**-3.4**	**-0.27**	**-0.83**
Belgium	13.7	-0.2	3.1	-0.5	-0.7	**10.1**	**-0.19**	**-2.8**	**-0.21**	**-0.75**
Albania	13.6	0.4	5.1	0.7	0.0	-2.9	0.07	0.0	0.01	-0.01
Indonesia	13.5	0.0	4.1	0.2	-0.3	**6.3**	**-0.16**	**-2.9**	**-0.19**	**-0.29**
Switzerland	13.0	0.2	3.1	-0.3	-0.6	**9.2**	**-0.26**	**-1.0**	**-0.22**	**-0.96**
Austria	12.8	0.3	3.4	-0.2	-0.6	**5.8**	**-0.25**	**-1.4**	**-0.23**	**-0.82**
Hong Kong-China	11.5	-0.5	2.7	-0.1	-0.9	**8.2**	-0.07	**-3.6**	**-0.29**	**-1.26**
Chile	10.9	0.1	2.8	0.2	-0.4	**6.6**	-0.06	**-1.5**	**-0.24**	**-0.49**
Czech Republic	10.0	-0.5	2.3	-0.2	-0.5	**5.3**	**-0.17**	**-1.0**	**-0.16**	**-0.70**
Germany	10.0	0.2	3.7	-0.2	-0.4	**5.8**	-0.13	**-1.1**	**-0.23**	**-0.86**
Korea	9.9	-0.6	1.4	-0.4	-1.4	**8.9**	**-0.27**	**-1.6**	**-0.34**	**-1.19**
Netherlands	7.7	-0.2	3.7	-0.2	-0.8	**5.9**	**-0.18**	**-2.5**	**-0.12**	**-0.76**
Ireland	6.9	-0.1	4.5	-0.2	-0.7	**3.4**	-0.06	**-3.4**	**-0.46**	**-0.86**
Japan	6.2	-0.3	1.9	-1.0	-1.5	**5.2**	**-0.12**	**-2.1**	**-0.41**	**-1.17**
Colombia	5.0	0.2	4.4	0.4	-0.5	**2.2**	**-0.16**	**-3.3**	**-0.16**	**-0.26**
Iceland	4.7	0.2	3.7	-0.5	-0.7	**3.4**	**-0.22**	-0.5	**-0.53**	**-0.98**
Shanghai-China	4.0	-0.4	4.1	0.1	-0.5	**3.4**	-0.11	**-10.2**	-0.17	**-1.54**
Liechtenstein	1.6	c	c	c	c	-0.5	c	c	c	c

Note: Values that are statistically significant are indicated in bold.

Countries/economies are ranked in descending order of the percentage of low performers in mathematics who had skipped school at least once in the two weeks prior to the PISA test.

Source: OECD, PISA 2012 Database, Tables 3.1, 3.3, 3.8, 3.12 and 3.15.

StatLink http://dx.doi.org/10.1787/888933315961

■ Table 0.5 [Part 1/3] ■
HOW SCHOOL CHARACTERISTICS ARE RELATED TO LOW PERFORMANCE

	Percentage of low performers in mathematics in schools where…									
	… principals report that teachers' low expectations of students hinder learning a lot or to some extent		… principals report that teacher absenteeism hinders learning a lot or to some extent		… there is ability grouping for all mathematics classes		… additional mathematics lessons are offered after school hours		… principals report that there is little or no pressure from parents for high academic standards	
	Percentage of students in these schools	Difference between students attending these schools and those where teachers' low expectations hinder learning very little or not at all	Percentage of students in these schools	Difference between students attending these schools and those where teacher absenteeism hinders learning very little or not at all	Percentage of students in these schools	Difference between students attending these schools and those where there is no ability grouping for any classes	Percentage of students in these schools	Difference between students attending these schools and those where additional mathematical lessons are not offered	Percentage of students in these schools	Difference between students attending these schools and those with constant pressure from many parents
	%	% dif.	%	% dif.	%	% dif.	%	% dif.	%	% dif.
OECD average	30.6	**9.1**	27.6	**4.7**	26.3	**7.3**	25.4	**3.4**	28.6	**15.0**
Lithuania	47.2	**22.8**	c	c	27.1	4.3	33.1	**9.1**	26.4	5.1
France	42.3	**21.6**	28.1	6.4	25.9	7.8	21.5	-1.4	24.4	**14.9**
Chile	63.5	**18.7**	61.9	**14.4**	57.1	**12.9**	61.4	**14.1**	68.1	**37.5**
Germany	33.0	**16.4**	20.8	4.1	27.8	**17.7**	25.8	**12.3**	20.4	c
Uruguay	65.6	**15.6**	63.0	**20.7**	52.6	3.4	62.5	8.2	58.3	24.7
Belgium	33.0	**15.4**	30.2	**15.2**	28.1	**13.4**	22.7	**6.2**	23.2	**15.7**
Bulgaria	56.6	**15.2**	42.0	-2.5	38.0	1.7	50.6	**10.8**	53.1	**28.6**
Thailand	62.2	**14.3**	59.2	10.6	45.4	-8.3	71.8	**24.4**	54.5	**16.4**
Croatia	40.3	**14.2**	20.5	**-10.2**	31.9	**16.7**	48.6	**21.0**	35.1	c
Slovak Republic	39.6	**13.8**	20.2	-7.9	35.1	**12.7**	31.3	5.8	36.4	**22.2**
Greece	45.5	**13.7**	27.0	**-9.9**	44.3	11.6	34.2	-5.2	42.8	**19.7**
Qatar	81.0	**13.6**	73.7	**4.7**	70.5	**-7.2**	56.1	**-16.6**	87.2	**31.8**
Ireland	28.6	**13.5**	22.1	5.7	15.7	c	14.9	-3.1	32.7	**23.5**
Malaysia	63.2	**13.5**	59.2	8.6	52.3	20.1	35.7	**-17.6**	57.7	**28.0**
New Zealand	33.4	**13.4**	30.7	**9.5**	23.2	c	28.1	7.0	28.9	**15.3**
Costa Rica	70.1	**12.9**	63.8	5.5	56.2	-4.5	56.7	-6.1	62.3	**17.8**
United States	36.2	**12.8**	33.5	8.9	22.7	-8.4	23.7	-2.9	32.8	**15.5**
United Arab Emirates	56.0	**12.5**	58.5	**15.5**	45.2	-0.8	51.4	**8.5**	53.1	**19.3**
Turkey	50.2	**12.4**	36.0	-6.4	47.4	**19.7**	43.6	3.4	46.7	**32.0**
Indonesia	87.4	**12.3**	84.4	8.7	79.2	1.7	86.6	**14.6**	72.9	-2.4
Argentina	76.5	**11.9**	73.8	**13.9**	73.1	10.7	57.7	**-15.2**	69.1	11.4
Austria	28.4	**11.5**	20.9	3.0	43.8	**33.1**	20.0	3.2	20.5	c

Note: Values that are statistically significant are indicated in bold.
Countries/economies are ranked in descending order of the difference in the percentage of low performers in mathematics in schools where teachers' low expectations hinder learning a lot or to some extent and schools where teachers' low expectations hinder learning very little or not at all.
Source: OECD, PISA 2012 Database, Tables 4.6, 4.8, 4.14, 4.16 and 4.20.
StatLink http://dx.doi.org/10.1787/888933315975

■ Table 0.5 [Part 2/3] ■
HOW SCHOOL CHARACTERISTICS ARE RELATED TO LOW PERFORMANCE

	Percentage of low performers in mathematics in schools where…									
	… principals report that teachers' low expectations of students hinder learning a lot or to some extent		**… principals report that teacher absenteeism hinders learning a lot or to some extent**		**… there is ability grouping for all mathematics classes**		**… additional mathematics lessons are offered after school hours**		**… principals report that there is little or no pressure from parents for high academic standards**	
	Percentage of students in these schools	Difference between students attending these schools and those where teachers' low expectations hinder learning very little or not at all	Percentage of students in these schools	Difference between students attending these schools and those where teacher absenteeism hinders learning very little or not at all	Percentage of students in these schools	Difference between students attending these schools and those where there is no ability grouping for any classes	Percentage of students in these schools	Difference between students attending these schools and those where additional mathematical lessons are not offered	Percentage of students in these schools	Difference between students attending these schools and those with constant pressure from many parents
	%	% dif.	%	% dif.	%	% dif.	%	% dif.	%	% dif.
OECD average	30.6	**9.1**	27.6	**4.7**	26.3	**7.3**	25.4	**3.4**	28.6	**15.0**
United Kingdom	32.4	11.3	31.0	**11.2**	21.3	c	11.3	**-11.2**	31.7	17.5
Italy	32.3	**11.1**	30.8	8.1	31.0	**10.8**	31.2	8.1	33.1	**23.0**
Australia	28.6	**11.1**	27.0	**8.3**	18.8	2.3	21.6	**3.1**	30.2	**16.7**
Israel	41.6	11.0	37.9	6.6	29.7	5.1	35.2	1.4	44.3	**27.0**
Montenegro	64.7	**10.3**	c	c	57.2	**22.0**	59.6	3.6	56.9	c
Brazil	74.5	**10.3**	72.9	**6.9**	65.1	3.8	74.1	**10.9**	70.7	**20.6**
Serbia	46.3	10.1	37.5	-1.6	38.9	10.4	56.3	**18.5**	47.6	**28.7**
Czech Republic	30.5	10.0	22.9	2.0	32.8	**14.8**	22.0	1.1	26.7	**15.6**
Peru	82.5	**10.0**	82.1	**9.0**	71.9	-1.3	79.4	**10.7**	78.3	**14.9**
Portugal	32.4	8.3	50.0	**25.1**	28.3	**13.1**	28.4	3.1	33.5	**20.0**
Hungary	35.8	8.3	c	c	30.7	1.4	41.2	**15.7**	44.3	**35.5**
Jordan	73.1	**8.2**	72.6	**8.1**	68.9	8.5	71.8	4.5	70.3	9.1
Japan	17.5	**8.0**	c	c	12.5	3.4	15.6	6.2	16.8	c
Norway	28.3	**7.9**	21.3	-0.6	22.9	1.5	22.6	2.0	25.5	**10.5**
Poland	21.5	7.4	17.5	3.6	13.7	-1.5	15.2	0.9	15.5	**5.0**
Spain	29.1	**7.3**	29.8	**6.7**	25.1	5.9	22.7	-2.2	25.7	**11.7**
Korea	14.1	**7.1**	c	c	7.0	**-9.5**	17.4	**9.0**	14.6	c
Switzerland	18.8	6.7	16.6	4.4	15.0	**13.3**	12.3	0.0	9.2	-2.4
Mexico	59.1	**6.0**	61.7	**8.5**	55.4	**5.9**	65.4	**17.9**	54.9	**6.1**
Denmark	22.1	5.4	22.5	6.2	16.2	0.9	16.3	-1.8	18.8	**6.8**
Canada	18.2	4.7	12.5	-1.4	13.7	-1.2	15.0	1.6	19.4	**10.2**
Estonia	14.8	4.6	17.0	**7.1**	11.6	0.8	10.2	0.0	10.8	0.8

Note: Values that are statistically significant are indicated in bold.
Countries/economies are ranked in descending order of the difference in the percentage of low performers in mathematics in schools where teachers' low expectations hinder learning a lot or to some extent and schools where teachers' low expectations hinder learning very little or not at all.
Source: OECD, PISA 2012 Database, Tables 4.6, 4.8, 4.14, 4.16 and 4.20.
StatLink http://dx.doi.org/10.1787/888933315975

■ Table 0.5 [Part 3/3] ■
HOW SCHOOL CHARACTERISTICS ARE RELATED TO LOW PERFORMANCE

	Percentage of low performers in mathematics in schools where…									
	… principals report that teachers' low expectations of students hinder learning a lot or to some extent		… principals report that teacher absenteeism hinders learning a lot or to some extent		… there is ability grouping for all mathematics classes		… additional mathematics lessons are offered after school hours		… principals report that there is little or no pressure from parents for high academic standards	
	Percentage of students in these schools	Difference between students attending these schools and those where teachers' low expectations hinder learning very little or not at all	Percentage of students in these schools	Difference between students attending these schools and those where teacher absenteeism hinders learning very little or not at all	Percentage of students in these schools	Difference between students attending these schools and those where there is no ability grouping for any classes	Percentage of students in these schools	Difference between students attending these schools and those where additional mathematical lessons are not offered	Percentage of students in these schools	Difference between students attending these schools and those with constant pressure from many parents
	%	% dif.	%	% dif.	%	% dif.	%	% dif.	%	% dif.
OECD average	30.6	**9.1**	27.6	**4.7**	26.3	**7.3**	25.4	**3.4**	28.6	**15.0**
Colombia	77.4	4.5	77.5	4.2	67.7	-11.2	77.1	**9.9**	74.1	1.3
Singapore	12.4	**4.4**	14.5	**6.5**	8.5	c	7.4	-0.9	15.0	**9.1**
Finland	15.8	3.6	9.7	**-3.0**	14.4	3.6	11.8	-0.8	12.7	**5.3**
Hong Kong-China	10.8	3.5	15.6	7.9	c	c	c	c	5.0	c
Russian Federation	26.5	3.3	25.4	1.7	22.4	-1.3	25.6	1.6	26.5	**8.6**
Slovenia	21.6	3.2	18.2	-0.7	27.2	7.2	26.9	**9.9**	24.1	**14.0**
Sweden	29.0	2.5	28.6	2.0	26.4	-4.1	26.1	-1.2	30.0	7.0
Albania	62.2	2.0	56.8	-4.2	60.6	c	62.0	1.6	62.9	3.6
Chinese Taipei	14.3	1.9	20.9	**8.9**	15.4	2.1	17.5	5.5	19.5	**11.9**
Latvia	20.8	0.9	17.0	-3.2	20.6	1.9	24.9	**6.5**	20.1	c
Shanghai-China	3.9	0.3	4.5	1.1	3.4	c	5.5	**3.5**	4.8	c
Tunisia	69.0	-0.3	67.9	-2.5	71.2	7.5	75.4	9.8	71.3	**20.5**
Kazakhstan	44.9	-1.1	47.3	3.2	41.1	11.1	41.1	-4.6	48.7	**14.8**
Macao-China	9.4	**-1.8**	17.1	**7.5**	21.1	**13.9**	c	c	10.3	c
Netherlands	14.0	-2.8	15.5	-1.0	17.9	**15.9**	19.5	6.8	27.8	**22.5**
Romania	36.5	-4.8	35.6	-5.6	41.2	1.1	45.5	6.0	39.2	9.7
Iceland	17.3	-4.8	25.7	**4.6**	22.6	2.8	22.6	2.6	24.2	3.5
Viet Nam	9.8	-5.7	c	c	13.7	-16.5	c	c	25.5	**17.3**
Luxembourg	c	c	c	c	27.7	**14.5**	c	c	20.1	**-3.3**
Liechtenstein	c	c	c	c	c	c	c	c	c	c

Note: Values that are statistically significant are indicated in bold.
Countries/economies are ranked in descending order of the difference in the percentage of low performers in mathematics in schools where teachers' low expectations hinder learning a lot or to some extent and schools where teachers' low expectations hinder learning very little or not at all.
Source: OECD, PISA 2012 Database, Tables 4.6, 4.8, 4.14, 4.16 and 4.20.
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■ Table 0.6 ■
HOW THE CHARACTERISTICS OF EDUCATION SYSTEMS ARE RELATED TO LOW PERFORMANCE
COUNTRY-LEVEL CORRELATIONS

Pearson correlation coefficients	Percentage of low performers in mathematics	Percentage of top performers in mathematics
Socio-economic inclusion index	**-0.52**	**0.29**
Index of quality of physical infrastructure	**-0.50**	**0.32**
Index of quality of educational resources	**-0.65**	**0.61**
Index of teacher shortage	0.24	0.00
Size of language-of-instruction class	0.21	0.19
Equity in resource allocation	**-0.60**	**0.32**
Index of school responsibility for resource allocation	-0.15	0.08
Index of school responsibility for curriculum and assessment	**-0.36**	**0.35**
Percentage of students enrolled in public schools	0.09	-0.23
Percentage of students enrolled in private government-dependent schools	-0.24	**0.25**
Percentage of students enrolled in private government-independent schools	**0.30**	0.00
School competition	-0.05	0.24
School accountability	-0.03	-0.16
Index of vertical stratification	**0.41**	-0.16
Index of horizontal between-school stratification	0.01	0.10
Index of horizontal within-school stratification	**0.26**	-0.21

Note: Values that are statistically significant are indicated in bold.
Source: OECD, PISA 2012 Database, Tables 5.1, 5.2 and 5.3.
StatLink http://dx.doi.org/10.1787/888933315983

Reader's Guide

Data underlying the figures

The data tables are listed in Annex A and available on line.

Four symbols are used to denote missing data:

a The category does not apply in the country concerned. Data are therefore missing.

c There are too few observations or no observation to provide reliable estimates (i.e. there are fewer than 30 students or less than five schools with valid data).

m Data are not available. These data were not submitted by the country or were collected but subsequently removed from the publication for technical reasons.

w Data have been withdrawn or have not been collected at the request of the country concerned.

Country coverage

This publication features data on 64 countries and economies: 34 OECD countries (indicated in black in the figures) and 30 partner countries and economies (indicated in blue in the figures).

Calculating international averages

An OECD average was calculated for most indicators presented in this report. The OECD average corresponds to the arithmetic mean of the respective country estimates. Readers should therefore keep in mind that the term "OECD average" refers to the OECD countries included in the respective comparisons.

Rounding figures

Because of rounding, some figures in tables may not exactly add up 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 0.00 is shown, this does not imply that the standard error is zero, but that it is smaller than 0.005.

Bolding of estimates

This report discusses only statistically significant differences or changes (statistical significance at the 5% level). These are denoted in darker colours in figures and in bold in tables.

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 have completed at least 6 years of formal schooling, regardless of the type of institution in which they are enrolled and of whether they are in full-time or part-time education, of whether they attend academic or vocational programmes, and of whether they attend public or private schools or foreign schools within the country.

Indices used in this report

Some analyses in this report are based on synthetic indices. Indices from student and school questionnaires summarise information from several related questionnaire responses into a single global measure. The construction of the following indices is detailed in the *PISA 2012 Technical Report* (OECD, 2014):

- *Index of ability grouping between mathematics classes* (also named in this report *Index of ability grouping within schools*)
- *Index of between-school horizontal stratification*
- *Index of creative extracurricular activities*
- *Index of mathematics anxiety*
- *Index of mathematics interest*
- *Index of mathematics-related extracurricular activities at school*
- *Index of mathematics self-efficacy*
- *Index of mathematics work ethic*
- *Index of perseverance*
- *Index of quality of physical infrastructure*
- *Index of quality of schools' educational resources*
- *Index of school responsibility for curriculum and assessment*
- *Index of school responsibility for resource allocation*
- *Index of sense of belonging at school*
- *Index of teacher morale*
- *Index of teacher support*
- *Index of teacher shortage*
- *Index of vertical stratification*
- *PISA index of economic, social and cultural status (ESCS)*

In addition, one index used in Chapter 3 of this report was derived to describe school absenteeism of students (skip a day of school, skip some classes, arrive late for school):

- *Index of school attendance*

Abbreviations used in this report

% dif.	Percentage-point difference	S.E.	Standard error
Dif.	Difference	% pts	Percentage points
ESCS	PISA index of economic, social and cultural status		

Further documentation

For further information on the PISA assessment instruments and the methods used in PISA, see the *PISA 2012 Technical Report* (OECD, 2014).

StatLinks

This report uses the OECD StatLinks service. Below each table and chart is a url leading to a corresponding Excel™ workbook containing the underlying data. These urls are stable and will remain unchanged over time. In addition, readers of the e-books will be able to click directly on these links and the workbook will open in a separate window, if their Internet browser is open and running.

Note regarding Israel

The statistical data for Israel are supplied by and under the responsibility of the relevant Israeli authorities. The use of such data by the OECD is without prejudice to the status of the Golan Heights, East Jerusalem and Israeli settlements in the West Bank under the terms of international law.

Reference

OECD (2014), *PISA 2012 Technical Report*, PISA, OECD, Paris, www.oecd.org/pisa/pisaproducts/PISA-2012-technical-report-final.pdf.

1

Who and Where are the Low-Performing Students?

Poor performance at school has long-term consequences for both the individual and for society as a whole. This chapter discusses how low performance is measured in PISA and describes the incidence of low performance across countries and over time. It also explains how some countries have managed to reduce their share of low-performing students.

The statistical data for Israel are supplied by and under the responsibility of the relevant Israeli authorities. The use of such data by the OECD is without prejudice to the status of the Golan Heights, East Jerusalem and Israeli settlements in the West Bank under the terms of international law.

Failure, it is often said, is a necessary step on the way towards success. But for far too many students around the world, failure at school is a dead end. These students get trapped in a vicious circle of poor performance and demotivation that leads only to more bad marks and further disengagement from school. Worse, poor performance at school has long-term consequences, both for the individual and for society as a whole. Students who perform poorly at age 15 face a high risk of dropping out of school altogether. The Canadian longitudinal study, *Youth In Transition*, in which students who had participated in PISA 2000 were surveyed every two years following the PISA test, found that students who scored in the bottom quartile in the PISA reading assessment were much more likely to drop out of secondary school and less likely to have completed a year of schooling beyond grade 12 than those in the top quartile (OECD, 2010).

Another survey, conducted in Denmark using data from PISA and from the 2012 Survey of Adult Skills (a product of the OECD Programme for the International Assessment of Adult Competencies, or PIAAC), found that students who are poor readers at school are unlikely to improve much by the time they become young adults. Of all Danish 15-year-olds who scored among the lowest third in reading proficiency in PISA 2000, about 61% also scored among the lowest third in literacy proficiency in the Survey of Adult Skills (PIAAC) 12 years later; only 39% of them had improved their reading skills over the intervening years to attain scores in the middle or top third in literacy proficiency (Danish Ministry of Education, 2014).

The 2012 Survey of Adult Skills (PIAAC) also found that poor proficiency in numeracy and literacy not only limits access to better-paying and more-rewarding jobs, but is also linked to poorer health and less social and political participation (OECD, 2013a). Extensive research confirms the impact of low academic performance on future educational and socio-economic attainment (e.g. Erickson et al., 2005; Rose and Betts, 2004).

What the data tell us

- On average across OECD countries, some 28% of students score below the baseline level of proficiency in at least one of the three core subjects that PISA assesses (reading, mathematics and science). The share of low performers is greater in mathematics (23%) than in reading or science (18% in each). Some 12% of students are low performers in all three subjects, and 3% of students perform below Level 1 in all three subjects.
- Almost four million 15-year-old students across OECD countries are low performers in mathematics, and almost three million are low performers in reading and science. Across the 64 countries and economies that participated in PISA 2012, 11.5 million 15-year-old students are low performers in mathematics, 8.5 million are low performers in reading, and 9 million are low performers in science.
- Nine countries reduced their share of low performers in mathematics between the 2003 and 2012 PISA assessments. Four of them (Brazil, Mexico, Tunisia and Turkey) improved by reducing the share of students who perform below Level 1, while in five (Germany, Italy, Poland, Portugal and the Russian Federation), the share of students at Level 1 and below Level 1 shrank simultaneously.

Based on results from PISA 2012, more than one in four 15-year-old students in OECD countries end their schooling without having attained a baseline level of proficiency in at least one of the three core subjects PISA assesses: reading, mathematics and science. In OECD partner countries and economies, the proportion of these students can be much larger. In absolute numbers, this means that about 13 million 15-year-old students in the 64 countries and economies that participated in PISA 2012 were low performers in at least one subject (Figure 1.1).

When a large share of the population lacks basic skills, a country's long-term economic growth is severely compromised. According to a recent estimate based on PISA data, if reforms were implemented today to raise the level of all low-performing students to baseline proficiency in reading, mathematics and science, the long-term economic gains for OECD countries would cover most, if not all, of the cost of these countries' education systems. Among middle-income countries, many of which also participate in PISA, the economic gains from achieving universal basic skills would average more than eight times their current GDP (OECD, Hanushek and Woessmann, 2015).

Reducing the number of low-performing students is not only a goal in its own right but, as PISA results over the years have shown, it is also an effective way to improve an education system's overall performance – and equity, since low performers are disproportionately from socio-economically disadvantaged families. Brazil, Germany, Italy, Mexico, Poland, Portugal, Tunisia and Turkey, for example, improved their performance in mathematics between 2003 and 2012 by reducing the share of low performers in this subject. Albania, Chile, Germany, Indonesia, Israel, Latvia, Peru and Poland raised their reading scores between 2000 and 2012 largely by reducing the proportion of low performers in reading. And Israel, Korea, Poland, Qatar, Romania, Thailand and Turkey improved their science performance between 2006 and 2012 largely because they reduced the share of poor performers in that subject (OECD, 2014a; OECD, 2015; OECD, 2011).

What do these countries have in common? Not very much; as a group, they are about as socio-economically and culturally diverse as can be. But therein lies the lesson: *all* countries can improve their students' performance, given the right policies and the will to implement them.

HOW PISA DEFINES LOW PERFORMERS

In each of the three core subjects PISA assesses – reading, mathematics and science –, proficiency is measured on a continuous numerical scale in score points. On average across OECD countries, these scales have a mean of 500 score points and a standard deviation of 100 points. To allow for more nuanced interpretations of the assessment results, the proficiency scales are divided into six levels, ranging from lowest (Level 1) to highest (Level 6) proficiency. As shown in Figure 1.2, low-performing students in mathematics are those who score under 420 points, low performers in reading are those who score under 407 points, and low performers in science are those who score below 410 points.

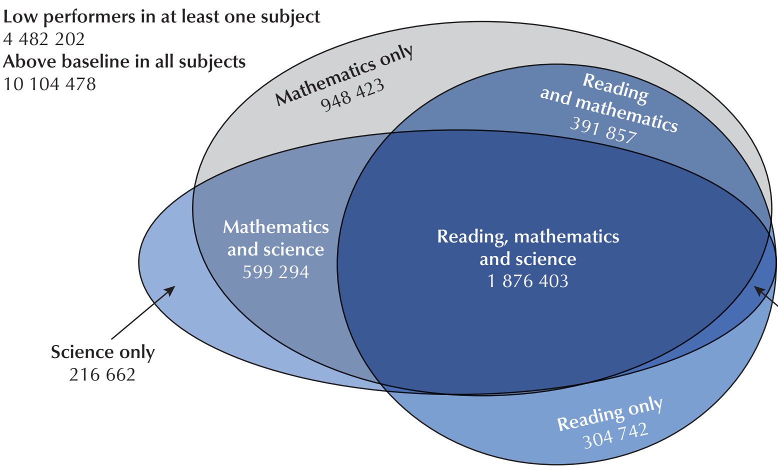
The range of scores within each proficiency level also varies slightly across subjects (62 score points in mathematics, 72 score points in reading, and 74 score points in science). As a reference, 40 score points is considered the equivalent of a full year of schooling. In 2009, PISA further subdivided Level 1 on the reading scale into Levels 1a and 1b to allow for a more precise assessment of skills among the lowest performers in reading.

■ Figure 1.1 ■

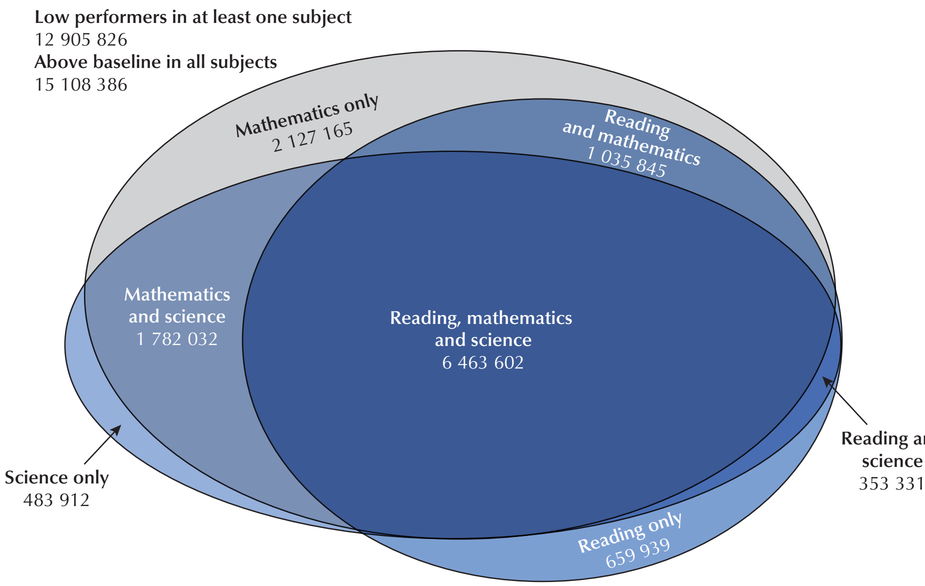
Overlap of low performers in mathematics, reading and science

Absolute number

OECD countries



All participating countries/economies



Notes: Low performers are students who score below the baseline level of proficiency, that is, who are proficient at Level 1 or below.
Numbers in the figures are point estimates based on the total enrolled population of 15-year-olds and the percentage of low performers in each country and economy. Because these estimations have a margin of error, see confidence intervals in Table 1.7b.
Source: OECD, PISA 2012 Database, Table 1.7b.

■ Figure 1.2 ■
Proficiency levels in mathematics, reading and science

	Proficiency level	Lowest score point in the level: Mathematics	Lowest score point in the level: Reading	Lowest score point in the level: Science
Students who score above the baseline proficiency level	Level 6	669	698	708
	Level 5	607	626	633
	Level 4	545	553	559
	Level 3	482	480	484
	Level 2 (baseline)	420	407	410
Low-performing students (below baseline)	Level 1	358	Level 1a: 335 Level 1b: 262	335
	Below Level 1	.	.	.

PISA defines "low performers" (or "low achievers", as they are also referred to in this report) as those students who score below Level 2 on the PISA mathematics, reading and/or science scales (for a more detailed description of how PISA defines and measures low performance, see the *PISA 2012 Technical Report* [OECD, 2014b]). Level 2 is considered the baseline level of proficiency that is required to participate fully in society. Students who score at Level 1 can answer questions involving clear directions and requiring a single source of information and simple connections; but these students cannot engage in more complex reasoning to solve the kinds of problems that are routinely faced by today's adults in modern societies. Figure 1.3 offers a description of the skills that students who perform just above or just below the baseline level of proficiency could be expected to demonstrate in each of the subjects assessed by PISA.

Box 1.1. **Examples of mathematics tasks at Level 2, Level 1 and below Level 1 in PISA 2012**

An illustration of the kinds of tasks that low performing students typically can and cannot solve correctly is provided below through items that were included in the PISA 2012 mathematics assessment. The unit *CHARTS* presents a bar chart showing 6 months of sales data for music. The complication of the bar chart is that is displays four separate data series (four different bands), and some bands do not have data for all periods. Students have to read values from the graphical representation of data and draw conclusions.

Each one of the three questions making up the unit CHARTS corresponds to a different proficiency level. Question 1, with a difficulty of 347.7, is the easiest of the three questions included in the unit, and is classified as Below Level 1 in the PISA mathematics scale. It requires students to find the bars for April, identify the bar for a particular music band, and read the corresponding number of CDs sold by that band in that month. No scale reading or interpolations is required.

Question 2 is a little more difficult than Question 1, with a difficulty of 415, and is classified as Level 1 in the PISA mathematics scale. This is an example of one of the more difficult mathematics task that low performers are typically able to answer correctly. Students need to identify the bars for two bands and compare their height, starting from January and then for the following months. No reading of the vertical scale is required, only to make a visual comparison of a very simple characteristic (which is bigger).

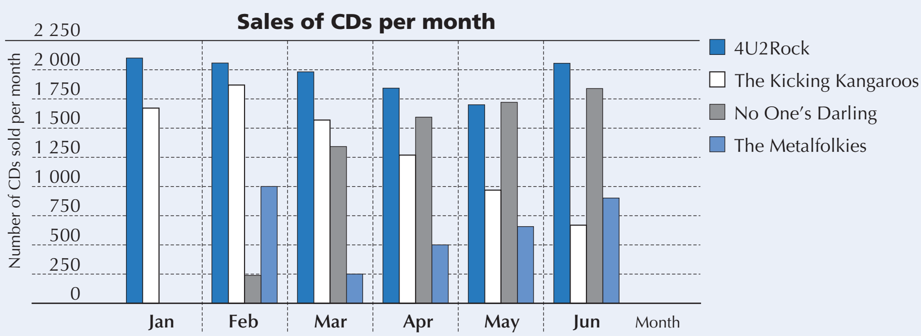
...

Question 5, with a difficulty of 428.2, is just above the baseline of proficiency and is thus classified as Level 2. In this question, students must identify the data series for a particular band and observe the negative trend noted in the lead-in to the item stimulus. It involves some work with numbers and an appreciation that the correct answer to choose may be an approximation to a calculated answer. There are several ways to solve the question. A student might work out each monthly decrease and average them, which involves a lot of calculation. Another student might take one fifth of the total decrease from February to June. Another student might place a ruler along the tops of the bars and find that the July bar would show something between 250 and 500. The question was classified as part of the *employing process* category because it was judged that most students at this level are likely to take the calculation routes, and that carrying these out accurately is likely to present the greatest difficulty for the item.

■ Figure 1.a ■

Charts

In January, the new CDs of the bands *4U2Rock* and *The Kicking Kangaroos* were released. In February, the CDs of the bands *No One's Darling* and *The Metalfolkies* followed. The following graph shows the sales of the bands' CDs from January to June.



CHARTS: Question 1

How many CDs did the band *The Metalfolkies* sell in April?

A. 250
B. 500
C. 1 000
D. 1 270

Scoring

Description: Read a bar chart
Mathematical content area: Uncertainty and data
Question format: Simple multiple choice
Difficulty: 347.7 ***(Below Level 1)***

Full credit

B. 500

No credit

Other responses
Missing

...

CHARTS: Question 2

In which month did the band *No One's Darling* sell more CDs than the band *The Kicking Kangaroos* for the first time?

A. No month
B. March
C. April
D. May

Scoring

Description: Read a bar chart and compare the height of two bars
Mathematical content area: Uncertainty and data
Question format: Simple multiple choice
Difficulty: 415 ***(Level 1)***

Full credit

C. April

No credit

Other responses
Missing

CHARTS: Question 5

The manager of *The Kicking Kangaroos* is worried because the number of their CDs that sold decreased from February to June.
What is the estimate of their sales volume for July if the same negative trend continues?

A. 70 CDs
B. 370 CDs
C. 670 CDs
D. 1 340 CDs

Scoring

Description: Interpret a bar chart and estimate the number of CDs sold in the future assuming that the linear trend continues
Mathematical content area: Uncertainty and data
Question format: Simple multiple choice
Difficulty: 428.2 (***Level 2***)

Full credit

B. 370 CDs

No credit

Other responses
Missing

For other examples of items and more information on the PISA assessment, see *PISA 2012 Assessment and Analytical Framework* (OECD, 2013b).

■ Figure 1.3 ■

Typical skills of students at PISA proficiency Levels 1 and 2 in mathematics, reading and science

	What students can do in mathematics
Level 2	Students can interpret and recognise situations in contexts that require no more than direct inference. They can extract relevant information from a single source and make use of a single representational mode. Students at this level can employ basic algorithms, formulae, procedures, or conventions to solve problems involving whole numbers. They are capable of making literal interpretations of the results.
Level 1	Students can answer questions involving familiar contexts where all relevant information is present and the questions are clearly defined. They are able to identify information and to carry out routine procedures according to direct instructions in explicit situations. They can perform actions that are almost always obvious and follow immediately from the given stimuli.

	What students can do in reading
Level 2	Tasks at this level require the reader to locate one or more pieces of information, which may need to be inferred and may need to meet several conditions. Others require recognising the main idea in a text, understanding relationships, or construing meaning within a limited part of the text when the information is not prominent and the reader must make low-level inferences. Tasks at this level 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.
Level 1a	Tasks at this level require the reader to locate one or more independent pieces of explicitly stated information; to recognise the main theme or author's purpose in a text about a familiar topic, or to make a simple connection between information in the text and common, everyday knowledge. Typically the required information in the text is prominent and there is little, if any, competing information. The reader is explicitly directed to consider relevant factors in the task and in the text.
Level 1b	Tasks at this level require the reader to locate a single piece of explicitly stated information in a prominent position in a short, syntactically simple text with a familiar context and text type, such as a narrative or a simple list. The text typically provides support to the reader, such as repetition of information, pictures or familiar symbols. There is minimal competing information. In tasks requiring interpretation, the reader may need to make simple connections between adjacent pieces of information.

	What students can do in science
Level 2	Students can provide possible scientific explanations in familiar contexts or draw conclusions based on simple investigations. They are capable of direct reasoning and making literal interpretations of the results of scientific inquiry or technological problem solving.
Level 1	Students can apply scientific knowledge to only a few, familiar situations. They can present scientific explanations that are obvious and follow explicitly from given evidence.

Note: There is no summary description of skills below Level 1 because PISA cannot reliably measure that level of proficiency.

UNDERSTANDING LOW PERFORMANCE: ANALYTICAL FRAMEWORK

There are many factors that influence the likelihood that a student will perform below the proficiency baseline in a particular subject. PISA reports, as well as previous research on a range of specialised topics, including academic achievement (e.g. Hanushek and Woessmann, 2011), and grade repetition and dropout (e.g. Rumberger, 1995; Jimerson, Anderson and Whipple, 2002; Stearns et al., 2007), have explored, albeit indirectly, some of these factors. This corpus of research suggests that there is no single or universal factor that accounts for low performance,

but rather an interaction and accumulation of experiences and processes over time that hinder learning and thus increase the probability of low performance (e.g. DiPrete and Eirich, 2006; Alexander, Entwisle and Horsey, 1997; Hao, Hu and Lo, 2014; Bernardi, 2014).

Throughout this report, low performance at age 15 is considered to be related to various factors observed at the student, school and education-system levels (see Figure 1.4).

■ Figure 1.4 ■

Analytical framework and structure of the report

Level of analysis	Chapter	Potential areas of risk	Risk/Protective factors
Students	Chapter 2	Socio-economic status	Socio-economic disadvantage
		Demographic background	Gender, immigrant background, language spoken at home, geographic location, family structure
		Progress through education	Pre-primary education, grade repetition, curricular track in secondary school
	Chapter 3	Attitudes and behaviours towards and at school	Truancy, time on learning activities, self-beliefs, perseverance
Schools	Chapter 4	School socio-economic composition	Concentration of disadvantaged students
		School learning environment	School leadership, teaching practices, after-school opportunities, parents' involvement in school
		School resources and administration	Quality of school's educational resources and teacher shortages
Education systems	Chapter 5	Resources	Physical infrastructure, educational resources, qualified teachers, class size, equity in resource allocation within the system
		Selecting and grouping students	Vertical and horizontal stratification
		Governance	School autonomy, public/private management and funding

Variables that are associated with greater odds of low performance are referred to as "risk factors". At the student level, these include not only the socio-economic status of the family, but a range of other family characteristics, such as its immigration and linguistic background, geographic location and family structure. Similarly, a student's low performance at one particular point in time may stem from an accumulation of key experiences in his or her education career that have led to a disengagement from school.

Readers should bear in mind two caveats when interpreting the results of this report. First, the PISA design does not include randomised assignments and therefore does not allow for claims of causality. Nonetheless, statistical correlations may indicate potential causal relationships (Carnoy et al., 2007). Second, the OECD average is commonly used throughout this report as a reference for comparison. While averages reveal commonalities across countries, the situation in any given country or economy may differ greatly from the average.

LOW PERFORMANCE IN MATHEMATICS, READING AND SCIENCE IN PISA 2012

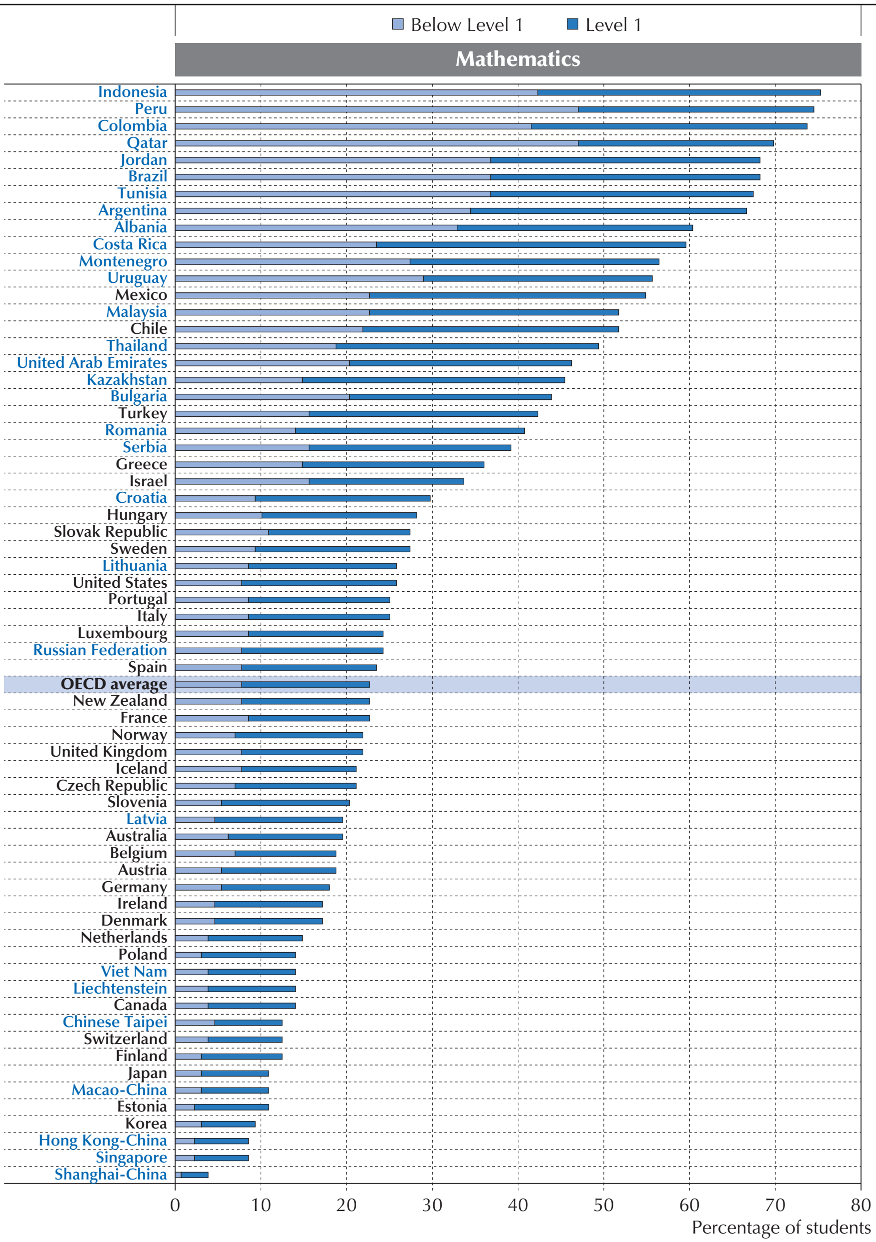
All countries that participated in PISA 2012, even those with the highest performance and equity outcomes, have a sizable share of low performers, as shown in Figure 1.5. Across OECD countries, 23% of students are low performers in mathematics, on average, but the shares of low performers in mathematics vary significantly across countries. In 15 countries that participated in PISA 2012, at least one in two students are low performers in mathematics, while in Hong Kong-China, Korea, Shanghai-China and Singapore, fewer than one in ten students is a low performer in mathematics.

The picture is slightly better when it comes to reading and science. On average across OECD countries, 18% of students were low performers in these two subjects in PISA 2012. There are ten countries where at least one in two students are low performers in reading, and nine countries where at least one in two students are low performers in science. In eight countries, one in ten (or fewer) students performs poorly in reading, and in 11 countries, one in ten (or fewer) students performs poorly in science (Figure 1.5 and Table 1.2).

Not all low performers are proficient at the same level. In addition to the total percentage of low performers, Figure 1.5 distinguishes between students who score at Level 1 and those who score below Level 1 in mathematics and science, and between students scoring at Level 1a, Level 1b or below Level 1b in reading. On average across OECD countries, 15% of students are proficient at Level 1 in mathematics, 12% are proficient at Level 1a in reading and 13% are proficient at Level 1 in science. Some 8% of students score below Level 1 in mathematics, 6% are proficient at Level 1b and below Level 1b, combined, in reading, and 5% score below Level 1 in science. In countries/economies with a large total share of low performers, the percentage of students who score below Level 1 is much higher (Figure 1.5 and Table 1.2).

■ Figure 1.5 [Part 1/3] ■

Share of low performers in mathematics, reading and science



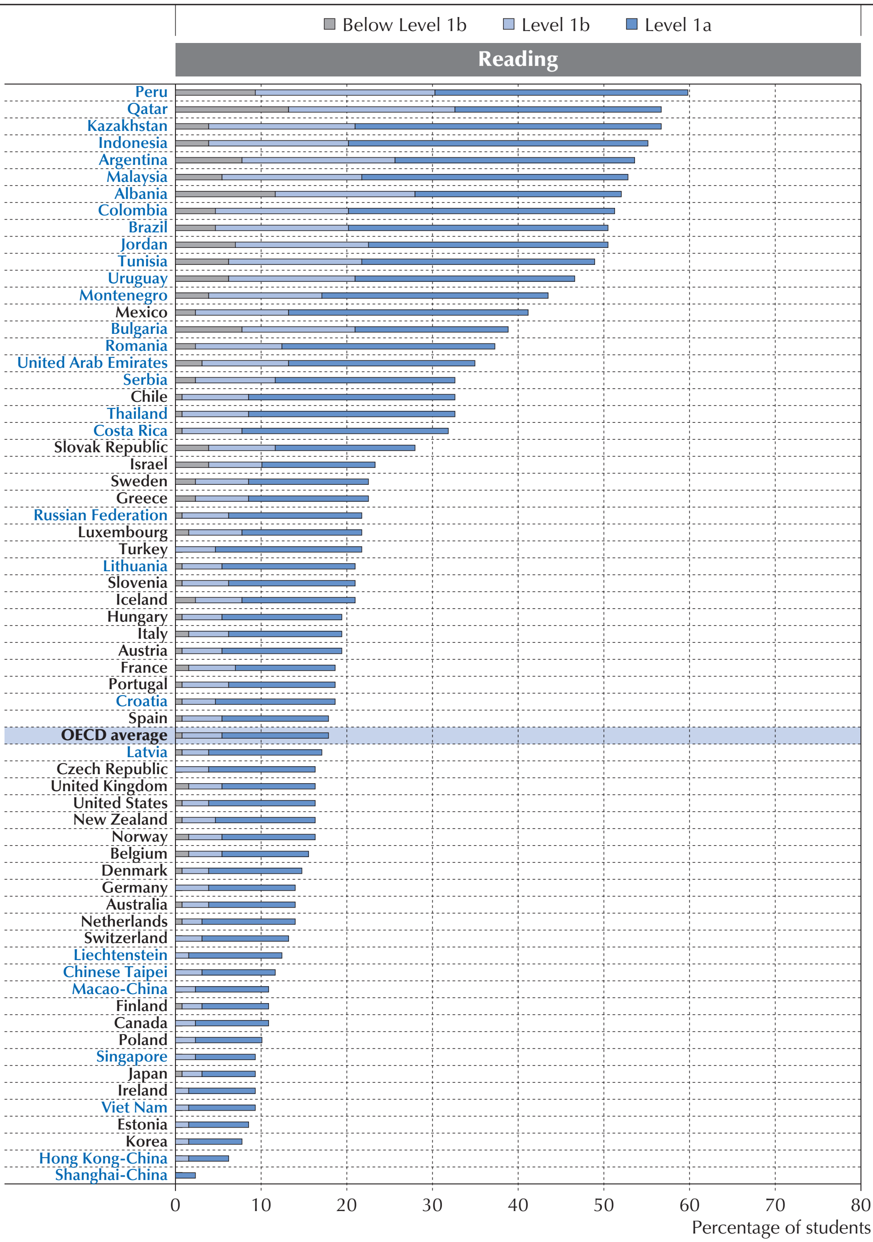
For each domain, countries and economies are ranked in descending order of the percentage of students who are low performers.

Source: OECD, PISA 2012 Database, Table 1.2.

StatLink http://dx.doi.org/10.1787/888933315197

■ Figure 1.5 [Part 2/3] ■

Share of low performers in mathematics, reading and science



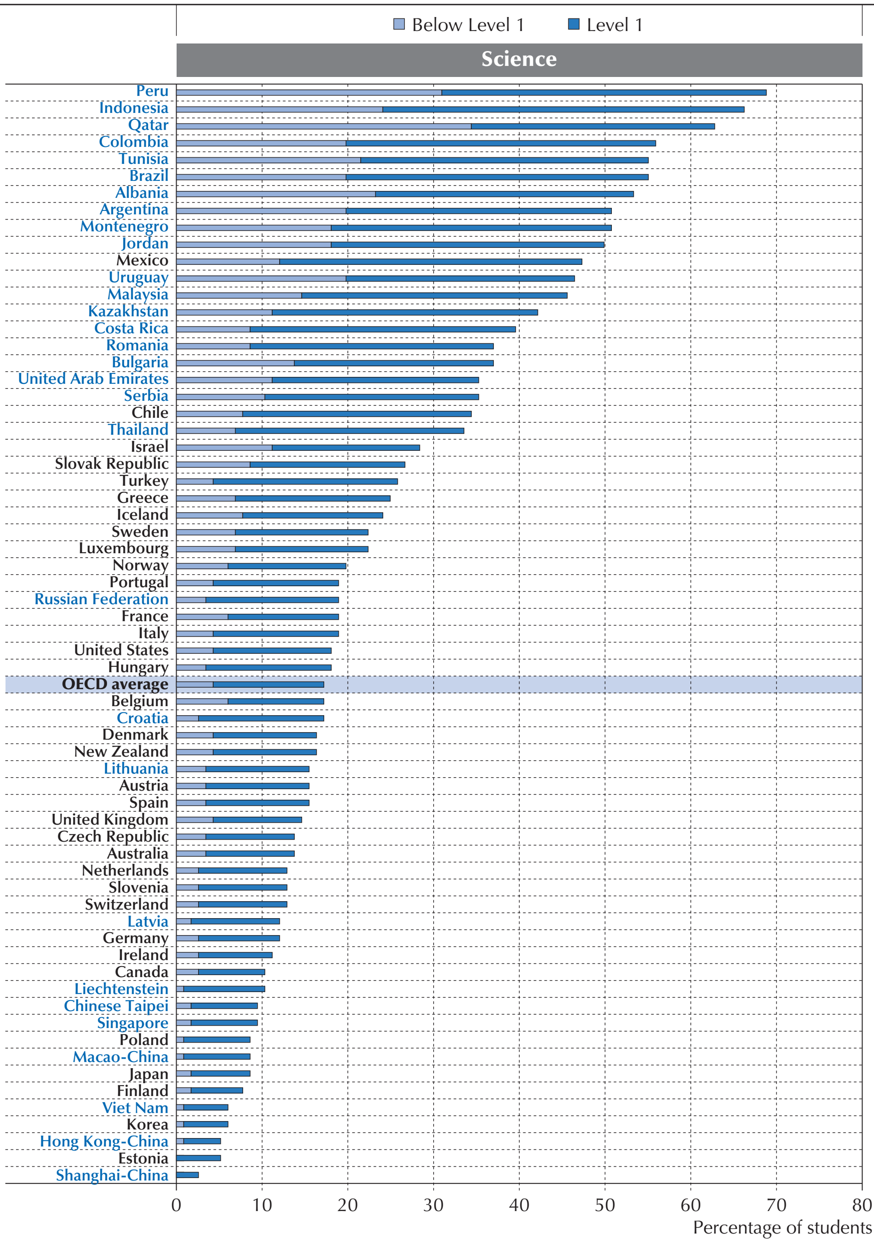
For each domain, countries and economies are ranked in descending order of the percentage of students who are low performers.

Source: OECD, PISA 2012 Database, Table 1.2.

StatLink http://dx.doi.org/10.1787/888933315197

■ Figure 1.5 [Part 3/3] ■

Share of low performers in mathematics, reading and science



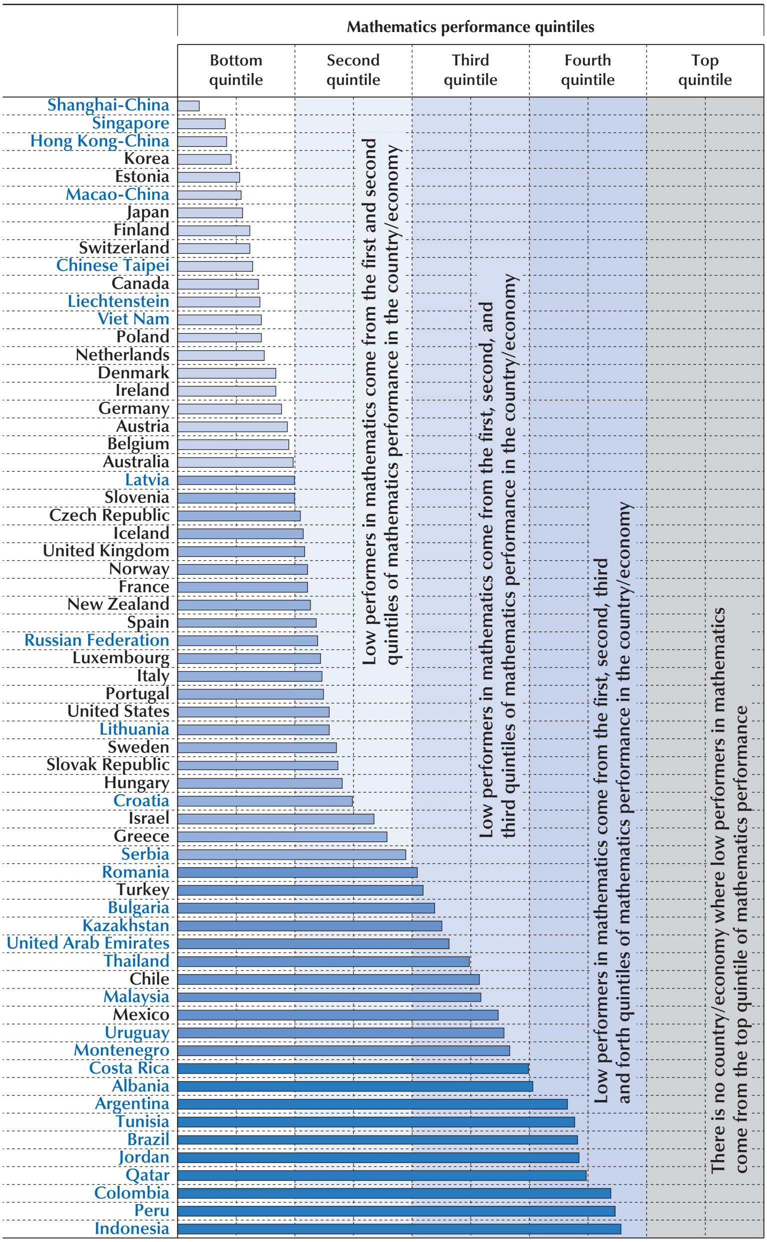
For each domain, countries and economies are ranked in descending order of the percentage of students who are low performers.

Source: OECD, PISA 2012 Database, Table 1.2.

StatLink http://dx.doi.org/10.1787/888933315197

■ Figure 1.6 ■

Low performers in mathematics by quintile of performance in country/economy



Countries and economies are ranked in ascending order of the percentage of low performers in mathematics.
Source: OECD, PISA 2012 Database, Table 1.14.
StatLink http://dx.doi.org/10.1787/888933315200

Not all low performers come from the bottom of the performance distribution in their countries. Figure 1.6 shows that, because the share of low performers varies widely across education systems, in some systems low performers come exclusively from the very lowest achievers in the country, whereas in other systems low performers, as defined in PISA, might include students who perform relatively well relative to other students in their country/economy. For example, in 21 countries and economies, all low performers in mathematics are students who perform in the lowest 20% of their own country/economy. This group includes Hong Kong-China, Korea, Shanghai-China and Singapore, where fewer than one in two of the students in the bottom quintile of mathematics performance scores below the baseline level of proficiency in mathematics.

■ Figure 1.7 [Part 1/2] ■

Low performers in mathematics, reading and science, and in all subjects

Absolute number

	Total enrolled population of 15-year-olds at grade 7 or above	Total low performers			
		Mathematics	Reading	Science	All subjects
OECD					
Australia	288 159	56 673	40 897	39 322	26 218
Austria	89 073	16 617	17 361	14 059	9 540
Belgium	121 493	23 039	19 532	21 521	14 005
Canada	409 453	56 623	44 609	42 674	25 212
Chile	252 733	130 265	83 441	87 162	62 094
Czech Republic	93 214	19 541	15 721	12 846	8 307
Denmark	70 854	11 932	10 376	11 826	6 612
Estonia	12 438	1 312	1 135	627	404
Finland	62 195	7 630	7 059	4 785	3 327
France	755 447	168 875	142 904	141 574	95 647
Germany	798 136	141 579	115 658	97 487	69 907
Greece	105 096	37 508	23 781	26 817	16 547
Hungary	108 816	30 536	21 460	19 634	14 251
Iceland	4 491	964	943	1 077	609
Ireland	57 979	9 797	5 560	6 430	3 918
Israel	113 278	37 951	26 716	32 719	20 961
Italy	566 973	139 866	110 565	105 999	67 285
Japan	1 214 756	134 380	118 574	102 724	67 062
Korea	672 101	61 384	51 400	44 564	29 243
Luxembourg	6 082	1 480	1 348	1 351	876
Mexico	1 472 875	805 842	605 011	692 490	456 475
Netherlands	193 190	28 580	27 025	25 355	16 655
New Zealand	59 118	13 387	9 619	9 614	6 586
Norway	64 777	14 451	10 507	12 725	7 125
Poland	410 700	59 086	43 439	37 007	23 433
Portugal	127 537	31 764	23 994	24 219	16 021
Slovak Republic	59 367	16 304	16 752	15 943	11 144
Slovenia	18 935	3 803	4 003	2 439	1 881
Spain	404 374	95 454	74 174	63 480	41 947
Sweden	102 027	27 621	23 179	22 682	15 300
Switzerland	85 239	10 606	11 673	10 929	6 361
Turkey	965 736	405 418	208 930	254 513	150 317
United Kingdom	745 581	162 632	123 950	111 607	83 404
United States	4 074 457	1 053 080	676 526	738 980	497 730

Notes: Low performers are students who score below the baseline level of proficiency, that is, who are proficient at Level 1 or below.

Numbers in the figures are point estimates based on the total enrolled population of 15-year-olds and the percentage of low performers in each country and economy. Because these estimations have a margin of error, see confidence intervals in Tables 1.7a and 1.7b.

Source: OECD, PISA 2012 Database, Tables 1.7a and 1.7b.

StatLink *http://dx.doi.org/10.1787/888933315217*

■ Figure 1.7 [Part 2/2] ■

Low performers in mathematics, reading and science, and in all subjects

Absolute number

	Total enrolled population of 15-year-olds at grade 7 or above	Total low performers			
		Mathematics	Reading	Science	All subjects
Partners					
Albania	50 157	30 428	26 250	26 633	19 065
Argentina	637 603	423 910	341 531	324 298	264 105
Brazil	2 786 064	1 902 611	1 414 512	1 538 832	1 165 231
Bulgaria	59 684	26 116	23 510	22 023	17 051
Colombia	620 422	457 977	319 182	348 374	266 975
Costa Rica	64 326	38 514	20 830	25 303	15 042
Croatia	46 550	13 904	8 704	8 050	5 450
Hong Kong-China	77 864	6 632	5 287	4 331	3 058
Indonesia	3 599 844	2 724 864	1 988 767	2 397 566	1 722 829
Jordan	125 333	85 931	63 562	62 110	50 305
Kazakhstan	247 048	111 773	140 953	103 628	71 163
Latvia	18 389	3 667	3 122	2 273	1 524
Liechtenstein	383	54	47	40	22
Lithuania	35 567	9 254	7 540	5 718	4 292
Macao-China	5 416	584	620	474	273
Malaysia	457 999	237 034	241 464	208 417	167 345
Montenegro	8 600	4 872	3 724	4 359	3 082
Peru	508 969	379 596	304 758	348 515	269 774
Qatar	11 532	8 021	6 590	7 221	5 797
Romania	146 243	59 703	54 496	54 598	35 126
Russian Federation	1 268 814	303 909	282 937	237 954	144 693
Serbia	75 870	29 521	25 134	26 543	17 302
Shanghai-China	90 796	3 444	2 641	2 484	1 465
Singapore	52 163	4 306	5 147	5 003	2 909
Chinese Taipei	328 336	42 163	37 748	32 222	23 669
Thailand	784 897	390 387	258 776	263 724	181 490
Tunisia	132 313	89 642	65 236	73 200	52 103
United Arab Emirates	48 446	22 422	17 212	17 032	13 081
Uruguay	46 442	25 907	21 849	21 790	16 363
Viet Nam	1091 462	155 520	102 765	72 981	46 616

Notes: Low performers are students who score below the baseline level of proficiency, that is, who are proficient at Level 1 or below.
Numbers in the figures are point estimates based on the total enrolled population of 15-year-olds and the percentage of low performers in each country and economy. Because these estimations have a margin of error, see confidence intervals in Tables 1.7a and 1.7b.
Source: OECD, PISA 2012 Database, Tables 1.7a and 1.7b.
StatLink *http://dx.doi.org/10.1787/888933315217*

The group also includes Australia, Austria and Belgium, where almost all of the students in the countries' bottom quintile of mathematics performers are low performers.

At the other extreme, in Indonesia, Peru and eight other countries, low performers in mathematics, as defined in PISA, can be found in even the fourth quintile of the national performance distribution. Somewhere between these two groups are the 17 OECD countries where students in the second quintile of performance score below the baseline level of proficiency in mathematics (Figure 1.6 and Table 1.14).

To get an idea of what these percentages mean in human terms, Figure 1.7 reports estimates for the absolute number of students who are low performers in each subject, and in all subjects,

for each country and economy that participated in PISA 2012 (see Tables 1.7a, 1.7b and 1.8 for confidence intervals of these estimates).

HOW LOW PERFORMANCE OVERLAPS ACROSS SUBJECTS

Low performance is not always limited to a single subject; in fact, more often than not, a student who underachieves in mathematics, reading or science underachieves in other subjects as well. In Figure 1.8, students are grouped according to whether they score below the baseline level of proficiency in one subject only, in two subjects, or in all three of the core subjects PISA assesses.

The largest of these groups is the group of students who underachieve in all three subjects. On average across OECD countries, more than one in four students (28%) are low performers in mathematics, reading and/or science. This one finding indicates the magnitude of low performance around the world. Some 5% of students across OECD countries underachieve in mathematics only and around 3% are low achievers in reading only, in both mathematics and science, or in both mathematics and reading. An alarming 12% of students across OECD countries do not make the grade in all three core subjects: they score below the baseline proficiency level in mathematics, reading and science (Figure 1.8 and Table 1.3).

Even more worrying are the students who score below Level 1 in all three subjects (Figure 1.9). These students are at particularly high risk of failure in their education and future careers. Some 3% of students across OECD countries score at this lowest level in all three subjects PISA assesses. Among the students who are low performers in all three subjects, 22% of them score below Level 1 in all of those subjects, on average across OECD countries. This proportion varies widely among countries, ranging from 40% or more in Albania and Qatar to less than 10% in Estonia, Liechtenstein and Viet Nam.

LOW PERFORMERS AND COUNTRIES' MEAN PERFORMANCE

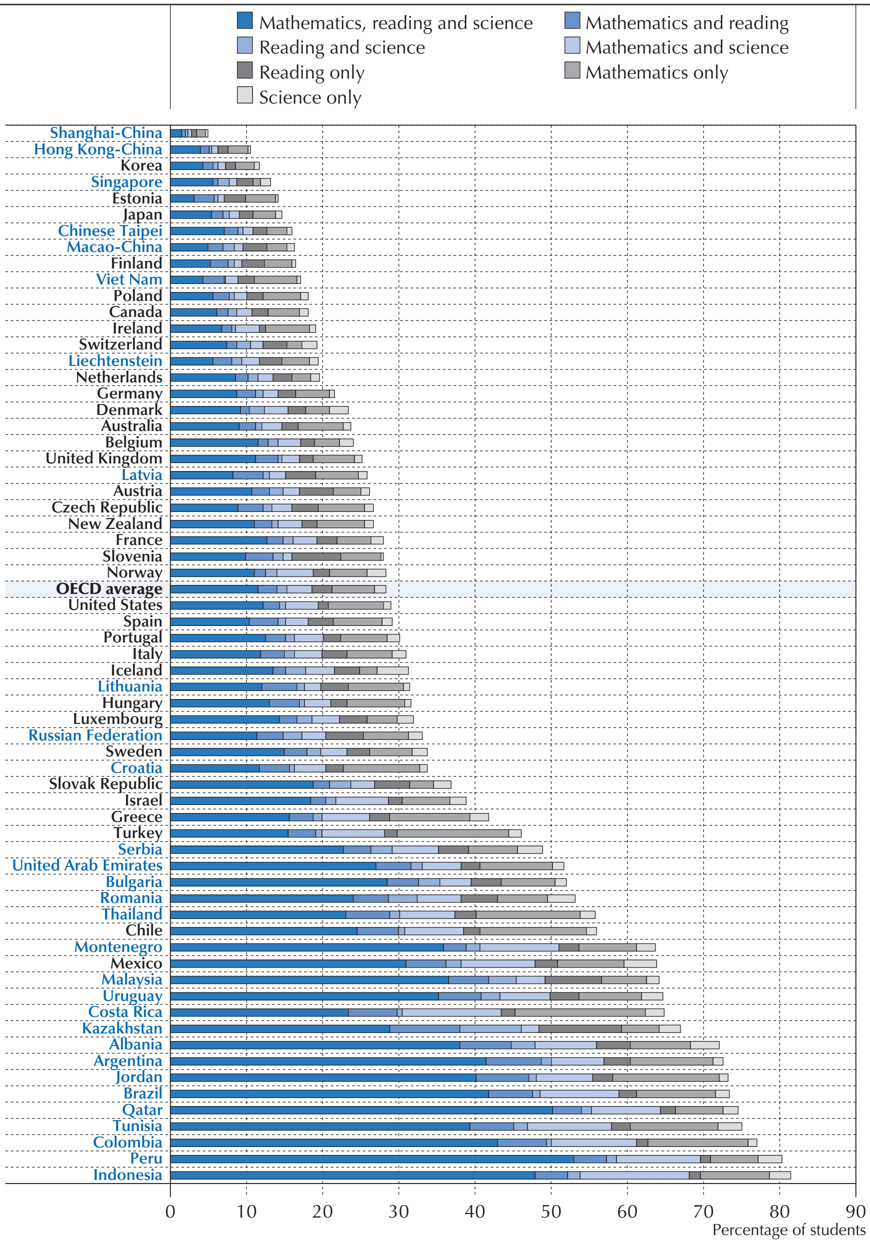
In most countries and economies, the share of low performers is closely related to that country's/economy's mean score in PISA. The correlation coefficient between the share of low performers in mathematics and an education system's mean score in mathematics is -0.9 for both OECD countries and partner countries and economies that participated in PISA 2012 (Table 1.13).

If a country's share of low performers in mathematics was based solely on its mean score in mathematics, the prediction would be fairly accurate for a large number of countries. Figure 1.10 suggests that, among low-performing countries and economies, small improvements in mean mathematics performance might be associated with large decreases in their shares of low performers; or, inversely, that reducing the share of low performers can be an effective way of improving the average performance of an education system (see also OECD, 2015). The figure also suggests that as countries improve their mean mathematics performance it becomes increasingly difficult to greatly reduce the share of low performers – most likely because the proportions of low performers are already small.

Shanghai-China, the best-performing economy in PISA 2012, with a mean mathematics score of 613 points, is a case in point. In 2009, some 5% of students in Shanghai-China were low performers; in 2012, after an increase of 13 score points in the economy's mathematics performance, the share of low performers decreased to 4% (Table 1.9).

■ Figure 1.8 ■

Overlap of low performers in mathematics, reading and science, by country/economy



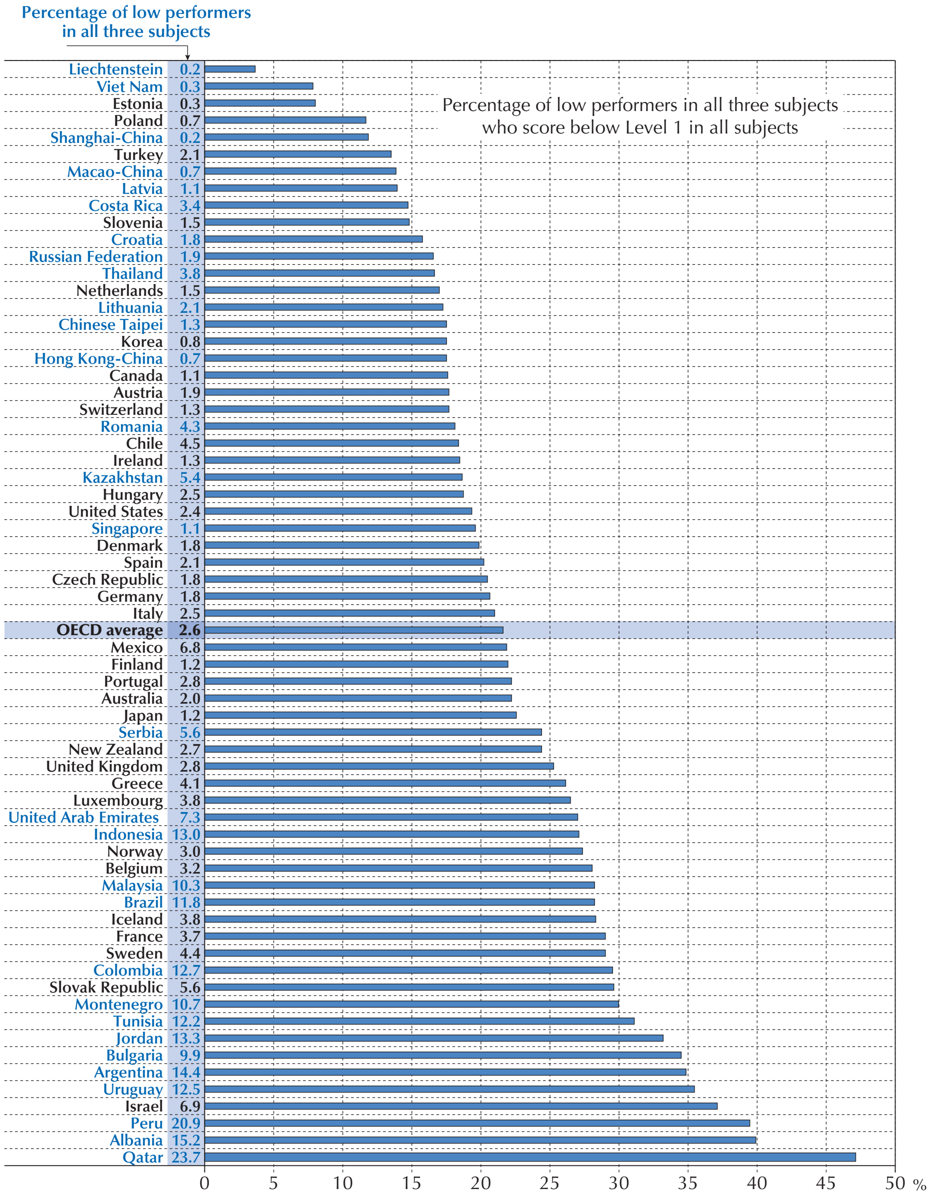
Countries and economies are ranked in ascending order of the total percentage of students who are low performers in at least one subject.

Source: OECD, PISA 2012 Database, Table 1.3.

StatLink http://dx.doi.org/10.1787/888933315224

■ Figure 1.9 ■

Percentage of low performers (students who perform below Level 2) in all three subjects who score below Level 1 in all subjects



Note: This figure includes only students who perform below Level 2 (low performers) in all three core PISA subjects (mathematics, reading and science). Students who are low performers in only two, one or in no subject are not included.

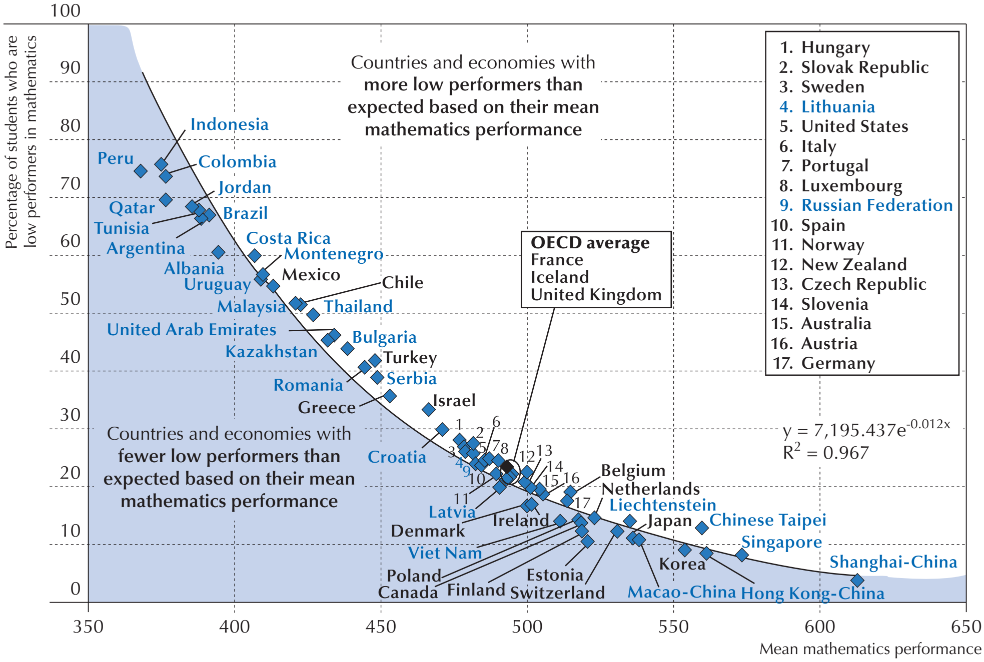
Countries and economies are ranked in ascending order of the percentage of low performers in all subjects who score below Level 1 in all subjects.

Source: OECD, PISA 2012 Database, Table 1.4.

StatLink http://dx.doi.org/10.1787/888933315238

■ Figure 1.10 ■

Relationship between the percentage of low performers and countries'/economies' mean performance



Source: OECD, PISA 2012 Database, Table 1.13.
StatLink *http://dx.doi.org/10.1787/888933315245*

In absolute terms, the reduction of 1 percentage point in the share of low performers is small and not statistically significant, but in relative terms, a change from 5% to 4% is equivalent to a 20% reduction of low performers, which is substantial. In any case, Shanghai-China's average performance improvement between 2009 and 2012 was largely the result of a significant increase in its share of top performers. Indeed, the percentage of students in Shanghai-China who scored at the highest levels of proficiency, Level 5 or 6, increased from 50% in 2009 to 55% in 2012 (OECD, 2014a). It is an open question whether Shanghai-China will sustain this improvement in its mean performance in the coming years and, if it does, whether it will be the result of growing the ranks of top performers or of ensuring that all of its students have acquired at least baseline level proficiency in mathematics.

The link between the share of low performers and mean mathematics score is also seen at the school level. On average across OECD countries, the correlation coefficient between a school's average share of low performers and the school's average mathematics score is 0.89. In Shanghai-China, Estonia and Singapore, where the correlation coefficient is the weakest, the link is still very strong (0.69, 0.76 and 0.76, respectively) (Table 1.13).

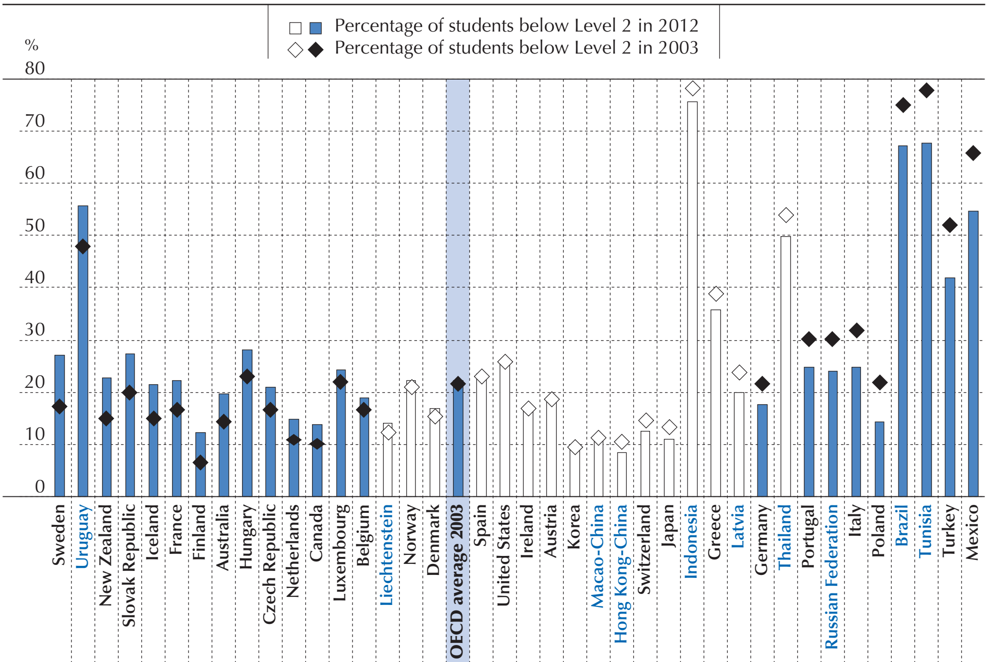
UNEVEN PROGRESS IN REDUCING THE SHARE OF LOW PERFORMERS

Countries have had mixed results in trying to reduce the share of low-performing students; and reducing low performance in mathematics has been particularly difficult. As shown in Figure 1.11, on average across OECD countries with comparable data, there was a small yet significant increase of 0.7 percentage point between 2003 and 2012 in the share of students who scored below the baseline level of proficiency in mathematics. The percentage of students who performed poorly in mathematics increased in 14 countries, and it was larger than 7 percentage points in New Zealand, the Slovak Republic, Sweden and Uruguay. By contrast, nine countries saw a reduction in the percentage of low performers in mathematics over the period, including Mexico, Tunisia and Turkey, where the share shrank by 10 percentage points or more (Table 1.9).

In reading, the OECD countries that participated in both PISA 2000 and PISA 2012 reduced their share of low performers by 1.6 percentage points, on average. Eleven countries reduced their share of low performers in reading significantly – six of them by more than 12 percentage points. Four countries saw an increase in the percentage of low performers in reading during this period; among them, only Sweden suffered an increase greater than 10 percentage points (Table 1.11).

■ Figure 1.11 ■

Trends in low performance in mathematics between PISA 2003 and PISA 2012



Notes: Statistically significant differences are marked in a darker tone.
OECD average 2003 compares only OECD countries with comparable data since 2003.
Countries and economies are ranked in descending order of the difference in the share of students who scored below Level 2 in mathematics between 2003 and 2012 (PISA 2012 - PISA 2003).
Source: OECD, PISA 2012 Database, Table 1.9.
StatLink *http://dx.doi.org/10.1787/888933315258*

The most progress has been made in improving student performance in science. The share of low performers in science shrank by 2.1 percentage points between 2006 and 2012, on average across OECD countries. Twenty countries and economies saw a significant reduction in the share of low performers in science; in three of these countries, the share was reduced by more than 12 percentage points. Six countries and economies saw an increase in the share of low performers in science. In four of these countries, the share grew by 5 percentage points or more (Table 1.12).

THE PATTERNS OF SUCCESS IN REDUCING THE INCIDENCE OF LOW PERFORMANCE

The countries that have managed to reduce their share of low performers have tackled the problem in different ways. Figure 1.12 shows the shares of students at proficiency Level 2, Level 1 and below Level 1 for the nine countries that significantly reduced their shares of low-performing students in mathematics between PISA 2003 and 2012.

These countries can be divided into two groups. In a first group of four countries – Brazil, Mexico, Tunisia and Turkey –, the share of students performing below Level 1 shrank considerably between 2003 and 2012 while the share of students scoring at Level 1 grew, but by a smaller margin. For example, in Turkey, the share of students performing below Level 1 fell by 12 percentage points while the share of students scoring at Level 1 grew by 2 percentage points. Similarly, in Brazil, the percentage of students scoring below Level 1 decreased by 18 percentage points while the share of students scoring at Level 1 increased by 10 percentage points. The net result of this dual trend is a decrease in the total share of low-performing students. Indonesia and Thailand show the same pattern, but in these countries the net reduction in low performers between 2003 and 2012 was not statistically significant (Tables 1.9 and 1.10).

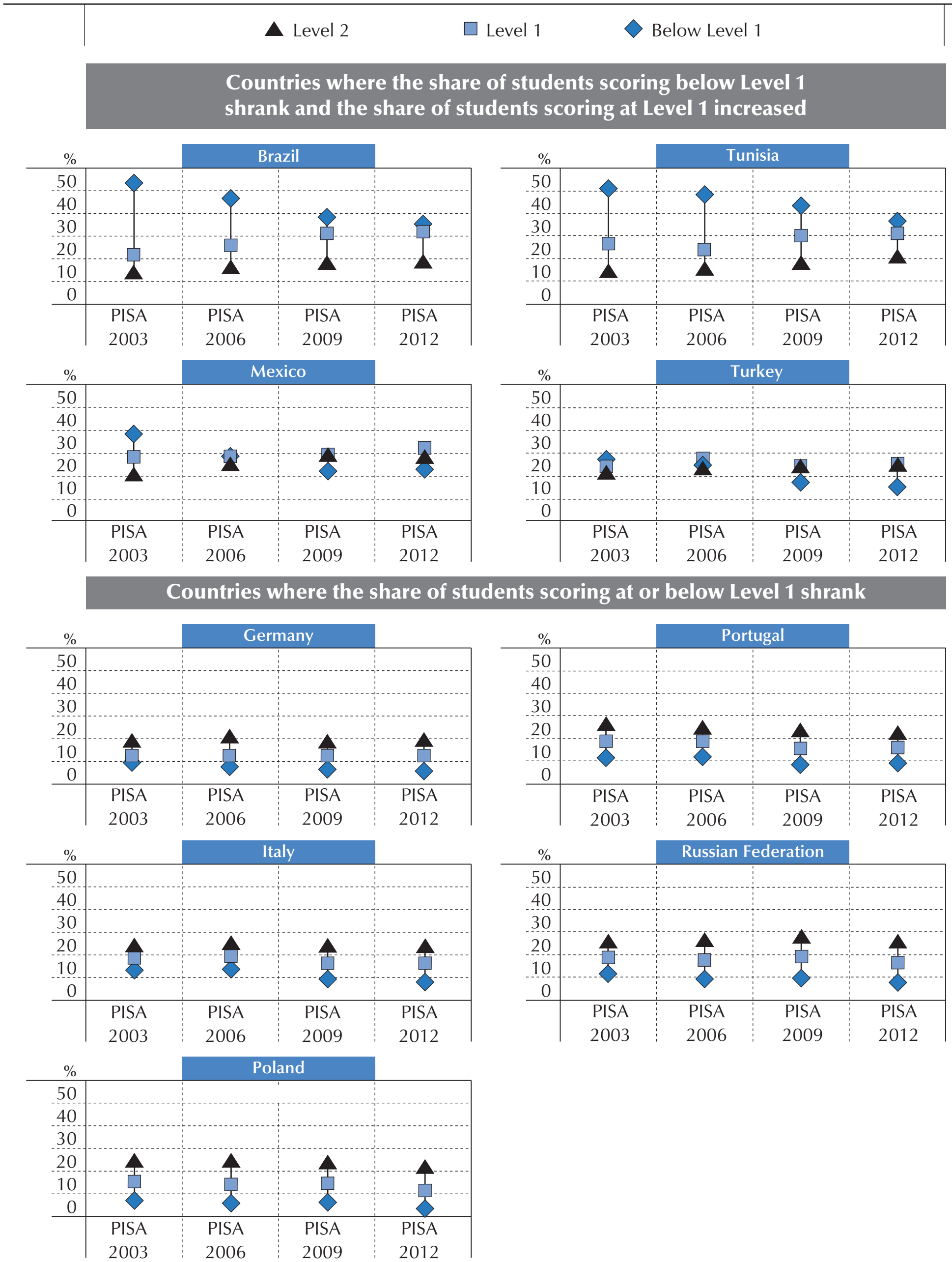
In a second group of countries – Germany, Italy, Poland, Portugal and the Russian Federation –, the shares of low-performing students at both Level 1 and below Level 1 were reduced simultaneously. As in the first group of countries, reductions in the share of students scoring below Level 1 were larger than the reductions in the share of students performing at Level 1 in mathematics. In Italy, for example, the share of students scoring below Level 1 decreased from 13% in 2003 to around 9% in 2012, and the share of Level 1 students fell from 19% in 2003 to 16% in 2012. In Poland, the share of students performing below Level 1 fell from 7% in 2003 to 3% in 2012, while the share of students scoring at Level 1 shrank from 15% in 2003 to 11% in 2012.

These differences in how improvements have been achieved are related to the initial size of the population of low performers in a country. As seen in Figure 1.12, in the countries that significantly reduced the share of students who performed below Level 1 (the first group), the share of low performers in PISA 2003 was large, ranging from 52% in Turkey to 78% in Tunisia – much larger than the OECD average that year (22%). Also, most of the low performers in these countries scored below Level 1 in PISA 2003, while on average across OECD countries that year, most low performers scored at, rather than below, Level 1 (Tables 1.9 and 1.10).

In the second group of countries, the share of low performers in mathematics in 2003 was similar to the OECD average – ranging from 22% in Germany and Poland to 32% in Italy – and larger proportions of students were proficient at Level 1 than below Level 1. In this group of countries, the reduction in the share of low performers ranged from 4 percentage points in Germany to 8 percentage points in Poland (Tables 1.9 and 1.10).

■ Figure 1.12 ■

Patterns of success in reducing the share of low performers in mathematics



Source: OECD, PISA 2012 Database, Table 1.10.
StatLink http://dx.doi.org/10.1787/888933315261

Box 1.2. What are the top-performing East Asian countries and economies doing to support their low-performing students and schools?

The East Asian countries and economies Shanghai-China, Singapore, Hong Kong-China, Chinese Taipei, Korea, Macao-China and Japan, in descending order of mean score, were at the top of the mathematics rankings in PISA 2012. They also had the smallest shares of low performers in mathematics of all participating countries and economies, ranging from 13% in Chinese Taipei to 4% in Shanghai-China.

Many researchers have wondered why East Asian students perform so well in PISA and other international comparisons. Some argue that the emphasis on education combined with a strong work ethic in these countries/economies imbues students with the motivation to attend school regularly and make their best effort while there. Others have pointed to various aspects of the education systems, such as the prevalence of high-stakes competitive examinations and out-of-school tutoring, teacher selection and quality, and school curricula (e.g. Jerrim, 2015).

What exactly are these top-performing countries doing to support their struggling and low-performing students?

Providing early diagnosis and additional support for struggling students

Singapore provides learning support for students who do not have the basic numeracy skills and knowledge needed to mathematics curriculum at school ("Learning Support for Maths" [LSM]). Students in need of support are identified through a screening test at the beginning of the first grade, and receive support by a specialist teacher for 4-8 periods per week. LSM teachers are provided as additional teachers to each school, based on need, and they receive additional training and teaching resources for LSM students, as required. In 2013, Singapore expanded the scope of this programme to cover students in second grade as well so that students could have more continuous support. The system is now considering providing this support for all the students up to secondary 4 level, which corresponds to 15-16 year-old students.

Holding high expectations for all students

Japan's educators hold high expectations for all students, including low performers. This belief that every student can achieve at high levels is reflected in the education policy decisions the country has taken. For example, there is almost no grade repetition and very little stratification between or within compulsory schools in Japan. As a result, teachers must work with students who have diverse needs and abilities to achieve common educational goals. Indeed, one of teachers' most important responsibilities is to ensure that all students keep up with the curriculum. Teachers are expected to identify students who are falling behind the rest of the class, and to give them extra support during regular school hours or, if necessary, after school.

In addition, Japan's national curriculum guideline is designed as a minimum standard of skills, so every student is expected to master its content. The mathematics curriculum, for example, stresses the understanding of fundamental mathematical concepts rather than memorisation of theorems or routine techniques.

Providing support for migrant/immigrant students

Hong Kong-China has a large population of migrants from mainland China and immigrants, and it provides various educational programmes to help them integrate into the education

...

system and prevent them from becoming low performers. One such initiative, the Full-time Initiation Program, is a six-month programme offered to students before they enter mainstream schools. The programme helps children to adjust to the schools and to local society. Similarly, the Induction Program is a 60-hour programme run by non-governmental organisations that is offered to migrant and immigrant children who are already enrolled in mainstream schools. It helps those students to adjust to their new community and tackle learning difficulties. Hong Kong-China also provides grants to schools that can be used to provide supplementary lessons and extracurricular activities, or to organise orientations for immigrant students.

Connecting and networking disadvantaged schools

Shanghai-China, where socio-economic disparities among schools are large, has been trying to connect rural schools to good urban schools through the Shanghai Rural Compulsory Education Management Program. In this programme, urban schools provide support to rural schools in developing their education projects and strategies, designing their management systems, and introducing effective teachers and educational resources to improve the quality of education.

In Japan, 15% of elementary and junior high schools are located in rural areas. In these schools, teachers often face difficulties that are unique to rural schools. To address these problems, teachers established the Research Network for Education in Rural Areas, through which participating schools and teachers exchange information and conduct research on relevant issues, such as how to teach more than one grade in the same classroom, how to provide students an opportunity to interact with the people outside their communities, and how to manage small-scale schools with limited numbers of teachers and staff.

Working with communities to help students who need support

The Study Support Volunteer Project in Japan subsidises voluntary activities, mostly undertaken by university students, that focus on studying at home, including homework, and offer advice on school choice for children from single-parent families. Japan's School Support Regional Headquarters Project invites local people to help low-performing students, including by providing after-school remedial lessons, in consultation with schools.

Sources:

Government of Hong Kong, Education Bureau, Special Administrative Region Research Network for Education in Rural Areas, www.zenhekiren.net/index.html; Government of Japan, Ministry of Education, Culture, Sports, Science and Technology, www.mext.go.jp/a_menu/01_l/08052911/004.htm; Government of Japan, Ministry of Health, Labour and Welfare, www.mhlw.go.jp/bunya/kodomo/pdf/shien.pdf; Government of Singapore, Ministry of Education, www.moe.gov.sg/media/press/2015/03/levelling-up-programmes-in-schools.php; Jerrim, J. (2015); OECD (2014c); OECD (2011b).

Again, what these data show is that improvement is possible, regardless of a country's/economy's starting point, regardless of its wealth, regardless of its culture. Once, universal access to primary education was little more than a rallying cry; today, every OECD country and nearly every partner country/economy can boast that it has achieved this objective. Tackling the problem of low performance requires the same will and sense of urgency. Nothing less than our futures are at stake.

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2

Student Background and Low Performance

This chapter examines the many ways that students' backgrounds affect the risk of low performance in PISA. It considers the separate and combined roles played by students' socio-economic status, demographic characteristics, and progression through education, from pre-primary school up to age 15.

The statistical data for Israel are supplied by and under the responsibility of the relevant Israeli authorities. The use of such data by the OECD is without prejudice to the status of the Golan Heights, East Jerusalem and Israeli settlements in the West Bank under the terms of international law.

Low performance is not associated with a single student or school characteristic. Rather, over time, a combination and accumulation of factors and experiences in the family, the school and the education system may limit opportunities for learning and thus undermine student performance. This chapter focuses on student-related factors, specifically students' socio-economic, demographic and education background (Figure 2.1). New analyses explore the relationship between these variables and low performance, and describe the cumulative effect of these variables on student performance.

What the data tell us

- Differences in student's socio-economic, demographic and education background explain 15% of the variation in low performance across students, on average across OECD countries.
- On average across OECD countries, a student of average socio-economic status who is a boy living in a two-parent family, has no immigrant background, speaks the same language at home as in school, lives in a city, attended more than one year of pre-primary education, did not repeat a grade and attends a general curricular track (or school) has a 10% probability of low performance in mathematics, while a student with the same socio-economic status but who is a girl living in a single-parent family, has an immigrant background, speaks a different language at home than at school, lives in a rural area, did not attend pre-primary school, repeated a grade and attends a vocational track has a 76% probability of low performance.
- Other than socio-economic status, grade repetition is the single factor most strongly associated with low performance. After accounting for socio-economic background and other student characteristics, the odds of low performance in mathematics are 6.4 times greater for a student who has repeated a grade in primary or secondary school compared to a student who has not repeated a grade, on average across OECD countries.

As the chapter reveals, social and demographic background do not determine student achievement, but they do create the conditions for opportunities – or the lack of them – that influence students' progression through the school system. Attending pre-primary education, for example, is a positive experience that puts potential low performers on a better track; but not every child is enrolled in pre-primary education, and those who do attend, do so for different lengths of time. Similarly, while many countries do not allow their students to repeat grades or to be separated into education tracks at an early age, wherever grade repetition and early tracking occur, they tend to be strongly linked with poor performance at age 15.

The findings of the chapter highlight the need to address multiple risks simultaneously and to tailor policies to local contexts. They also confirm the importance of identifying students at high risk of low performance early on so that they can be given the support they need and avoid the deleterious effects of grade repetition.

■ Figure 2.1 ■

Student background and low performance

Potential areas of risk	Sub-areas	Risk factors
Socio-economic status	Economic, cultural and social status	Socio-economic disadvantage
Demographic background	Gender	Being a girl (in mathematics)
		Being a boy (in reading and science)
	Immigrant background	Immigrant background
	Language spoken at home	Different from mainstream language
	Location	School in a rural area
	Family structure	Single-parent family
Progress through education	Attendance at pre-primary education	No pre-primary education
	Grade repetition	Repeated at least one grade
	Programme orientation	Enrolled in a vocational track

The first part of the chapter explores the multidimensional nature of the risk of low performance by analysing each of the nine risk factors separately. The second part explores the cumulative nature of the risk of low performance by showing how the probability of low performance in mathematics increases among students with different combinations of risk factors.

THE MULTIDIMENSIONAL RISK OF LOW PERFORMANCE

Socio-economic background

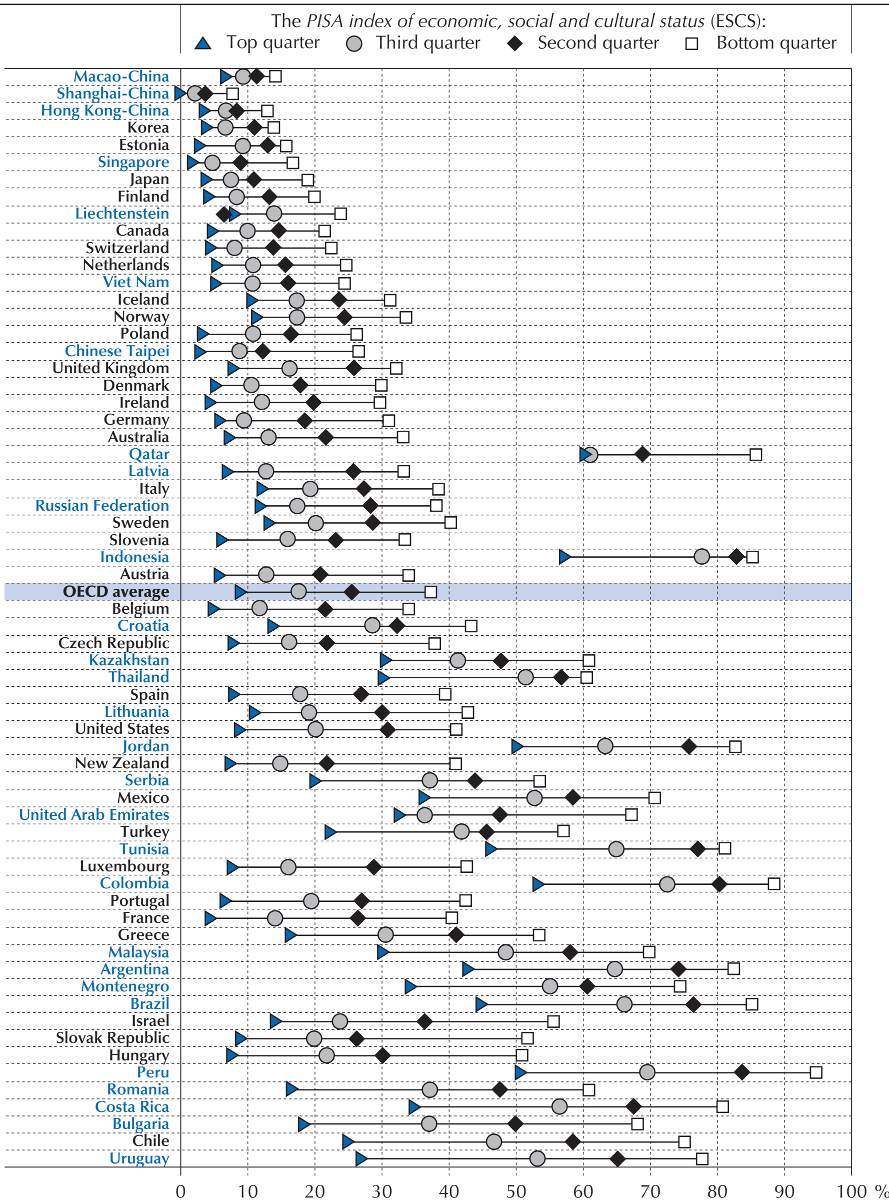
The effects of socio-economic background on student achievement are well-known, and specific economic and cultural mechanisms linking students' background and achievement have been studied extensively (e.g. Bourdieu, 1986; Coleman, 1988; Kao and Thompson, 2003; Paino and Renzulli, 2013; Baker, Goesling and LeTendre, 2002). Students whose parents have higher levels of education and more prestigious and better-paid jobs benefit from accessing 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 that make it easier for them to succeed in school, compared with students from families with lower levels of education or from families that are affected by chronic unemployment, low-paid jobs or poverty. For this reason, the primary measure of equity in education outcomes used in PISA is the relationship between the *PISA index of economic, social and cultural status* (ESCS)[1] and student performance (OECD, 2013a).

At the same time, the link between socio-economic status and student achievement is neither absolute nor automatic, and should not be overstated. Regardless of the school subject concerned, ESCS explains about 15% of the variation in PISA scores, on average across OECD countries, with substantial differences across countries. Many countries have managed to reduce the influence of socio-economic background on performance over time. In addition, some 6% of students across OECD countries are considered "resilient" in that, while they are disadvantaged, they manage to beat the odds against them and perform among the top quarter of students in PISA (OECD, 2013a).

■ Figure 2.2 ■

Socio-economic status and low performance in mathematics

Percentage of low performers in mathematics, by socio-economic quartiles



Note: Differences between the top and the bottom quarter of ESCS are statistically significant in all countries and economies.
Countries and economies are ranked in ascending order of the difference in the percentage of students who are low performers in mathematics between the top and bottom quarters of ESCS.
Source: OECD, PISA 2012 Database, Table 2.1.
StatLink http://dx.doi.org/10.1787/888933315272

While low performers come from all socio-economic backgrounds, they are disproportionately disadvantaged. As shown in Figure 2.2, the difference in the percentage of low performers in mathematics between the top and the bottom quartile of ESCS varies considerably across countries, but is significant in all countries and economies that participated in PISA 2012. On average across OECD countries, 37% of disadvantaged students are low performers in mathematics, compared to nearly 10% of advantaged students, a difference of around 28 percentage points. In Bulgaria, Chile and Uruguay, that difference is around 50 percentage points, while in Hong Kong-China, Korea, Macao-China and Shanghai-China, the difference is less than 10 percentage points (Table 2.1).

It is possible, however, that other factors related to student background, such as students' demographic characteristics and their progression through education, might be correlated with both students' socio-economic status and academic achievement, and may partially account for the differences displayed in Figure 2.2. For example, students from immigrant families or those studying in vocational tracks often come from disadvantaged families (OECD, 2013a). A more precise way to calculate the specific association between socio-economic status and low achievement is to hold other potential factors constant.

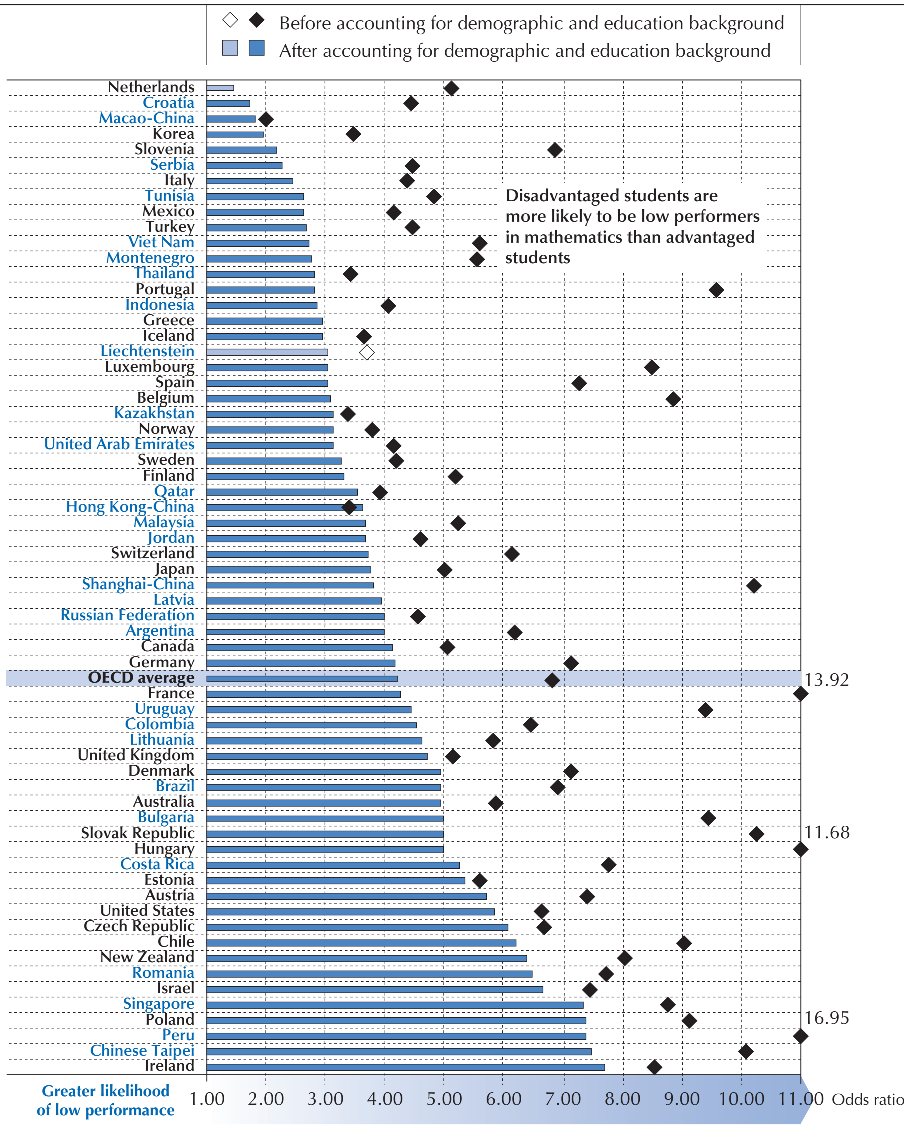
Figure 2.3 shows the association between students' socio-economic status and low performance in mathematics before and after accounting for students' demographic characteristics and progression through education. Greater values in the odds ratio indicate a stronger association of socio-economic background and low performance. More specifically, values in the figure indicate how much greater are the chances of low performance for socio-economically disadvantaged students (those in the bottom quarter of the ESCS index) compared with socio-economically advantaged students (those in the top quarter of the ESCS index).

The figure reveals that the influence of socio-economic status on the likelihood of low performance in mathematics is partially weakened, yet remains statistically significant and strong, in all countries and economies that participated in PISA 2012 (except Liechtenstein and the Netherlands), even after accounting for students' demographic characteristics and education career. On average across OECD countries, the odds of low performance for a disadvantaged student are almost seven times higher (odds ratio of 6.8) as those for an advantaged student before accounting for other student characteristics, and more than four times as high (odds ratio of 4.2) after other student characteristics have been taken into account. This indicates that these other dimensions of student background have a substantial mediating effect on performance (Table 2.2).

Countries differ in the extent to which other student characteristics mediate the relationship between socio-economic disadvantage and underachievement. In some countries and economies, such as Belgium, France, Hungary, Luxembourg, Peru, Portugal, Shanghai-China, the Slovak Republic and Uruguay, the odds of low performance among disadvantaged students decreases considerably after accounting for demographic and education background. In Estonia, Hong Kong-China, Kazakhstan, Macao-China, Qatar and the United Kingdom, these other student characteristics have a weaker mediating effect (the odds vary less than 0.6 after accounting for other variables (Table 2.2).

■ Figure 2.3 ■

Socio-economic status and the likelihood of low performance in mathematics



Notes: Disadvantaged students are those in the bottom quarter of the *PISA index of economic, social and cultural status* (ESCS); advantaged students are those in the top quarter of the index.
Statistically significant coefficients are marked in a darker tone.
Demographic and education background covariates include: gender, immigrant background, language spoken at home, location of student's school (rural area, town or city), family structure, attendance at pre-primary school, grade repetition and programme orientation (vocational or general).
Countries and economies are ranked in ascending order of the odds ratio of students with disadvantaged socio-economic status performing below baseline Level 2 in mathematics, compared with students with advantaged socio-economic status, after accounting for other student characteristics.
Source: OECD, PISA 2012 Database, Table 2.2.
StatLink http://dx.doi.org/10.1787/888933315284

Box 2.1 **How odds ratios are calculated and interpreted**

Some of the figures in this report use odds ratios to assess the increased likelihood that a student with certain characteristics (e.g. a student who is a girl or who attends a school with more supportive teachers) will perform below the baseline level of proficiency in PISA. Three outcomes are possible for the odds ratios (OR):

- OR = 1 Student or school characteristic does not affect the odds of low performance
- OR > 1 Student or school characteristic is associated with higher odds of low performance
- OR < 1 Student or school characteristic is associated with lower odds of low performance

In odds ratios, student or school characteristics of interest are compared with a predetermined reference category. For example, to analyse the relationship between the predictor variable "gender" and the outcome variable "mathematics low performance", girls were chosen as the category of interest and assigned a value of 1, and boys were defined as the reference category and assigned a value of 0. Odds ratios can be interpreted in such a way that for a one-unit change in the predictor variable (e.g. the student is a girl instead of a boy), the odds ratio of performing below the baseline in mathematics, relative to the reference category (e.g. the student is a boy), is expected to change by a certain factor (by 1, more than 1 or less than 1). The same interpretation holds when other variables are accounted for (i.e. held constant) in the model.

Odds ratios in this chapter are based on binary logistic regression analyses. These analyses allow for an estimation of the relationship between one or more independent variables (predictors) and a dependent variable with two categories (binary outcome). The outcome variable in these analyses was whether a student performed below (value 1) or above (value 0) the baseline level of proficiency in mathematics. Binary logistic regression analyses were conducted for each country separately because prior analysis showed noticeable differences in regression coefficients between countries. When a logistic regression is calculated, the statistical software (Stata) first generates the regression coefficient (s), which is the estimated increase in the log odds of the outcome per unit increase in the value of the predictor variable. Then, the exponential function of the regression coefficient is obtained, which is the odds ratio (OR) associated with a one-unit increase in the predictor variable. The transformation of log odds into odds ratios (OR) makes the data easier to interpret. The OECD average is the arithmetic mean of the odds ratios of OECD countries.

Note that with cross-sectional data such as PISA data, no causal relations can be established.

Demographic background

Gender

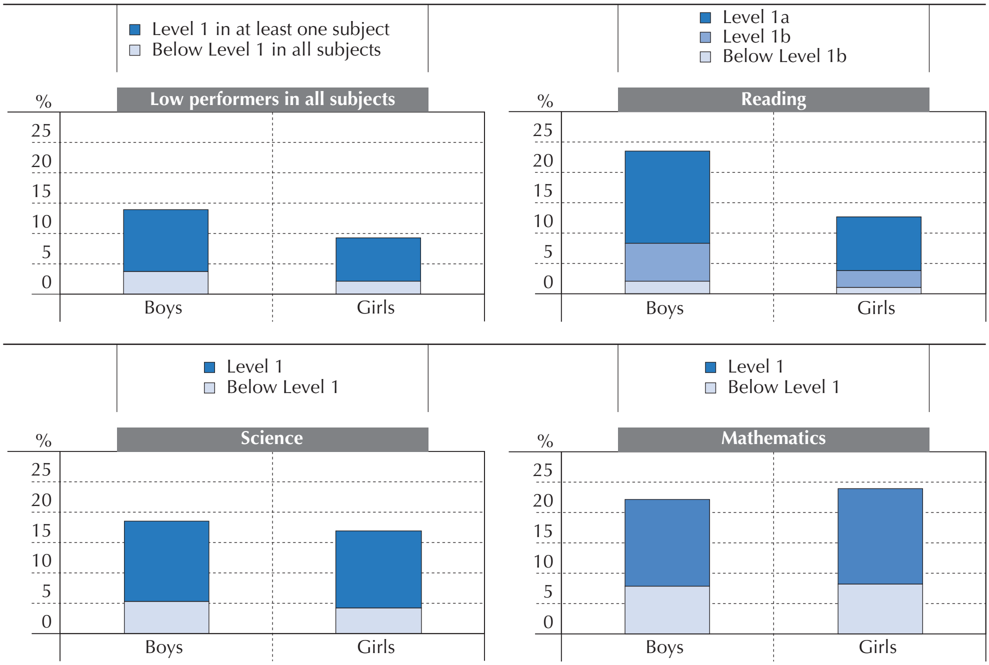
In most countries and economies, differences in student performance related to gender are large – and complex. A recent PISA report that examined this issue in depth (OECD, 2015a) shows that gender differences in achievement are not explained by innate ability; instead, social and cultural contexts reinforce stereotypical attitudes and behaviours that, in turn, are associated with gender differences in student performance. For example, boys are significantly more likely than girls to be disengaged from school, get lower marks, to have repeated grades, and to play video games in their free time, whereas girls tend to behave better in class, get higher marks, are less likely to repeat grades, spend more time doing homework, and read for enjoyment, particularly complex texts, such as fiction, in their free time. But girls are less likely than boys to believe that they can successfully perform mathematics and science tasks at designated levels (low self-efficacy), are more likely than boys to feel anxious about mathematics, are less likely than boys to be enrolled in technical and vocational programmes, and are also less likely than boys to gain "hands-on" experience, through internships or job shadowing, in potential careers.

Figure 2.4 shows the percentage of low performers in all subjects and in reading, mathematics and science separately. On average across OECD countries in 2012, 14% of boys and 9% of girls did not attain the baseline level of proficiency in any of the three core PISA subjects (Table 2.3b). Boys perform significantly worse than girls in reading: 24% of boys but only 12% of girls score below the baseline level of proficiency in reading. In every country and economy that participated in PISA 2012, the share of low performers in reading is larger among boys than among girls (Table 2.3a).

■ Figure 2.4 ■

Percentage of low-performing students in mathematics, reading, science, and in all three subjects, by proficiency level and gender

OECD average



Source: OECD, PISA 2012 Database, Table 2.4.

StatLink *http://dx.doi.org/10.1787/888933315297*

In science, 19% of boys and 17% of girls, on average across OECD countries, performed below the baseline level of proficiency in PISA 2012. In 27 countries and economies, a larger share of boys than girls were low performers in science; in Bulgaria, Jordan, Qatar, Thailand and the United Arab Emirates, this difference was equal to or larger than 10 percentage points. In Colombia, Costa Rica, Luxembourg and Mexico, the share of science low performers was larger among girls than boys (Table 2.3a).

In mathematics, however, the picture is inverted. On average across OECD countries in PISA 2012, 24% of girls and 22% of boys were low performers in mathematics. In 17 countries and economies, there were significantly more girls than boys who were low performers in mathematics, whereas in only eight countries (including Finland and Iceland, the only OECD countries in this group) was there a statistically significant difference in favour of girls (Table 2.3a). Between 2003 and 2012, there was a small yet statistically significant increase of 0.8 percentage point in the share of girls scoring below Level 2 in mathematics, on average across OECD countries, while no trend, positive or negative, was observed among boys (OECD, 2014a, Table I.2.2b).

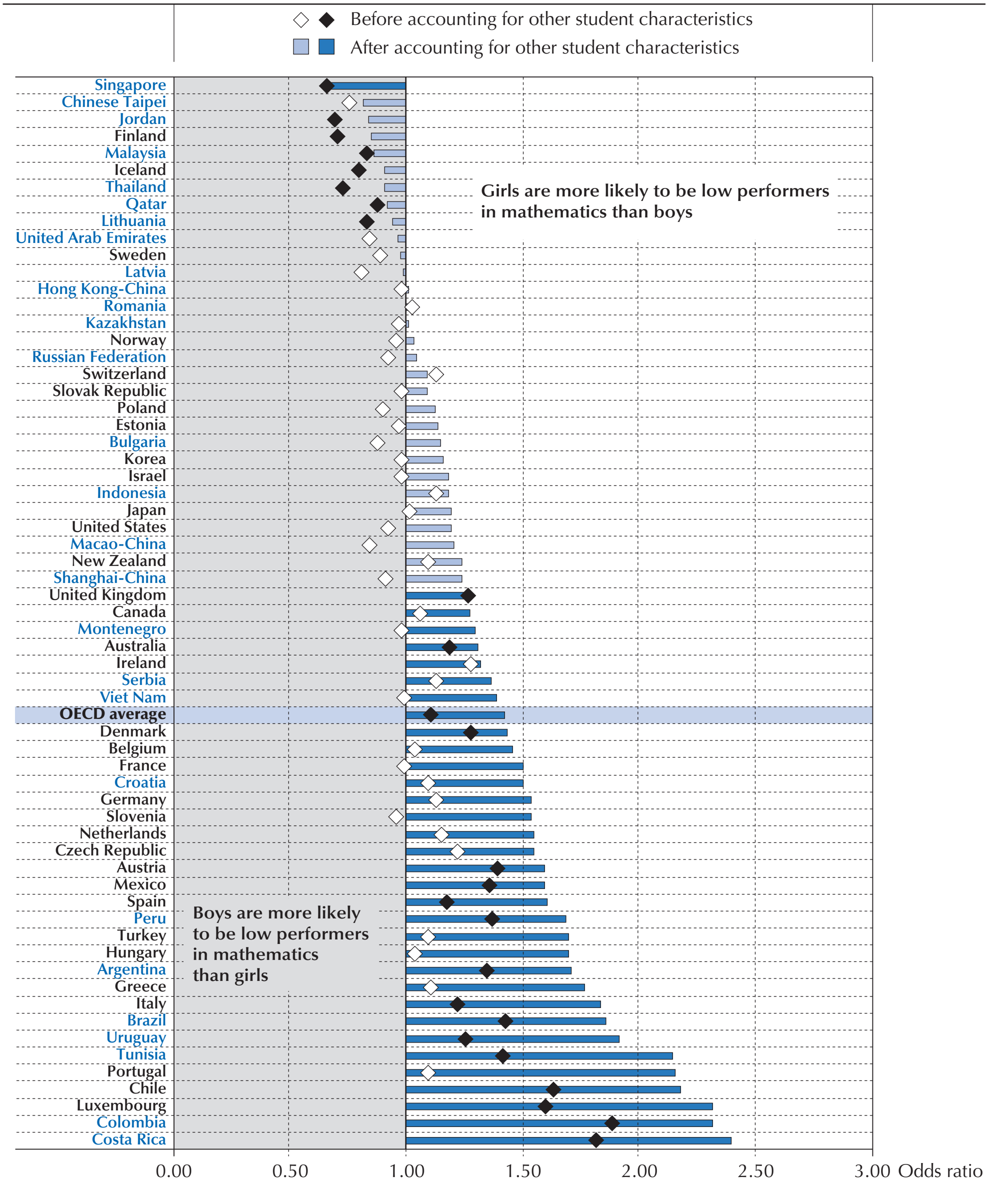
Girls are more likely than boys to be low achievers in mathematics even after student background characteristics (socio-economic status, family structure, immigrant background, language spoken at home, geographic location, attendance at pre-primary school, grade repetition and curricular track at age 15) are taken into account. Before taking these characteristics into consideration, in 16 countries and economies, girls are significantly more likely than boys to perform poorly in mathematics; after taking these characteristics into account, they are more likely to be low performers in 32 countries and economies. On average across OECD countries, girls are 1.1 times more likely than boys to be low performers in mathematics before accounting for other student characteristics, and 1.4 times more likely after accounting for those characteristics (Figure 2.5 and Table 2.5).

This increase in girls' likelihood to be low performers in mathematics after accounting for other student characteristics largely reflects the impact of grade repetition and enrolment in vocational tracks of education on performance (the "inconsistent mediation" of these factors[2]). Students who have repeated a grade and who are enrolled in a vocational track are more likely to be low performers in mathematics at age 15; and, as mentioned above, girls are less likely to be in either category. However, those girls who do repeat grades and/or are enrolled in vocational tracks are even more likely to be low performers in mathematics. Thus, when comparing boys and girls with similar profiles as regards these specific characteristics as well as others, in most countries and economies that participated in PISA 2012, girls are even more likely than boys to underachieve in mathematics.

Gender is unique among the risk factors for low performance analysed in this chapter in that all other factors have a similar effect across the school subjects assessed in PISA, while the impact of gender varies, depending on the subject. Boys are at greater risk than girls of low performance in reading and in science, but in many countries/economies, girls are at greater risk than boys of low performance in mathematics.

■ Figure 2.5 ■

Gender and the likelihood of low performance in mathematics



Notes: Statistically significant coefficients are marked in a darker tone.
Other student characteristics include: socio-economic status, immigrant background, language spoken at home, location of student's school (rural or urban area), family structure, attendance at pre-primary school, grade repetition and programme orientation (vocational or general).
Countries and economies are ranked in ascending order of the odds ratio of girls performing below baseline Level 2 in mathematics compared with boys, after accounting for other student characteristics.
Source: OECD, PISA 2012 Database, Table 2.5.
StatLink http://dx.doi.org/10.1787/888933315305

Immigrant background and language spoken at home

As economies have become increasingly globalised, the flow of people among countries has increased as well. As a result, education systems have had to adapt to accommodate larger numbers of immigrant students (OECD, 2012). PISA reports show that the percentage of students with an immigrant background, including both students who were born in a different country ("first generation") and students whose parents were born in a different country ("second generation"), has grown over the past decade. On average across OECD countries in 2012, 11% of students had an immigrant background, compared to 9% of students in 2003. This increase was accompanied by an improvement in the socio-economic status of immigrant students (0.18 point higher, on average, on the ESCS index), and also by a narrowing of the performance gap between immigrant students and students without an immigrant background (the difference in mathematics scores narrowed by 10 points). Still, on average across OECD countries in 2012, the gap in mathematics performance between immigrant students and students without an immigrant background was as large as 34 score points – the equivalent of nearly one year of formal schooling (OECD, 2015b).

The proportion of immigrant students varies greatly across countries. In Macao-China, Qatar and the United Arab Emirates, more than one in two students are immigrants, in Hong Kong-China, Liechtenstein and Luxembourg, more than 30% are immigrant students, while in Australia, Canada, New Zealand, Switzerland and the United States, between 20% and 30% of the total student population are immigrants. In 19 countries, 1% of students or less report an immigrant background (Table 2.6).

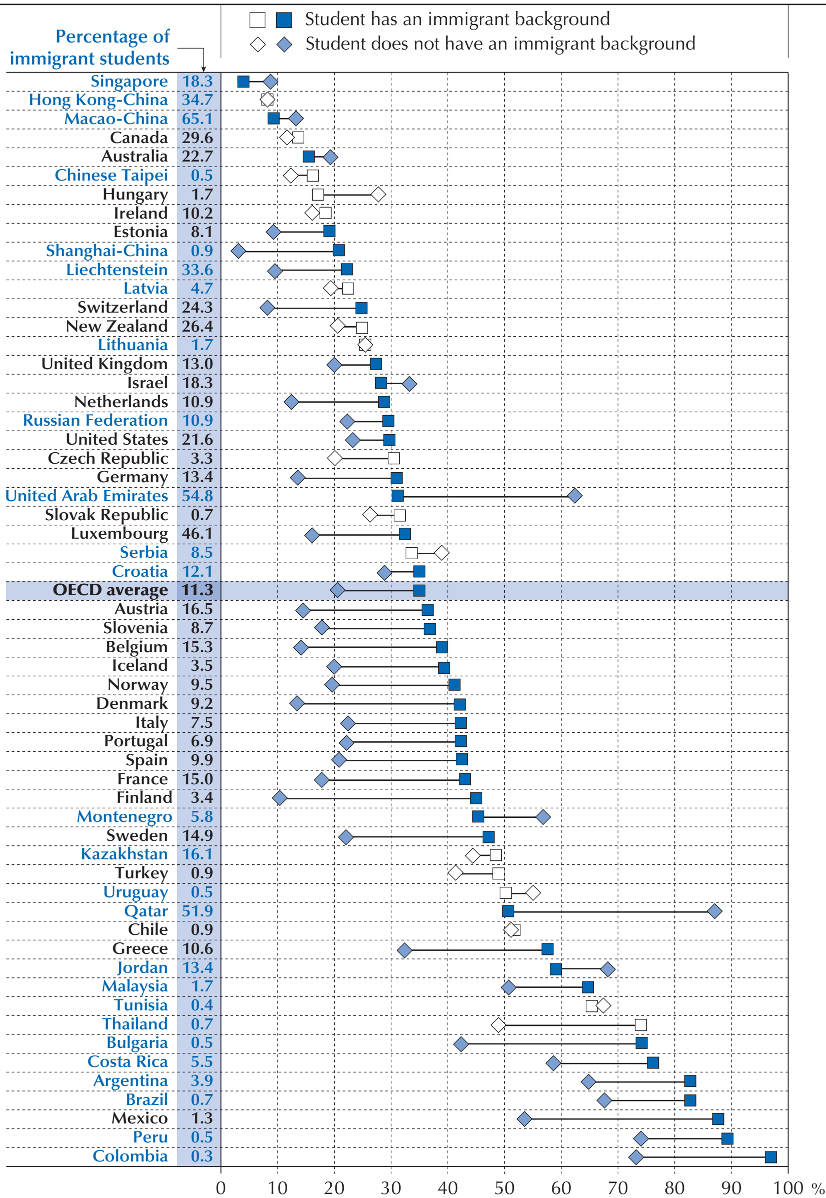
Research indicates that the education outcomes of immigrant students are shaped both by the different resources, skills and dispositions of individual students, their families and immigrant communities and by the social and education policies, and attitudes towards immigrants, in general, in the countries of destination (e.g. Buchman and Parrado, 2006; Marks, 2005; Portes and Zhou, 1993). Previous PISA reports have shown that: immigrant students who have spent more time in the country of destination ("early arrival") tend to perform better than those who have spent less time ("late arrival"); second-generation immigrant students tend to perform better than first-generation students; and students who belong to immigrant communities that are larger and more socio-economically diverse tend to perform better than those coming from smaller and more homogeneous and marginalised communities (OECD, 2013b; OECD, 2013c; OECD, 2011).

Low performers tend to be more prevalent among immigrant students than among students without an immigrant background; yet there are countries where this is not the case, and still others where the opposite is true. Figure 2.6 shows that, on average across OECD countries, the share of low performers among students with an immigrant background is 14 percentage points larger than the share of low performers among students without an immigrant background. This difference exists in 32 of the countries and economies that participated in PISA 2012; in Bulgaria, Denmark, Finland, France, Greece, Mexico and Sweden, the difference is equal to or larger than 25 percentage points. By contrast, in Australia, Israel, Jordan, Macao-China, Montenegro, Qatar, Singapore and the United Arab Emirates, immigrant students perform better than students without an immigrant background (Table 2.6).

■ Figure 2.6 ■

Immigrant background and low performance in mathematics

Percentage of low performers in mathematics, by immigrant background



Note: Statistically significant percentage-point differences between the share of low-performing students with and those without an immigrant background are marked in a darker tone.

Countries and economies are ranked in ascending order of the percentage of low-performing students with an immigrant background.

Source: OECD, PISA 2012 Database, Table 2.6.

StatLink http://dx.doi.org/10.1787/888933315314

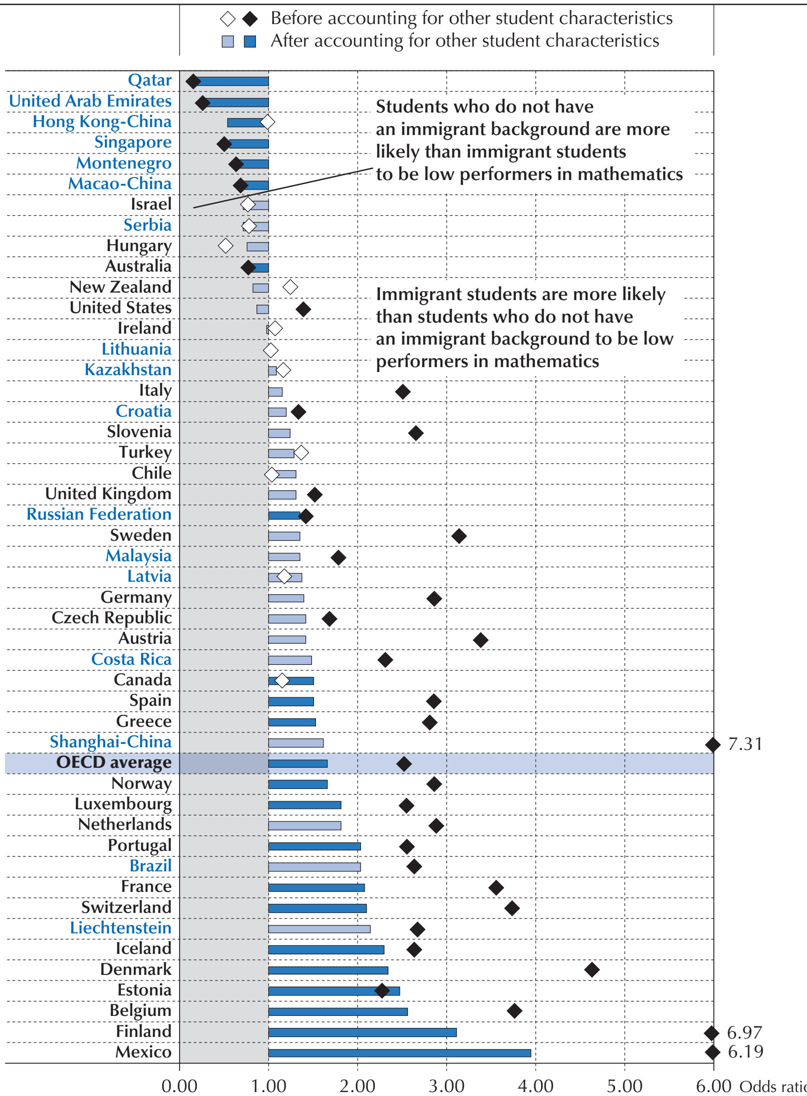
Since an immigrant background is correlated with a number of other student characteristics, to better understand the association between immigrant background and low performance, those other variables should be taken into account. Figure 2.7 shows how the odds of low performance change after accounting for students' socio-economic, demographic and education background. On average across OECD countries with sufficient data, immigrant students were 1.6 times more likely to be low performers in mathematics in PISA 2012 than students without an immigrant background who are similar in all other background characteristics. Before accounting for these other background characteristics, the odds of low performance for immigrant students were much higher (2.5), meaning that part of the difference in low performance between immigrant students and students without an immigrant background is related to factors other than immigrant background (Table 2.7).

Figure 2.7 also shows that the way in which an immigrant background is related to other student characteristics is not the same in all countries. On average across OECD countries, the higher odds of low performance among immigrant students, compared with students without an immigrant background, decrease, but remain significant, after accounting for other student characteristics. In 15 countries, the odds are reduced to the point of becoming statistically insignificant. In another 10 countries, there is no performance gap between immigrant students and students without an immigrant background either before or after accounting for other factors. In Australia, Macao-China, Montenegro, Qatar, Singapore and the United Arab Emirates, immigrant students are less likely than students without an immigrant background to underachieve, and the odds of low performance remain virtually unchanged after accounting for other student characteristics. In Hong Kong-China, where there is no difference in the likelihood of low performance between immigrant and non-immigrant students before accounting for other factors, immigrant students are less likely to underachieve than non-immigrant students who share similar socio-economic, demographic and education backgrounds.

Speaking a different language at home from the language of assessment is one of the barriers to learning that students with an immigrant background and other students must try to overcome (Figure 2.8). On average across OECD countries, the odds of low performance in mathematics among students who speak a different language at home are more than twice as high (odds ratio of 2.3) as the odds among students who speak the same language, before accounting for other student-related variables, including socio-economic status and immigrant background. After accounting for these characteristics, language-minority students still have 1.4 times higher odds of underachieving than mainstream-language students. Yet, the specific association varies from country to country. In 17 countries and economies that participated in PISA 2012, speaking a different language at home increases the likelihood of low performance even after accounting for other variables, but in 4 countries and economies, speaking a different language at home reduces the chances of low performance. In 16 other countries and economies, statistically significant differences become insignificant after accounting for the other variables, thus factors other than language at home explain the differences in performance (Table 2.9).

■ Figure 2.7 ■

Immigrant background and the likelihood of low performance in mathematics



Notes: Statistically significant coefficients are marked in a darker tone.

Other student characteristics include: socio-economic status, gender, language spoken at home, location of student's school (rural or urban area), family structure, attendance at pre-primary school, grade repetition and programme orientation (vocational or general).

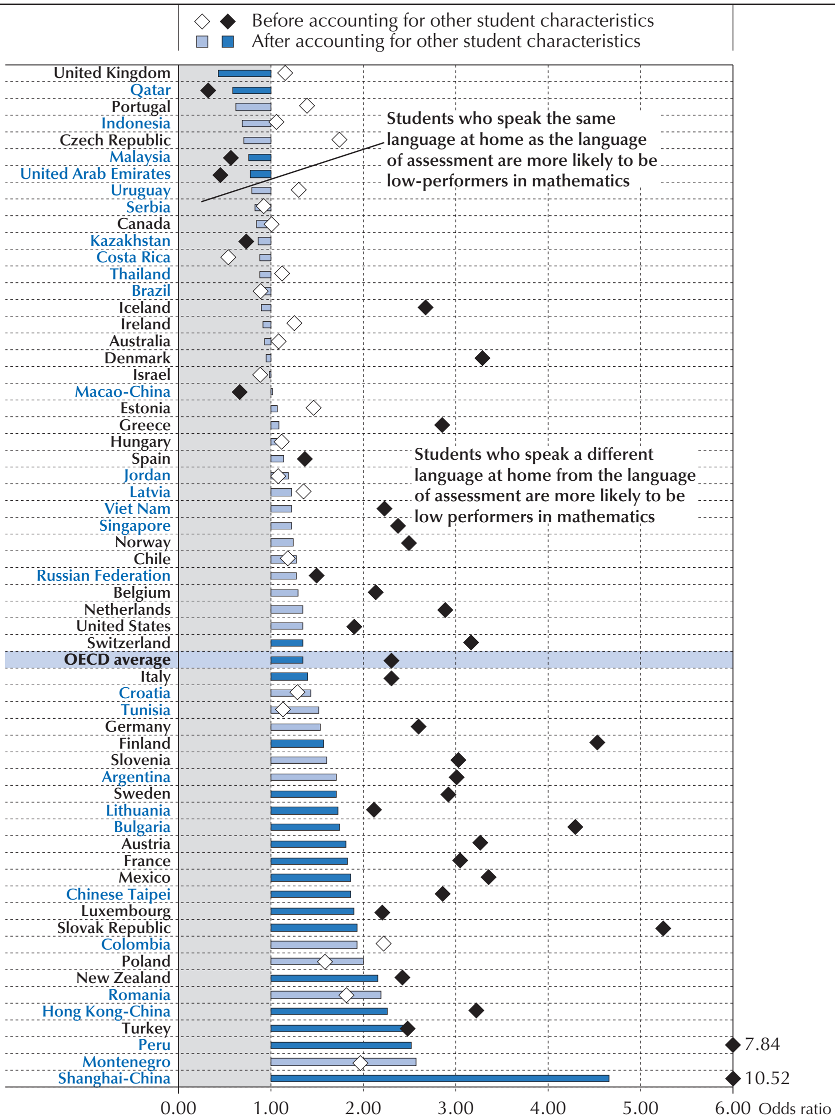
Countries and economies are ranked in ascending order of the odds ratio of immigrant students performing below baseline Level 2 in mathematics, compared with students who do not have an immigrant background, after accounting for other student characteristics.

Source: OECD, PISA 2012 Database, Table 2.7.

StatLink http://dx.doi.org/10.1787/888933315329

■ Figure 2.8 ■

Language spoken at home and the likelihood of low performance in mathematics



Notes: Statistically significant coefficients are marked in a darker tone.
Other student characteristics include: socio-economic status, family structure, immigrant background, location of student's school (rural or urban area), attendance at pre-primary school, grade repetition and programme orientation (vocational or general).
Countries and economies are ranked in ascending order of the odds ratio of students who speak a different language at home performing below baseline Level 2 in mathematics, compared with students who speak the same language at home as the language of assessment, after accounting for other student characteristics.
Source: OECD, PISA 2012 Database, Table 2.9.
StatLink http://dx.doi.org/10.1787/888933315337

Family structure

Family structure – whether a student grows up in a single-parent, two-parent or extended family; how many siblings live in the household; and such important family events as divorce and remarriage – also shapes students' education outcomes (McLanahan and Sandefur, 1994; Beller and Chung, 1992; Ginther and Pollak, 2004; Pong, Dronkers and Hampden-Thompson, 2003; Sandefur and Wells, 1999). Research suggests that students who live in single-parent families receive less encouragement and less help with school work than students who live in two-parent families (Astone and McLanahan, 1991). On average across OECD countries, 85% of students come from two-parent households, and 15% from single-parent or other kinds of family structures. In 15 countries that participated in PISA 2012, at least 20% of students came from single-parent families; only in five countries did less than 10% of students come from such families (Table 2.10).

The share of low performers is larger among students who live in single-parent families than among those living with two parents[3] (Figure 2.9). On average across OECD countries, 26% of students in single-parent families performed below the baseline level of proficiency in mathematics in PISA 2012, while nearly 20% of students from two-parent families performed at that level. Although the difference of around 7 percentage points is statistically significant, the performance gap related to family structure is smaller than the gap related to socio-economic status (28 percentage-point difference, in favour of advantaged students), the gap related to immigrant background (15 percentage-point difference, in favour of students without an immigrant background), the gap related to language spoken at home (15 percentage-point difference, in favour of mainstream-language speakers), and the gender gap in reading (12 percentage-point difference, in favour of girls). It is larger than the gender gap in mathematics (2 percentage-point difference, in favour of boys) and science (2 percentage-point difference, in favour of girls) (Tables 2.1, 2.3a, 2.6 and 2.8).

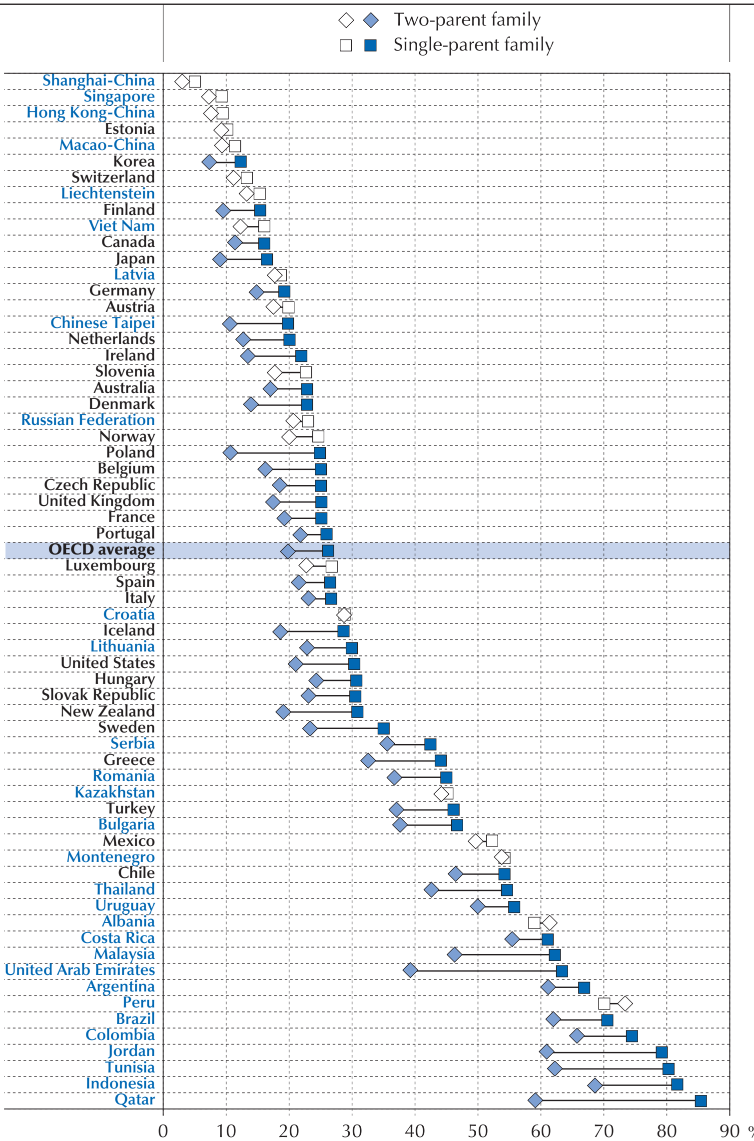
Before accounting for any other variable, students in single-parent families are 1.5 times more likely than those in two-parent families to be low performers in mathematics, on average across OECD countries (Figure 2.10). After accounting for students' socio-economic status and other background characteristics, those odds shrink to 1.2. In 16 countries and economies, this greater likelihood is statistically significant after accounting for other student characteristics. In 27 countries and economies, the difference in likelihood becomes insignificant after accounting for other variables. There is no country or economy in PISA 2012 where students from single-parent families are less likely to be low performers than students from two-parent families.

Urban or rural location

Whether urban or rural areas provide more opportunities or risks for students' academic performance is far from obvious. Greater economic and cultural resources are concentrated in large cities, but many social problems, including crime, are more prevalent in urban areas too. In many countries, ethnic and linguistic minorities are concentrated in rural areas, but in other countries, immigrant communities are more frequently found in large cities. Differences in education opportunities and outcomes related to geographic location are observed in the availability of qualified teachers and other resources across schools, or as differences in student behaviour, depending on where the student goes to school (e.g. Schafft and Jackson, 2010).

■ Figure 2.9 ■

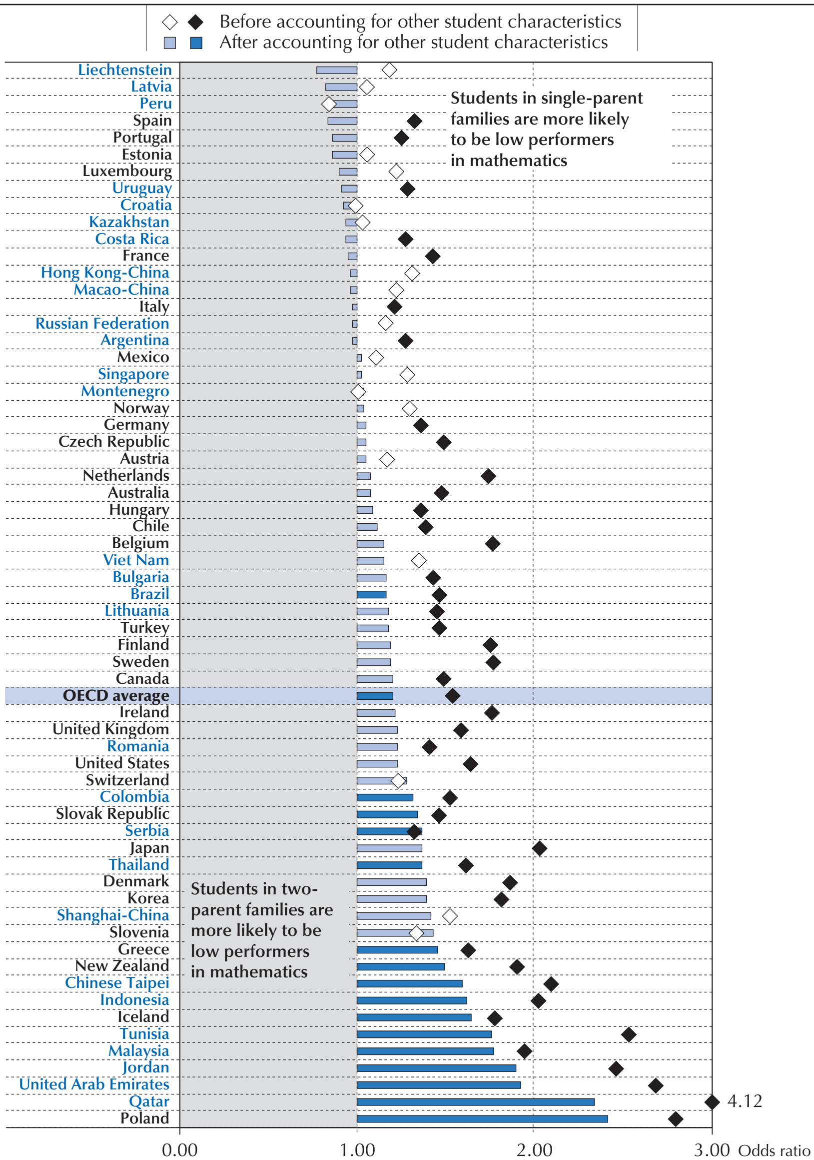
Percentage of low performers in mathematics, by family structure



Notes: Statistically significant percentage-point differences between the share of underperforming students from single-parent families and those from two-parent families are marked in a darker tone.
The "single-parent family" group includes also students from "other type" of families.
Countries and economies are ranked in ascending order of the percentage of low-performing students from single-parent families.
Source: OECD, PISA 2012 Database, Table 2.10.
StatLink http://dx.doi.org/10.1787/888933315342

■ Figure 2.10 ■

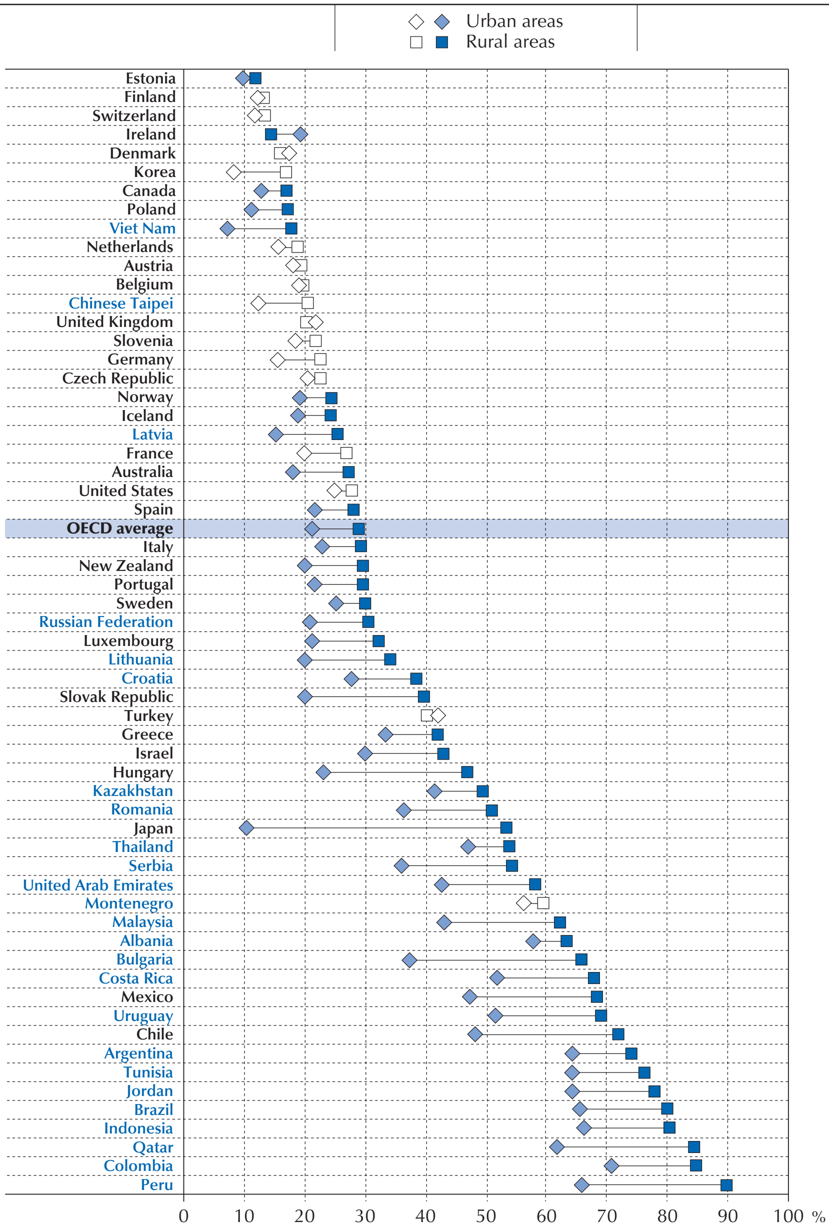
Family structure and the likelihood of low performance in mathematics



Notes: Statistically significant coefficients are marked in a darker tone.
Other student characteristics include: socio-economic status, gender, immigrant background, language spoken at home, location of student's school (rural area, town or city), attendance at pre-primary school, grade repetition and programme orientation (vocational or general).
Countries and economies are ranked in ascending order of the odds ratio of students in single-parent families performing below baseline Level 2 in mathematics compared with students in two-parent families, after accounting for other student characteristics.
Source: OECD, PISA 2012 Database, Table 2.11.
StatLink http://dx.doi.org/10.1787/888933315357

■ Figure 2.11 ■

Percentage of low performers in mathematics, by geographic location



Note: Statistically significant percentage-point differences between the share of low-performing students from rural area and those from cities or towns are marked in a darker tone.

Countries and economies are ranked in ascending order of the percentage of low-performing students in schools in rural areas.

Source: OECD, PISA 2012 Database, Table 2.12.

StatLink http://dx.doi.org/10.1787/888933315360

But as shown in Figure 2.11, in most countries and economies that participated in PISA 2012, there is a clear relationship between the share of low performers and geographic location. Rural areas host the largest proportions of low performers, and urban areas, defined as cities and towns of at least 3 000 inhabitants, host the smallest proportions.[4] On average across OECD countries, 29% of students who attend school in rural areas and 21% of students in cities or towns perform below Level 2 in mathematics. In the majority of countries and economies, the share of low performers is larger in rural areas than in urban areas, and the difference is statistically significant.

After accounting for other characteristics of student background (i.e. socio-economic status, gender, immigrant and language background, family structure, attendance at pre-primary school, grade repetition and programme orientation), differences in the likelihood of low performance related to geographic location shrink, but remain significant in 24 countries and economies (Figure 2.12). On average across OECD countries, the odds of low performance among students in rural areas are 1.5 times higher than the odds among urban students, but are 1.3 times higher after accounting for other student characteristics.

Progression through education

Pre-primary education

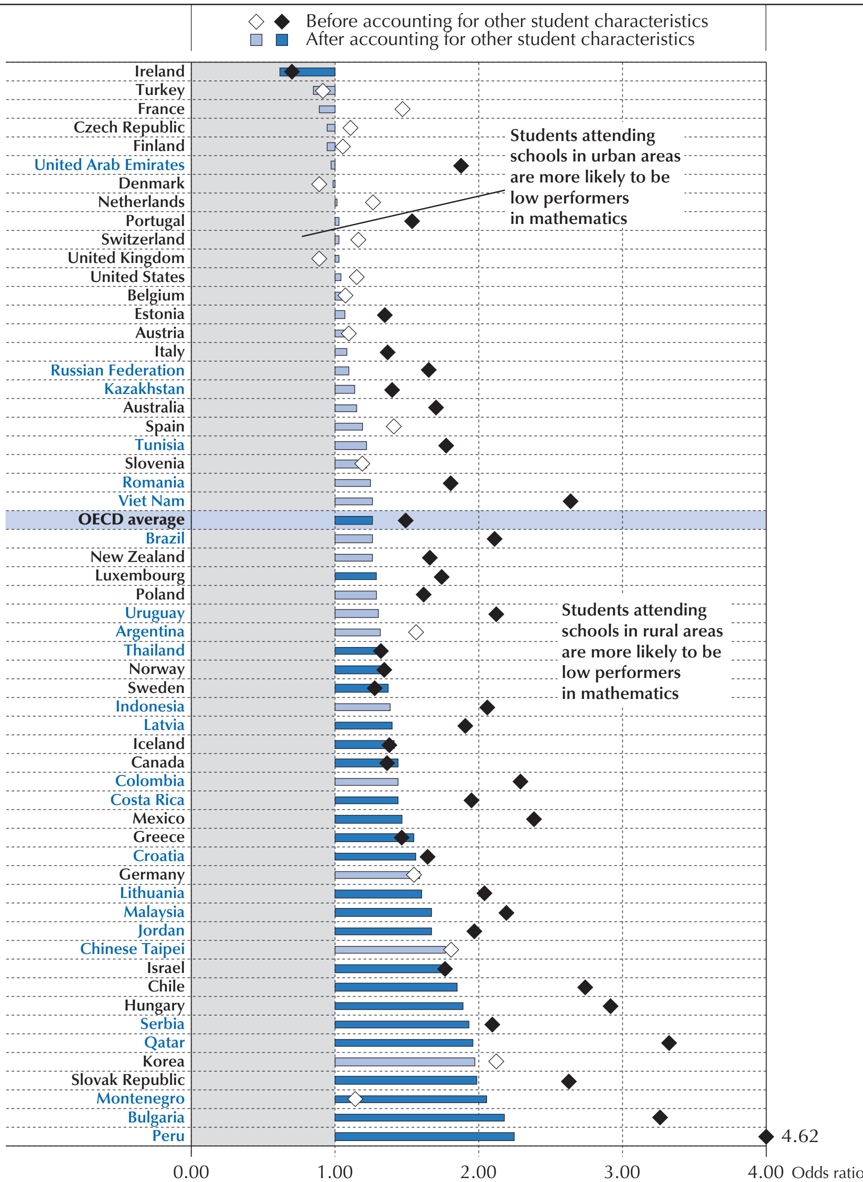
Evidence of the importance of pre-primary education for early child development and for later education outcomes is convincing (e.g. Berlinski, Galiani and Gertler, 2009; Barnett, 1995; Currie, 2001). Enrolment in pre-primary education is high among OECD countries, where on average only 7% of students who participated in PISA 2012 reported that they had not attended any pre-primary education. Pre-primary enrolment has also increased over time, as 74% of students in PISA 2012 reported that they had attended more than one year of pre-primary school, compared with 69% of students who so reported in PISA 2003. The growth in pre-primary enrolment is significantly greater among advantaged students than disadvantaged students, and among students who attend advantaged schools than those who attend disadvantaged schools (OECD, 2013a).

The lack of pre-primary education is a strong predictor of low performance at age 15. In 2012, on average across OECD countries, 41% of students without any pre-primary education performed below the baseline proficiency level in mathematics. By comparison, 30% of students who had attended pre-primary education for less than a year, and 20% of students who had attended pre-primary education for more than one year performed at that level. The difference in the share of low performers between students with no pre-primary education and students with more than one year of pre-primary education is statistically significant in all countries except Albania, Estonia, Ireland and Latvia (Figure 2.13 and Table 2.14).

After adjusting for other characteristics, the difference in the odds of low performance between students without any pre-primary schooling and those with more than a year of pre-primary education shrinks, as shown in Figure 2.14. On average across OECD countries, the odds of low performance in mathematics for a student with no pre-primary education are 3.3 times higher than the odds for a student who had attended more than a year of pre-primary educations before accounting for other student characteristics, and 1.9 times higher after accounting for them.

■ Figure 2.12 ■

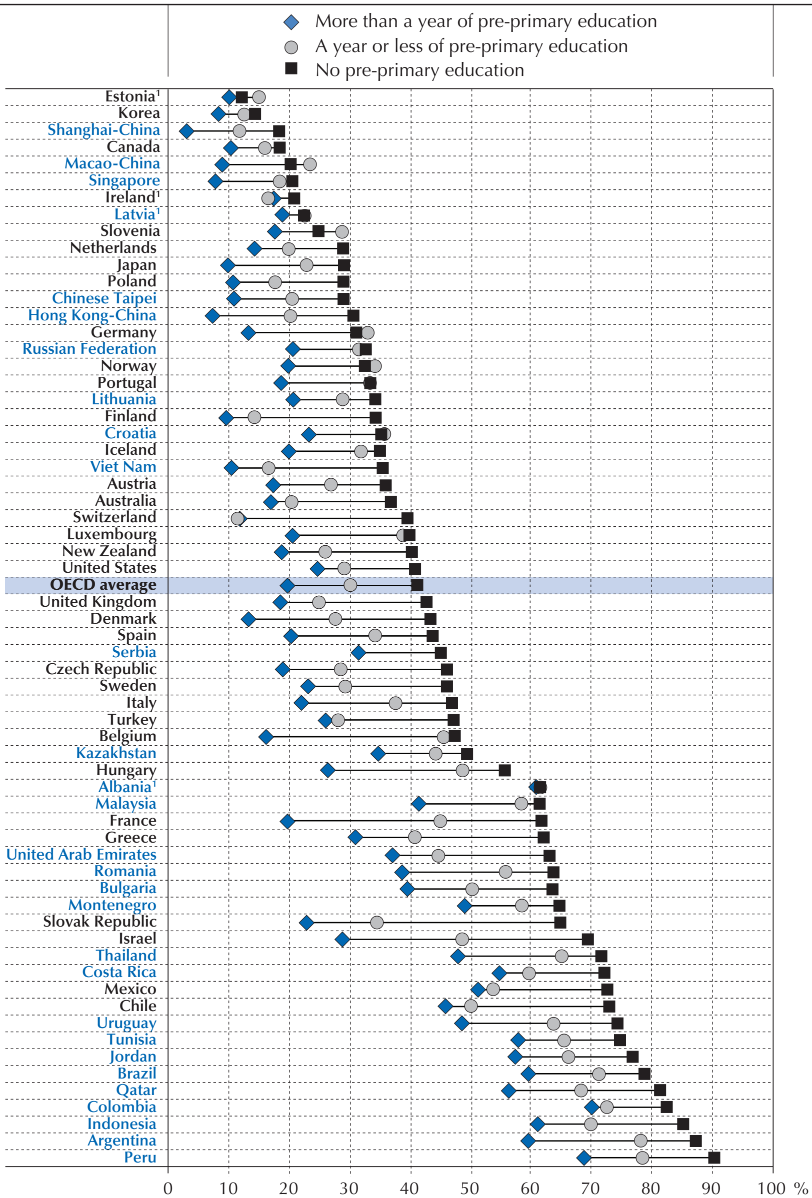
Geographic location and the likelihood of low performance in mathematics



Notes: Statistically significant coefficients are marked in a darker tone.
Other student characteristics include: socio-economic status, gender, immigrant background, language spoken at home, family structure, attendance at pre-primary school, grade repetition and programme orientation (vocational or general).
Countries and economies are ranked in ascending order of the odds ratio of low performance in mathematics among students in schools in rural areas compared to students in schools in urban areas, after accounting for other student characteristics.
Source: OECD, PISA 2012 Database, Table 2.13.
StatLink *http://dx.doi.org/10.1787/888933315376*

■ Figure 2.13 ■

Percentage of low performers in mathematics, by attendance at pre-primary school



1. Percentage-point differences between the share of low-performing students who had not attended pre-primary school and those who had attended for at least one year are not statistically significant.

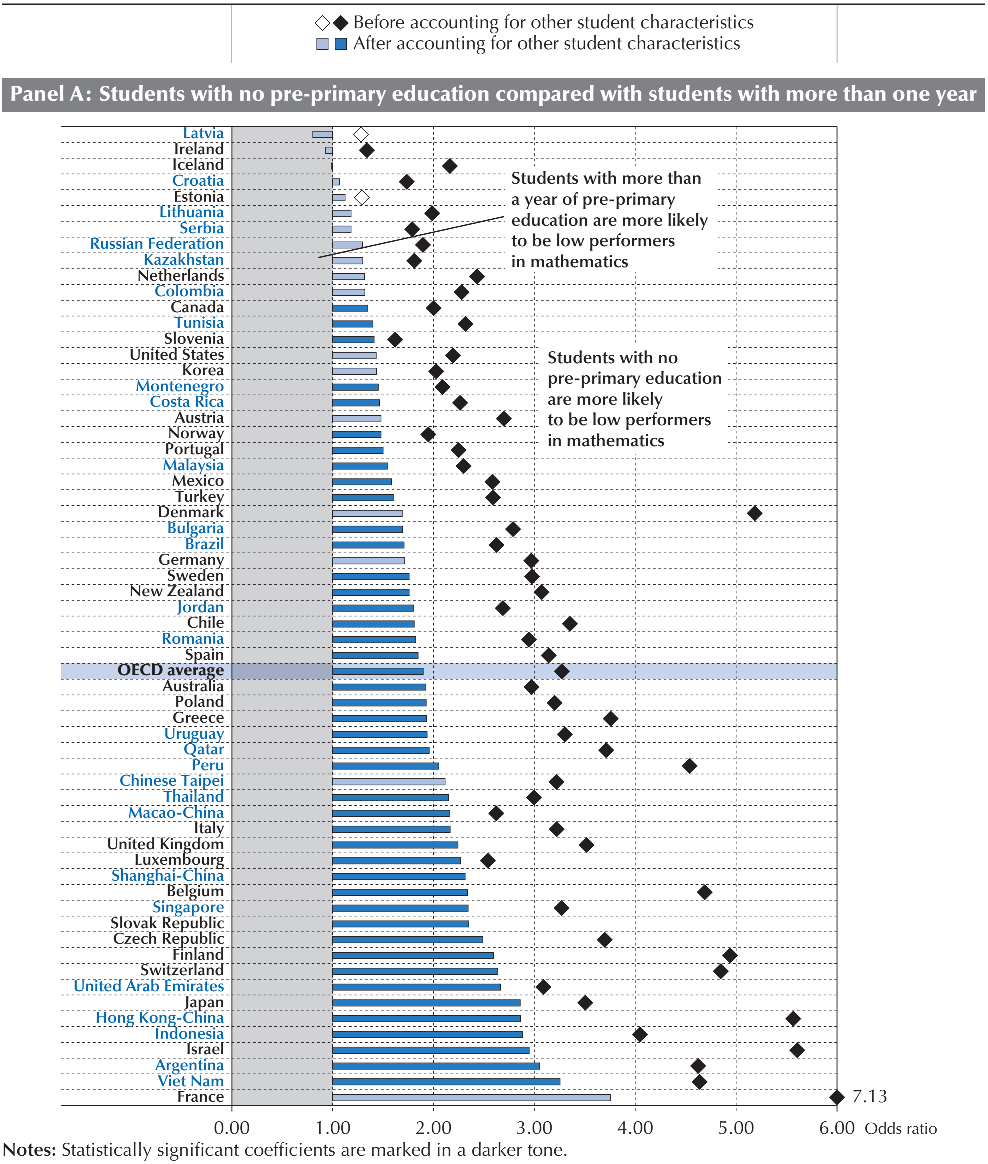
Countries and economies are ranked in ascending order of the percentage of low-performing students who had not attended pre-primary school.

Source: OECD, PISA 2012 Database, Table 2.14.

StatLink http://dx.doi.org/10.1787/888933315381

■ Figure 2.14 [Part 1/2] ■

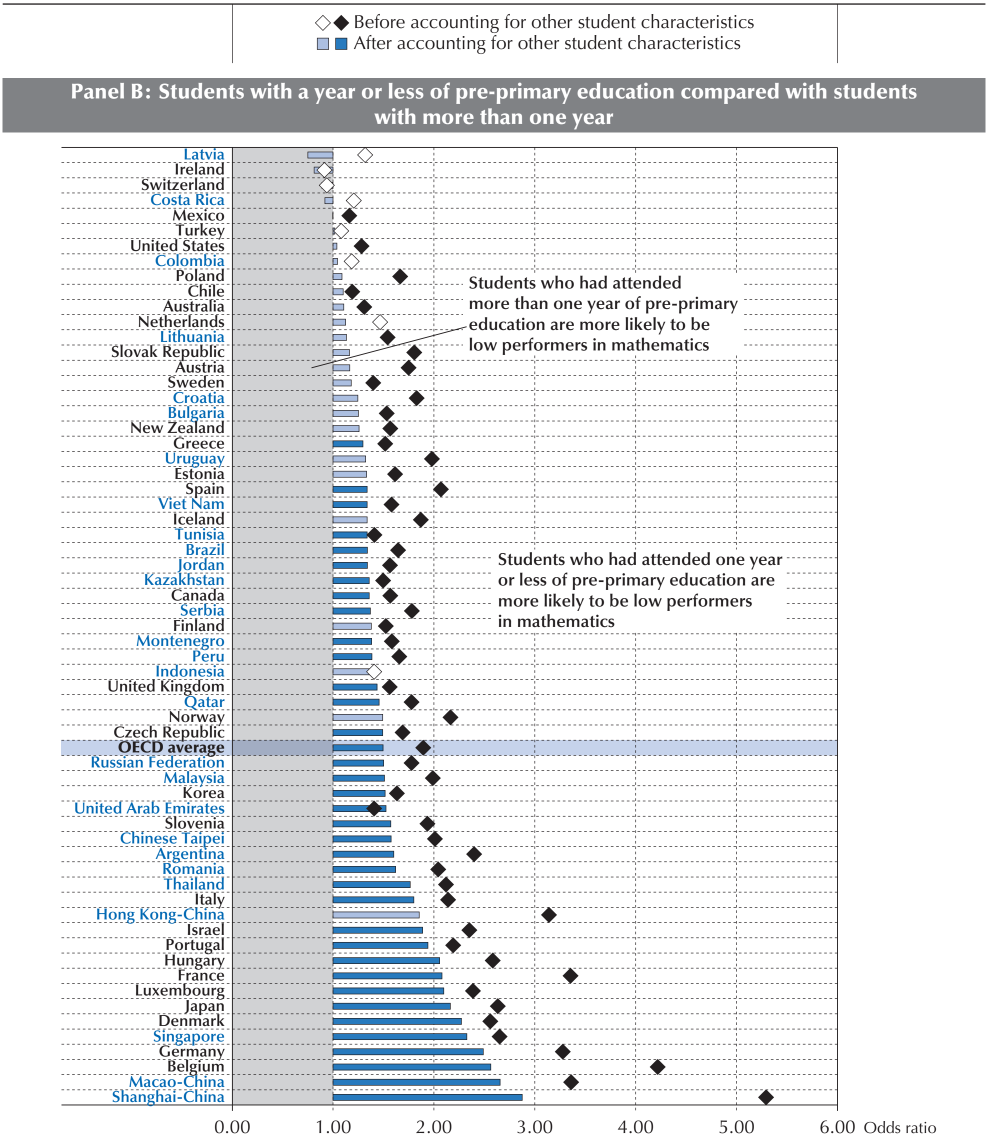
Pre-primary education and the likelihood of low performance in mathematics



Notes: Statistically significant coefficients are marked in a darker tone.
Other student characteristics include: socio-economic status, gender, immigrant background, language spoken at home, family structure, location of student's school (rural area, town or city), grade repetition and programme orientation (vocational or general).
Countries and economies are ranked in ascending order of the odds ratio of students who had no pre-primary education (Panel A) performing below the proficiency baseline Level 2 in mathematics compared to students with more than a year of pre-primary education, after accounting for other student characteristics.
Source: OECD, PISA 2012 Database, Table 2.15.
StatLink http://dx.doi.org/10.1787/888933315392

■ Figure 2.14 [Part 2/2] ■

Pre-primary education and the likelihood of low performance in mathematics



Notes: Statistically significant coefficients are marked in a darker tone.
Other student characteristics include: socio-economic status, gender, immigrant background, language spoken at home, family structure, location of student's school (rural area, town or city), grade repetition and programme orientation (vocational or general).
Countries and economies are ranked in ascending order of the odds ratio of students who had a year or less of pre-primary education (Panel B) performing below the proficiency baseline Level 2 in mathematics compared to students with more than a year of pre-primary education, after accounting for other student characteristics.
Source: OECD, PISA 2012 Database, Table 2.15.
StatLink http://dx.doi.org/10.1787/888933315392

The odds of low performance for a student who had attended one year or less of pre-primary education are 1.9 times higher, on average, than the odds for a student who had more than one year of pre-primary education before accounting for other characteristics, and 1.5 times higher after accounting for those characteristics. Differences in socio-economic status account for a large part of the variation in the relationship between pre-primary education and low performance.

Grade repetition

As important as pre-primary education is, it is not the only element of a student's progress through school that influences whether she or he will be at risk of low performance by the age of 15. Grade repetition in primary or secondary school is another element. Grade repetition is a long-standing and highly contentious practice. Its intended purpose is to give students who perform below standard more time to master the curriculum and catch up with their peers. Yet evidence on whether grade repetition yields positive results is mixed (Xia and Kirby, 2009; Allen et al., 2009; Eide and Showalter, 2001; Jacob and Lefgren, 2004). Students who are "left back" are more likely to drop out of high school than students who progress steadily through grades (Jimerson, Anderson and Whipple, 2002; Stearns et al., 2007). Students who have repeated a grade also tend to hold more negative attitudes towards school than those who have not (Ikeda and García, 2014). Previous PISA reports have suggested that grade repetition is a costly policy, that it is sometimes used as a form of punishment to sanction misbehaviour in school, and that it can reinforce inequalities in education because socio-economically disadvantaged students are more likely to repeat grades than advantaged students (OECD, 2013d; OECD, 2014b; OECD, 2015a).

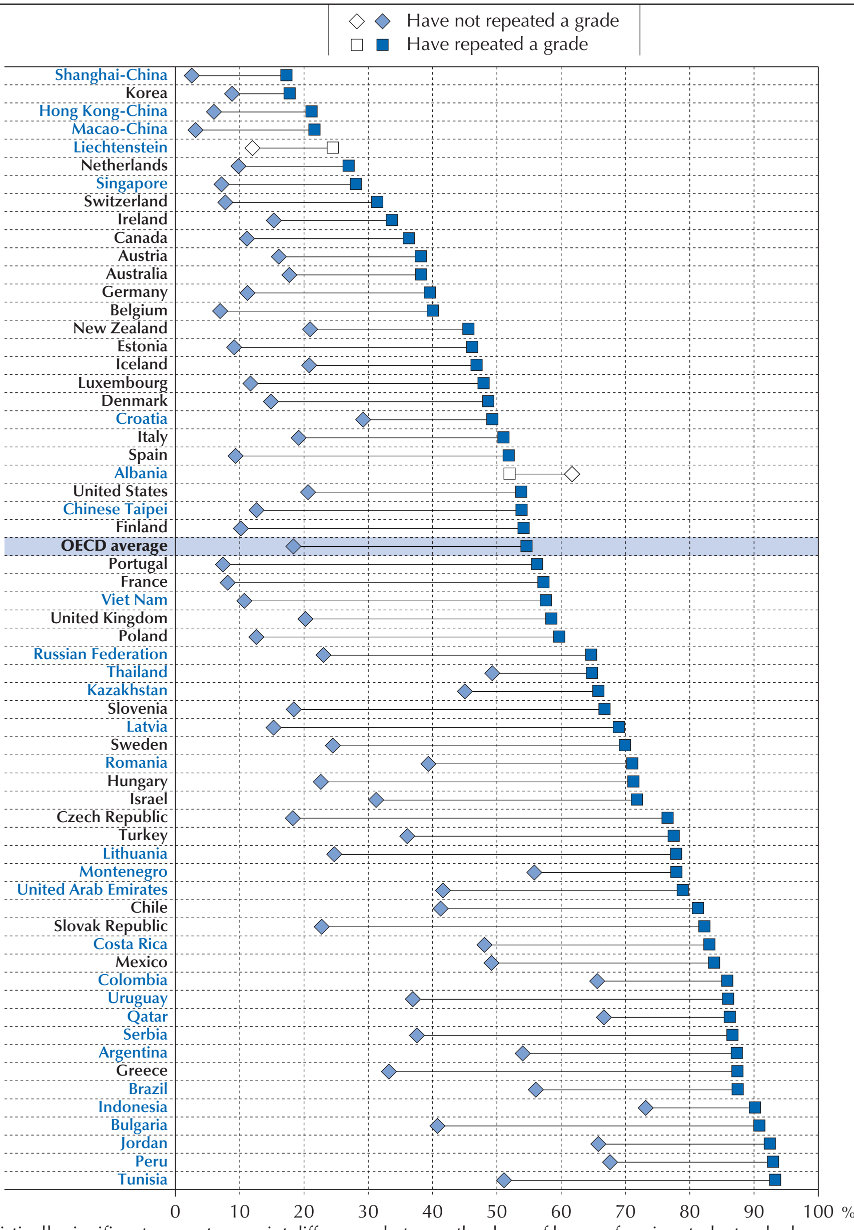
While the percentage of students who reported that they had repeated a grade has decreased during the past decade, it is still relatively high. In 2003, 20% of students reported that they had repeated a grade at least once, whereas in 2012 the share of self-reported repeaters shrank to 12%, on average across OECD countries (OECD, 2013d). The prevalence of grade repetition varies widely across countries, ranging from at least 20% of students who had repeated a grade in 16 countries and economies to 5% or less of such students in 27 other countries and economies (Table 2.16). Japan, Malaysia and Norway show no incidence of grade repetition. Most of the grade repetition that was reported in PISA 2012 occurred in primary and lower secondary school, and some occurred in upper secondary school. Most of the students who reported that they had repeated a year of school came from disadvantaged families (OECD, 2013d).

In all countries and economies that participated in PISA 2012 and have sufficient data, except Albania and Liechtenstein, there are large differences in the shares of low performers who have repeated a grade and low performers who have been continuously promoted. Figure 2.15 shows that, on average across OECD countries, the share of low performers in mathematics who have repeated a grade is 36 percentage points larger than the share of low performers who have not repeated a grade. In Bulgaria, the Czech Republic, Greece, Latvia, Lithuania and the Slovak Republic, the difference between the two groups is equal to or more than 50 percentage points. Only in Korea and Shanghai-China is the difference less than 15 percentage points (Table 2.16).

Figure 2.16 shows whether the relationship between grade repetition and low performance varies after accounting for students' socio-economic, demographic and education backgrounds.

■ Figure 2.15 ■

Percentage of low performers in mathematics, by grade repetition



Note: Statistically significant percentage-point differences between the share of low-performing students who have repeated a grade and those who have not repeated a grade are marked in a darker tone.

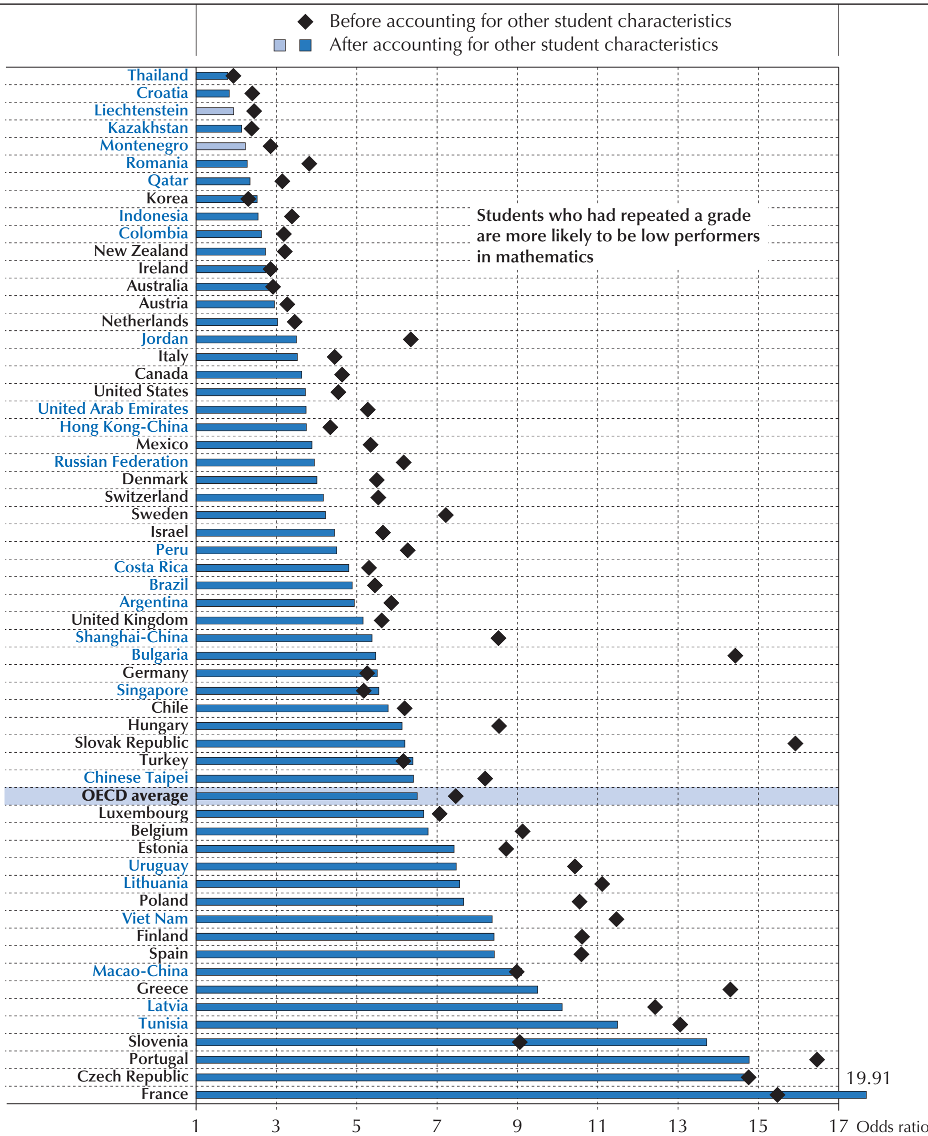
Countries and economies are ranked in ascending order of the percentage of low-performing students who have repeated a grade.

Source: OECD, PISA 2012 Database, Table 2.16.

StatLink http://dx.doi.org/10.1787/888933315409

■ Figure 2.16 ■

Grade repetition and the likelihood of low performance in mathematics



Notes: Coefficients before accounting for other students characteristics are statistically significant. Statistically significant coefficients for after accounting for other student characteristics are marked in a darker tone.

Other student characteristics include: socio-economic status, gender, immigrant background, language spoken at home, family structure, location of student's school (rural area, town or city), attendance at pre-primary school and programme orientation (vocational or general).

Countries and economies are ranked in ascending order of the odds ratio of students who had repeated a grade performing below baseline Level 2 in mathematics, compared with students who had not repeated a grade, after accounting for other student characteristics.

Source: OECD, PISA 2012 Database, Table 2.17.

StatLink *http://dx.doi.org/10.1787/888933315416*

Before accounting for students' background, the odds of performing below the baseline level of proficiency in mathematics for a student who repeated a grade are 7.4 times higher than for a student who had not repeated a grade, on average across OECD countries. After accounting for other student characteristics, the odds of underachievement in mathematics are still 6.5 times higher for a student who had repeated a grade compared with a student who had been continuously promoted. This suggests that the link between grade repetition and low performance is not only strong, but that it is not mediated by differences in socio-economic status, demographic characteristics or a student's progress through education.

Caution is advised when interpreting the link between grade repetition and low performance, however, because determining the direction of the association is particularly difficult. On the one hand, grade repetition in the earlier grades makes a student more likely to perform poorly in a later grade, because teachers have lower expectations for these students, because these students might have greater difficulties in integrating themselves into peer and school cultures, or for other reasons (Kaplan, Peck and Kaplan, 1997; Roderick, 1994). But the association might run in the opposite direction if students repeat a grade simply because they are chronic low performers. PISA data provides only correlational evidence, so no causal inferences should be drawn from this analysis.

Programme orientation

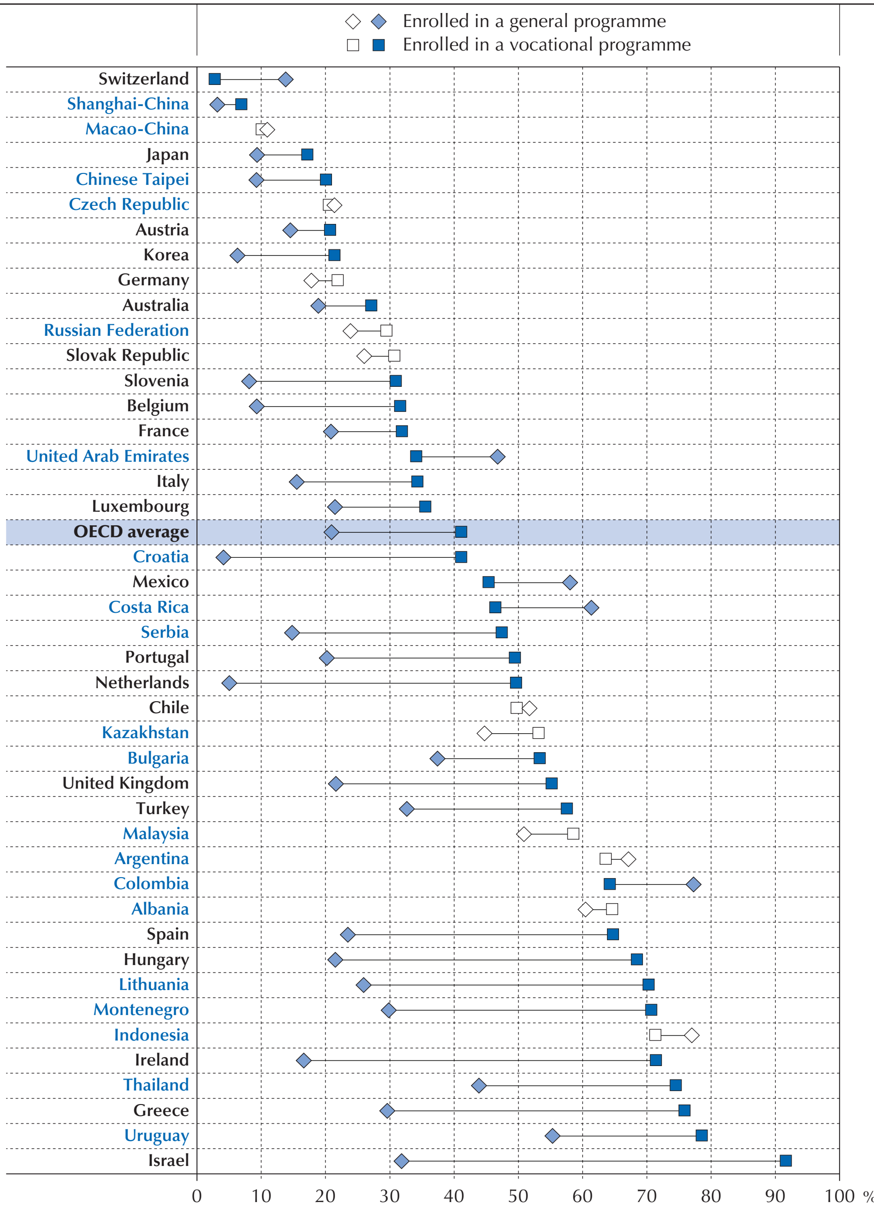
Curricular tracking is another long-standing and hotly debated way to handle student heterogeneity (Oakes, 1985; LeTendre, Hofer and Shimizu, 2003; Van de Werfhorst and Mijs, 2010). Separating students into homogeneous groups might help teachers to be more effective. Many students might benefit from more practical, vocational training that prepares them for the labour market. But students in these tracks might lose more than they gain – from lower expectations from their teachers to more disengaged classmates. Previous PISA reports have shown that education systems in which students are selected into separate tracks at an earlier age tend to show lower levels of equity in education outcomes (OECD, 2013d).

School systems vary widely in the extent to which they place students into separate academic and vocational tracks. In PISA 2012, an average of 18% of students in OECD countries were enrolled in a vocational track. In Austria, Croatia, Italy, Montenegro, Serbia and Slovenia, at least one in two students were enrolled in a vocational track, while in 15 other countries and economies, no student was enrolled in a vocational track, as defined in PISA. In Canada, a 100% of students are enrolled in modular schools, which are considered in this analysis in combination with vocational programmes (Table 2.18).

The share of low performers is twice as large among students enrolled in a vocational track than among students enrolled in a general track (Figure 2.17). On average across OECD countries, 41% of students pursuing a vocational education were low performers in mathematics in 2012, whereas 21% of students in a general track were. The difference in the share of low performers between vocational and general students is larger than 40 percentage points in Greece, Hungary, Ireland, Israel, Lithuania, Montenegro, the Netherlands and Spain. But in Colombia, Mexico and Switzerland, where more than 10% of students are enrolled in vocational schools, the share of low performers is larger among students in general programmes (Table 2.18).

■ Figure 2.17 ■

Percentage of low performers in mathematics, by programme orientation



Note: Statistically significant percentage-point differences between the share of low-performing students who are enrolled in vocational programmes and those who are enrolled in general programmes are marked in a darker tone.
Students enrolled in vocational programmes are those enrolled in pre-vocational, vocational and modular programmes.
Countries and economies are ranked in ascending order of the percentage of low-performing students who are enrolled in vocational programmes.
Source: OECD, PISA 2012 Database, Table 2.18.
StatLink *http://dx.doi.org/10.1787/888933315424*

Figure 2.18. reveals that, on average across OECD countries, students in vocational tracks are 5 times more likely to perform below the baseline level of proficiency in mathematics than students in academic tracks, before accounting for other student characteristics, and are 4.4 times more likely after accounting for those characteristics. Socio-economic status accounts for most of this weakening of the link between vocational tracks and low performance after accounting for other factors. In 25 countries and economies, students in vocational programmes are more likely than students in general programmes to be low performers in mathematics before accounting for other student characteristics (black diamonds in the right panel of Figure 2.18); in 18 of them, the odds of low performance among students in vocational tracks shrink after student characteristics are accounted for. In 12 other countries and economies, the odds are higher after taking other student characteristics into account.

Caution is also advised when interpreting these results, since the causal relationship between programme orientation and low performance could run in both directions.

THE CUMULATIVE RISK OF LOW PERFORMANCE

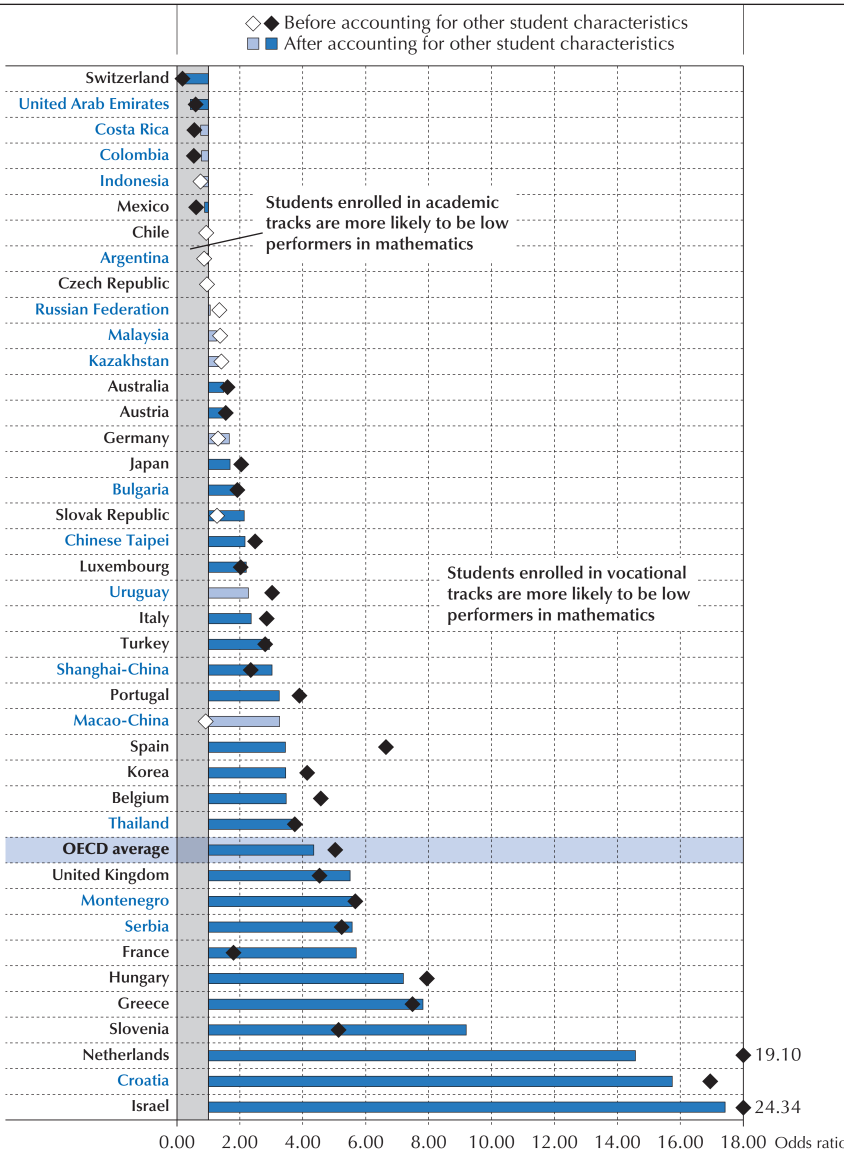
As shown above, each of the risk factors for low performance has a specific, separate association with the likelihood of low performance among individual students. Yet risk factors are also cumulative, in that they interact with one another, usually within individual students (e.g. a rural student who is also poor and is enrolled in a vocational track). Combinations of these risk factors result in even greater probabilities of low performance.

Figure 2.19 shows the intersection and accumulation of risks of low performance related to socio-economic, demographic and education background. The horizontal axis in the figure represents a progression of risk scenarios, or "risk profiles", from lower risk to higher risk of low performance in mathematics. Based on the analyses presented in this chapter, a "low risk profile" is a 15-year-old student who: is a boy, does not have an immigrant background, speaks the same language at home that is spoken at school, lives in a two-parent family, in a city, had attended pre-primary school for more than one year, had never repeated a grade, and is enrolled in an academic track. On the opposite end of the spectrum, a "high risk profile" is a girl who has an immigrant background, speaks a language at home that is different from the language spoken at school, lives in a single-parent family, in a rural area, did not attend pre-primary school, repeated a grade at least once, and is enrolled in a vocational track.

Figure 2.19 shows how the predicted probability of low performance in mathematics increases as each one of the characteristics of the low risk profile is changed for its opposite value. For example, the second value in the horizontal axis, "girl", is the probability of low performance for a student with the same "low risk" characteristics, but who is a girl instead of a boy. Similarly, the third value represents the probability of low performance for a student with the same "low risk" characteristics but who is a girl and has an immigrant background. The fourth value represents the probability of low performance for a student with the same "low risk" characteristics but who is a girl, has an immigrant background and speaks a different language; and so on. The right-most column presents the "high risk" profile, which encompasses all of the risk factors.

■ Figure 2.18 ■

Programme orientation and the likelihood of low performance in mathematics

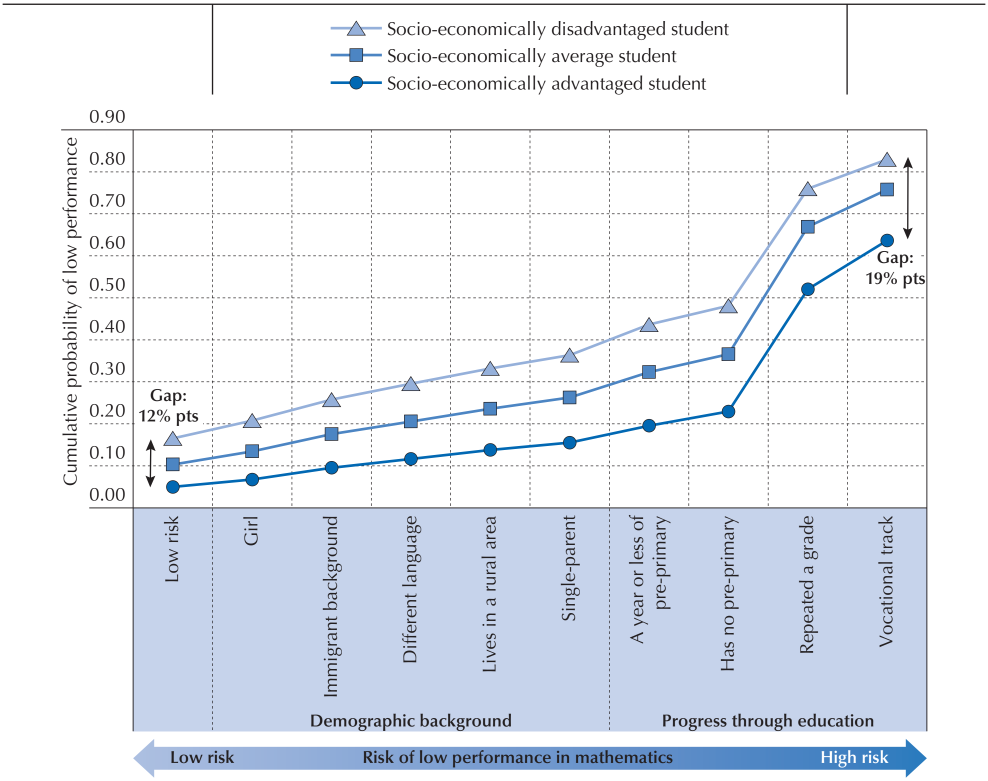


Notes: Statistically significant coefficients are marked in a darker tone.
Students enrolled in vocational tracks are those enrolled in pre-vocational, vocational and modular programmes.
Other student characteristics include: socio-economic status, gender, immigrant background, language spoken at home, family structure, location of student's school (rural area, town or city), attendance at pre-primary school and grade repetition.
Countries and economies are ranked in ascending order of the odds ratio of students enrolled in vocational programmes performing below baseline Level 2 in mathematics, compared with students enrolled in general programmes, after accounting for other student characteristics.
Source: OECD, PISA 2012 Database, Table 2.19.
StatLink http://dx.doi.org/10.1787/888933315431

■ Figure 2.19 ■

Cumulative probability of low performance in mathematics across risk profiles

OECD average



Notes: Risk profiles are based on students' socio-economic, demographic and education characteristics.
The profile of a low risk student is a student who is a boy, has no immigrant background, speaks the same language at home as the language of assessment, lives in a two-parent family, attends a school located in a city, attended pre-primary education for more than one year, has not repeated a grade, and is enrolled in a general track.
A socio-economically advantaged student is a student at the top quarter of the *PISA index of economic, social and cultural status* (ESCS). A socio-economically disadvantaged student is a student at the bottom quarter of ESCS, and a socio-economically average student is a student at the average of the second and third quarters of ESCS.
Coefficient estimates come from a multivariate logistic regression with low performance in mathematics as the outcome and each of the variables in the figure as a covariate.
Source: OECD, PISA 2012 Database, Table 2.21.
StatLink *http://dx.doi.org/10.1787/888933315444*

The figure shows that the probability of low performance in mathematics varies by socio-economic status, as indicated by the three symbols (circle, square and triangle). A socio-economically advantaged student is defined as a student in the top quarter of ESCS; a socio-economically average student is a student at the average of the second and third quarters of ESCS; and a socio-economically disadvantaged student is a student in the bottom quarter of ESCS. On average across OECD countries, a student with a low-risk profile who comes from a disadvantaged family has a 17% probability of low achievement in mathematics, whereas a student who comes from a socio-economically average family has a 10% probability, and an advantaged student has a 5% probability of low performance in mathematics.

On average across OECD countries, a student with a high-risk profile who comes from a disadvantaged family has an 83% probability of low achievement in mathematics, compared with a 76% probability for a student who comes from a socio-economically average family and a 64% probability for an advantaged students. These findings show that while differences in socio-economic status matter, other factors have to be considered too when designing policies to tackle low performance among students.

Which of the other student characteristics are most strongly related to low performance? On average across OECD countries, the variables related to the students' progress through education are associated with larger increases in the probability of low performance compared with variables related to students' demographic background. In particular, repeating a grade leads to an increase in the probability of low performance in mathematics of 28 percentage points for disadvantaged students, 30 percentage points for socio-economically average students, and 29 percentage points for socio-economically advantaged students (see the "Repeated a grade" category in Figure 2.19). This does not necessarily mean that repeating a grade once or more in primary or secondary school causes low performance; but it does show that when students of similar socio-economic, demographic and education backgrounds are compared, by far the largest proportions of low performers are found among students who have repeated a grade.

Enrolment in a vocational track is also a major risk factor. Combined with all other risks, attending a vocational programme leads to an increase in the probability of low performance of 7 percentage points for disadvantaged students, 9 percentage points for socio-economically average students, and 12 percentage points for advantaged students, on average across OECD countries (see "vocational track" in Figure 2.19). For all socio-economic groups, the probability of low performance in mathematics is greater than 50% only for students who have repeated a grade and/or are enrolled in a vocational track. In other words, a student who has never repeated a grade and is enrolled in a general track could be a girl living in a disadvantaged, single-parent family with an immigrant background whose mother tongue is not the same as the language spoken in school, and she would still be expected to score above the baseline level of proficiency in mathematics, based on OECD average estimates. (See Table 2.21 for specific values for each country, and Figure 2.20 hereafter for the variation across groups of countries).

Of the demographic characteristics considered in this analysis, gender and immigration background matter the most. On average across OECD countries, being a girl leads to an increase of 4 percentage points for disadvantaged students, 3 percentage points for socio-economically average students, and 2 percentage points for advantaged students in the probability of low performance in mathematics. Having an immigrant background increases the probability by 5 percentage points, 4 percentage points and 3 percentage points, respectively, for these groups of students.

The figure also reveals that the difference between advantaged and disadvantaged students in the low-risk scenario (a gap of 12 percentage points) becomes even larger under high-risk conditions (a gap of 19 percentage points). This is because student characteristics can affect the probability of low performance among advantaged and disadvantaged students differently. There are some student characteristics, notably all demographic variables and attendance at pre-primary education, that affect disadvantaged students more than they affect advantaged students (i.e. the increase in the probability of low performance is larger), on average across OECD countries. Only repeating a grade and enrolment in a vocational track have greater penalties for advantaged students. Overall, the widening of the gap across the risk spectrum indicates that the concentration of different kinds of risk factors is more detrimental to disadvantaged students. In other words, disadvantaged students tend not only to be encumbered with more risk factors than advantaged students, but those risk factors have a stronger impact on these students' performance.

Different patterns of risk accumulation across countries

Different patterns of risk accumulation are observed in the PISA 2012 data, as shown in Figure 2.20. All countries and economies that participated in PISA 2012 are included in one of the four groups of countries in the figure. The main distinction between the groups is the way the difference in the probability of low performance that is related to socio-economic status varies across the risk spectrum. In the first and second groups (Panels A and B, respectively), the difference (related to socio-economic status) in the probability of low performance in mathematics increases from low-risk to high-risk profiles; in the third group of countries (Panel C), the difference remains stable across the risk spectrum; and in the fourth group (Panel D), the difference decreases in higher-risk profiles.

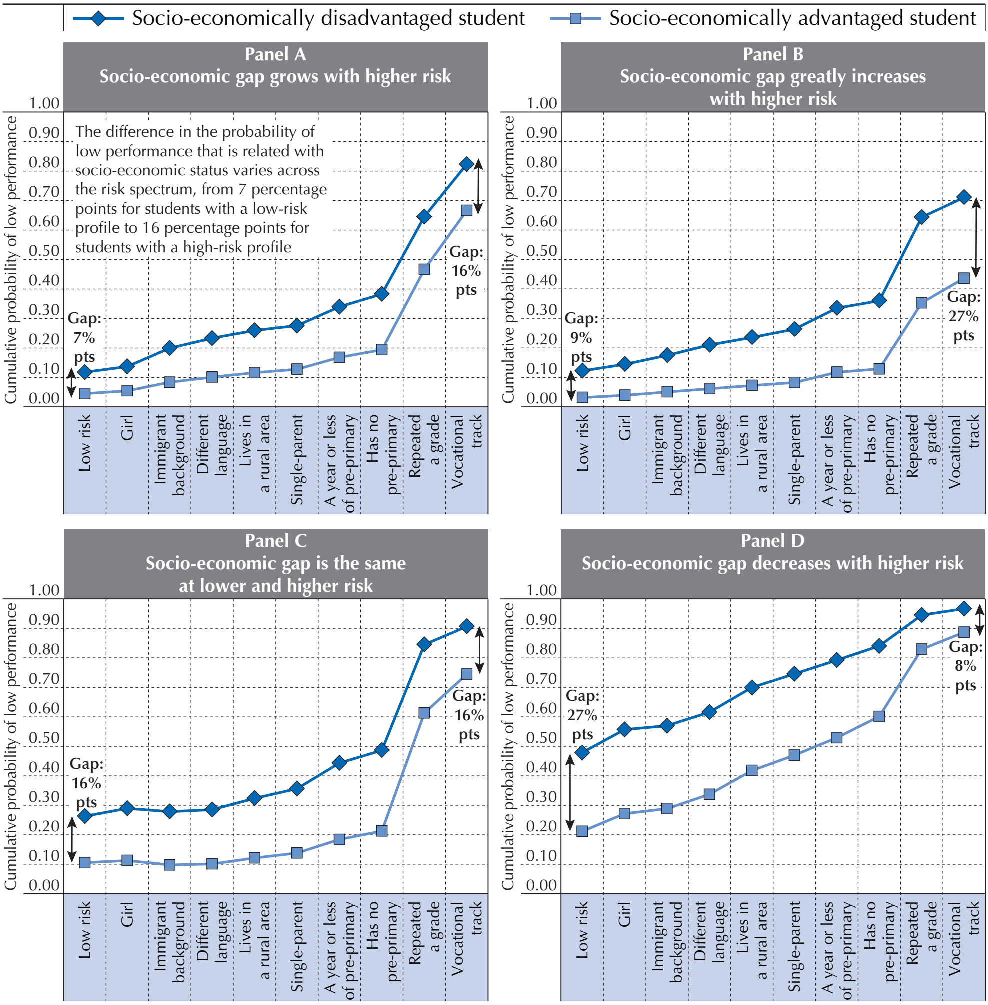
The first group in Figure 2.20 is composed of eight countries (five OECD and three partner countries). These countries show a pattern of risk accumulation that is similar to the OECD average, i.e. the difference in probability of low performance related to socio-economic status grows as more risk factors are added (Panel A). In these countries, the difference in the cumulative probability of low performance between disadvantaged and advantaged students is 7% for students with a low-risk profile and 16% for students with a high-risk profile – an increase of 8 percentage points from low-risk to high-risk profiles. The probability increases because in these countries, the "penalty" that is associated with each of the risk factors under analysis is slightly greater for disadvantaged students than for advantaged students (with the exception of grade repetition and enrolment in a vocational track, where the penalty is slightly greater for advantaged students).

In the second group of countries (Panel B), this difference related to socio-economic status not only increases from low risk to high risk profiles, but does so by a much larger magnitude than the OECD average. Twenty-five countries and economies are part of this group (17 OECD and 8 partner countries and economies), including many countries and economies that were top performers in PISA 2012 (e.g. Estonia, Hong Kong-China, Japan, Korea, Shanghai-China, Singapore, Switzerland and Chinese Taipei). In this group of countries/economies, the difference in the probability of low performance between disadvantaged and advantaged students is 9 percentage points under the low-risk scenario and 27 percentage points under the high-risk scenario – a difference of 18 percentage points. What differs here from the countries in Panel A is that in this group of countries, the penalty for having attended a year or less of pre-primary education (a 7 percentage-point increase for disadvantaged students and a 3 percentage-point increase for advantaged students) and for having repeated a grade (a 28 percentage-point increase for disadvantaged students and a 22 percentage-point increase for advantaged students) is much greater for disadvantaged students than for advantaged students.

■ Figure 2.20 ■

Patterns of risk accumulation across countries

Cumulative probability of low performance in mathematics across risk profiles



Notes: Risk profiles are based on students' socio-economic, demographic and educational background characteristics.
Panel A is the average of the following 8 countries: Croatia, Finland, Iceland, Italy, the Netherlands, the Russian Federation, Spain and Viet Nam.
Panel B is the average of the following 25 countries and economies: Australia, Austria, Belgium, Canada, Denmark, Estonia, Germany, Hong Kong-China, Ireland, Japan, Korea, Latvia, Liechtenstein, Luxembourg, Macao-China, New Zealand, Norway, Poland, Portugal, Serbia, Shanghai-China, Singapore, Switzerland, Chinese Taipei and the United States.
Panel C is the average of the following 9 countries: the Czech Republic, France, Hungary, Kazakhstan, Lithuania, Slovenia, Sweden, the United Arab Emirates and the United Kingdom.
Panel D is the average of the following 21 countries: Argentina, Brazil, Bulgaria, Chile, Colombia, Costa Rica, Greece, Indonesia, Israel, Jordan, Malaysia, Mexico, Montenegro, Peru, Qatar, Romania, the Slovak Republic, Thailand, Tunisia, Turkey and Uruguay.
Coefficient estimates come from a multivariate logistic regression with low performance in mathematics as the outcome and each of the variables in the figure as a covariate.
Source: OECD, PISA 2012 Database, Table 2.21.
StatLink *http://dx.doi.org/10.1787/888933315457*

In a third group of 9 countries (6 OECD and 3 partner countries), there is a 16 percentage-point difference in the probability of mathematics underachievement related to socio-economic status, and it does not change across the risk spectrum (Panel C). In this group of countries, the penalty for repeating a grade (a 36 percentage-point increase in probability for disadvantaged students and a 40 percentage-point increase for advantaged students) and for being enrolled in a vocational track (a 6 percentage-point increase in probability for disadvantaged students and a 13 percentage-point increase for advantaged students) is greater for advantaged students. But the increase in probability of low performance related to demographic risk factors and to not having attended pre-primary education is still slightly larger for disadvantaged students than for advantaged students.

The pattern that diverges the most from the OECD average is found among the group of 21 countries (6 OECD and 15 partner countries) where the difference in the probability of low performance in mathematics related to socio-economic status does not grow but, instead, shrinks in the higher-risk profiles (Panel D). Many of these countries are those with large shares of low performers in mathematics (e.g. Argentina, Brazil, Chile, Colombia, Costa Rica, Indonesia, Jordan, Mexico, Montenegro, Peru, Qatar, Tunisia and Uruguay). In these countries, the difference in probability related to socio-economic status for students with a low-risk profile is, at 27 percentage points, much larger than that observed in the other three groups, and the difference in probability of low performance for students with a high-risk profile is much smaller (8 percentage points) than seen in the other groups. In this group of countries, repeating a grade carries a particularly high penalty for advantaged students (a 23 percentage-point increase in probability) compared with the penalty for disadvantaged students (a 10 percentage-point increase). Being enrolled in a vocational track and having attended a year or less of pre-primary school also carries a higher penalty for advantaged students in these countries.

When interpreting these results, countries should consider the percentage of low performers who have these characteristics. On average across OECD countries, out of all low performers in mathematics, 43% come from disadvantaged families, 51% are girls, 18% have an immigrant background, 15% speak a different language at home than at school, 35% live in rural areas, 20% live in single-parent families, 11% had not attended pre-primary education, 30% had repeated a grade, and 26% attend a vocational programme (see Table 2.22 for each country and economy).

In some countries, the share of some of these groups among the total population of low performers is noticeably greater than the OECD average. For example, in Shanghai-China, Singapore and Chinese Taipei, more than half of low performers come from the 25% most disadvantaged families, and these countries belong to the group shown in Panel B, where the probability of low performance increases steeply for disadvantaged students under conditions of higher risk. In Shanghai-China, 42% of low performers had repeated a grade and 38% are enrolled in a vocational programme. In Singapore, 73% of low performers speak a language at home that is different from the one spoken at school. In Chinese Taipei, 54% of low performers are enrolled in a vocational programme (Table 2.22). This information can help policy makers to tailor support for low performers more effectively.

Similarly, countries in the other groups might want to focus on specific populations of low performers. For example, in Turkey, more than 80% of low performers had not attended pre-primary school. In Germany, 48% of low performers had repeated a grade. In France, 30% of low performers

have an immigrant background, and 74% had repeated a grade. In Chile, where gender has a stronger impact on the likelihood of low performance among disadvantaged students, 58% of low performers in mathematics are girls (Table 2.22).

The policy implications from these findings are clear, and policy makers might want to tailor their policies to address the patterns of risk specific to their own countries. In most countries, students' demographic characteristics and a lack of pre-primary education carry a greater penalty for disadvantaged students, thereby reinforcing their already higher risk of low performance relative to advantaged students. In some countries, particularly in top-performing countries, the penalty for repeating a grade and for attending less than a year of pre-primary school is much greater for disadvantaged students. In other countries, particularly those with large shares of low performers, the differences related to socio-economic status are very large to begin with; but grade repetition, a lack of pre-primary education and being enrolled in a vocational track carry a greater penalty for socio-economically advantaged students. In still other countries, the risk factors for low performance analysed in this chapter affect students of different socio-economic status in similar ways. Chapter 6 discusses in greater depth how policy can be designed to address these diverse and complex relationships.

Notes

1. The *PISA index of economic, social and cultural status* (ESCS) is derived from the following three indices: *highest occupational status of parents* (HISEI), *highest educational level of parents*, in years of education according to ISCED (PARED), and *home possessions* (HOMEPOS). The *index of home possessions* (HOMEPOS) comprises all items on the indices of WEALTH, CULTPOSS and HEDRES, as well as books in the home recoded into a four-level categorical variable (0-10 books, 11-25 or 26-100 books, 101-200 or 201-500 books, more than 500 books). The *PISA index of economic, social and cultural status* (ESCS) is derived from a principal component analysis of standardised variables (each variable has an OECD mean of zero and a standard deviation of one), taking the factor scores for the first principal component as measures of the *PISA index of economic, social and cultural status*. Principal component analysis was also performed for each participating country or economy to determine the extent to which the components of the index operate in similar ways across countries and economies. The analysis revealed that patterns of factor loading were very similar across countries and economies, with all three components contributing to a similar extent to the index (for details on reliability and factor loadings, see the *PISA 2012 Technical Report* (OECD, 2014c).

2. When, as in this case, the inclusion of a variable or set of variables in a regression equation increases the predictive validity (i.e. magnitude of the regression coefficient) of an independent variable, this is known as a "suppression effect" or "inconsistent mediation" (MacKinnon, Krull and Lockwood, 2000; Tzelgov and Henik, 1991; Conger, 1974).

3. The "single-parent" category includes students who declared living in a "single-parent family" and in "other types" of family. Comparisons are made between these two groups combined and students living in "two-parent" families.

4. PISA defines rural areas as locations with fewer than 3 000 inhabitants, towns are those with between 3 000 and 100 000 inhabitants, and cities are locations with more than 100 000 inhabitants. In this analysis, towns and cities are grouped together because they present a similar distribution of low performers in mathematics across OECD countries: 21% of students in cities and 22% of students in towns are low performers, on average across OECD countries, when these groups are considered separately.

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3

Engagement, Motivation and Self-Confidence among Low-Performing Students

Students' attitudes towards learning, and their behaviour in and outside of school, have a considerable impact on their performance. This chapter examines the strength of the associations between low performance and the amount of time and effort students invest in learning, students' perseverance and motivation in completing their schoolwork, and students' sense of their own academic abilities and well-being at school.

The statistical data for Israel are supplied by and under the responsibility of the relevant Israeli authorities. The use of such data by the OECD is without prejudice to the status of the Golan Heights, East Jerusalem and Israeli settlements in the West Bank under the terms of international law.

I'm a great believer in luck, and I find the harder I work the more I have of it.
- Unknown

Low-performing students are often portrayed as lacking the necessary engagement, drive and self-beliefs to succeed in school. By playing truant, students miss out on learning opportunities, increase the likelihood of dropping out of school entirely (Salisbury, Rees and Gorard, 1999), and limit their lifelong employment opportunities. By defying authority and escaping adult supervision, truants may acquire the wrong set of skills: those needed for becoming a better delinquent (Sutphen, Ford and Flaherty, 2010). However, being physically present at school is not enough. Without perseverance, motivation, courage and self-esteem, students may fail to make the most of available learning opportunities (Akey, 2006; Christenson, Reschly and Wylie, 2012), regardless of their aptitude, school resources, teaching quality and even how much time they spend in educational activities.

The social and emotional problems that low performers often develop and reinforce in school, such as tardiness, disengagement, apathy and/or anxiety, may resurface later in life (Bennett and Offord, 2001). After all, the school environment is not radically different from the organisations most students will join as adults, including universities, private companies and public administrations. The attitudes they cultivate in school can help them to adapt to different social roles. There is no reason to believe that problems of perseverance, disaffection, motivation and self-confidence will automatically disappear as 15-year-olds progress to the next stage of life. Even if these problems were related to the upheavals of adolescence, the impact of low performance and disaffection at school may be felt well into adulthood.

What the data tell us

- On average across OECD countries, low performers tend to skip classes or days of school more, and have less perseverance, motivation and self-confidence in mathematics than better-performing students. However, they spend a similar amount of time in some mathematics activities, such as programming computers or taking part in mathematics competitions, and are more likely to participate in a mathematics club and play chess after school.
- Students who had skipped school at least once in the two weeks prior to the PISA test are three times more likely to be low performers in mathematics than students who had not skipped school.
- Compared to better-performing students in mathematics, low performers are less likely to report that they complete mathematics tasks successfully, such as "finishing homework on time" or being "prepared for exams", than they are to report that they "work hard on homework" or "study hard for quizzes". This suggests their investment in after-school learning activities might be relatively unproductive.

Students' attitudes towards school and learning are important well beyond their influence on academic and professional success. Feeling safe, socially connected and happy at school should

be considered ends in themselves, especially since school is a primary venue for socialisation. The importance of students' well-being is reflected in the unique importance parents give to a pleasant, active and safe environment when choosing a school for their child (OECD, 2015a), and in the strong consensus among teachers that the social and emotional development of students is as important as their acquisition of knowledge and skills (OECD, 2013a).

New analyses in this chapter focus on low performers' attitudes towards learning, and how these attitudes may differ from those held by better-performing students. It is vital for education systems to understand the role attitudes play in student learning, particularly for low performers, if only because fostering positive attitudes can result in significant improvements in performance at little cost (Dweck, 2006). Particularly in contexts of severe budgetary constraints, the value of greater student engagement, perseverance, motivation and self-confidence cannot be overstated.

The results are based on correlational evidence and only identify patterns of association between students' attitudes and educational outcomes. Any causal claims in this chapter should be downplayed or considered inexact.

INVESTING TIME AND EFFORT

The most effective tools that students, particularly low performers, have at their disposal to develop their skills and make the most of available opportunities are time and attention. Students need to invest enough of their time in learning activities and be more engaged with the task at hand. To be fair, it is not always 15-year-olds who decide how much time and concentration they put into academic tasks, and even less so how productive these efforts are. Learning time, for instance, can too easily turn into wasted time if teaching practices are not effective. Education systems and schools vary in the time they allocate to a given subject; after-school activities can be proposed, imposed or disregarded by parents; students have little say in who is selected to be their classmates; and students have little to no influence on the quality of the school's physical infrastructure, educational resources or teachers (see Chapters 4 and 5 for further details). Still, education systems should make sure that every student makes the most of available learning opportunities. To start with, this means having every student physically and mentally present at school.

Showing up at school

From laws banning child labour and early marriage to offering compulsory free schooling, education systems around the world have pursued different strategies to get children to school, and with positive results overall (Barro and Lee, 2013). The rationale behind compulsory education is that learning occurs primarily, although not exclusively, in school, and that higher enrolment and attainment rates benefit both individuals and society as a whole (Lleras-Muney, 2002; Oreopoulos, 2006). Regular school truants not only miss learning opportunities, they are also more likely to drop out of school altogether (Tidwell, 1988).

Even though access to education was one of the *Education For All* goals for 2015, not every 15-year-old is enrolled in school. In some OECD countries, such as Mexico and Turkey, more than 20% of students were not enrolled in grade 7 or above in 2012; in Albania and Viet Nam, more than 30% of 15-year-olds were not enrolled (OECD, 2013b). Even in countries with high enrolment rates, a lack of punctuality and absenteeism means that many adolescents are missing learning opportunities; and low performers are missing these opportunities the most. Among PISA-participating countries and economies, only in Turkey do low performers in mathematics attend school more regularly than students who score at proficiency Level 2 or above on the PISA mathematics assessment, and about half of them reported that they had skipped a day of school at least once during the two weeks prior to the PISA test (Figure 3.1). In every education system except those in Albania, Liechtenstein, Qatar and Turkey, low performers are more likely to report that they had skipped a day of school. In Lithuania, for instance, more than 1 in 3 low performers in mathematics played truant at least once in the two weeks prior to the PISA test, but only 1 in 8 students who scored above the baseline proficiency level did.

As Figure 3.2 shows, being engaged at school pays off academically, even after accounting for various student characteristics. On average across OECD countries, students who reported that they had skipped an entire school day were three times as likely to be low performers in mathematics than students who had not skipped school in the two weeks prior to the PISA test, and more than twice as likely after accounting for students' socio-economic status, gender, immigrant background and attendance at pre-primary education. In Japan and Chinese Taipei, having skipped a school day at least once during those two weeks increased the probability of being a low performer in mathematics fivefold, after accounting for the above-mentioned student characteristics; in Shanghai-China the probability was increased six times, and in Korea, almost tenfold (Table 3.2a). In fact, in Korea, where only 9% of students were low performers in mathematics (Table 1.1), more than 50% of the comparatively few students who had skipped a school day did not attain the baseline level of proficiency in mathematics. Meanwhile, across OECD countries, students who had skipped some classes or arrived late for school at least once during the two weeks prior to the PISA test were about twice more likely to be low performers in mathematics than those who had not skipped classes or arrived late for school, after accounting for their socio-economic status, gender, immigrant background and attendance at pre-primary education (Figure 3.2).

Making the most of after-school time

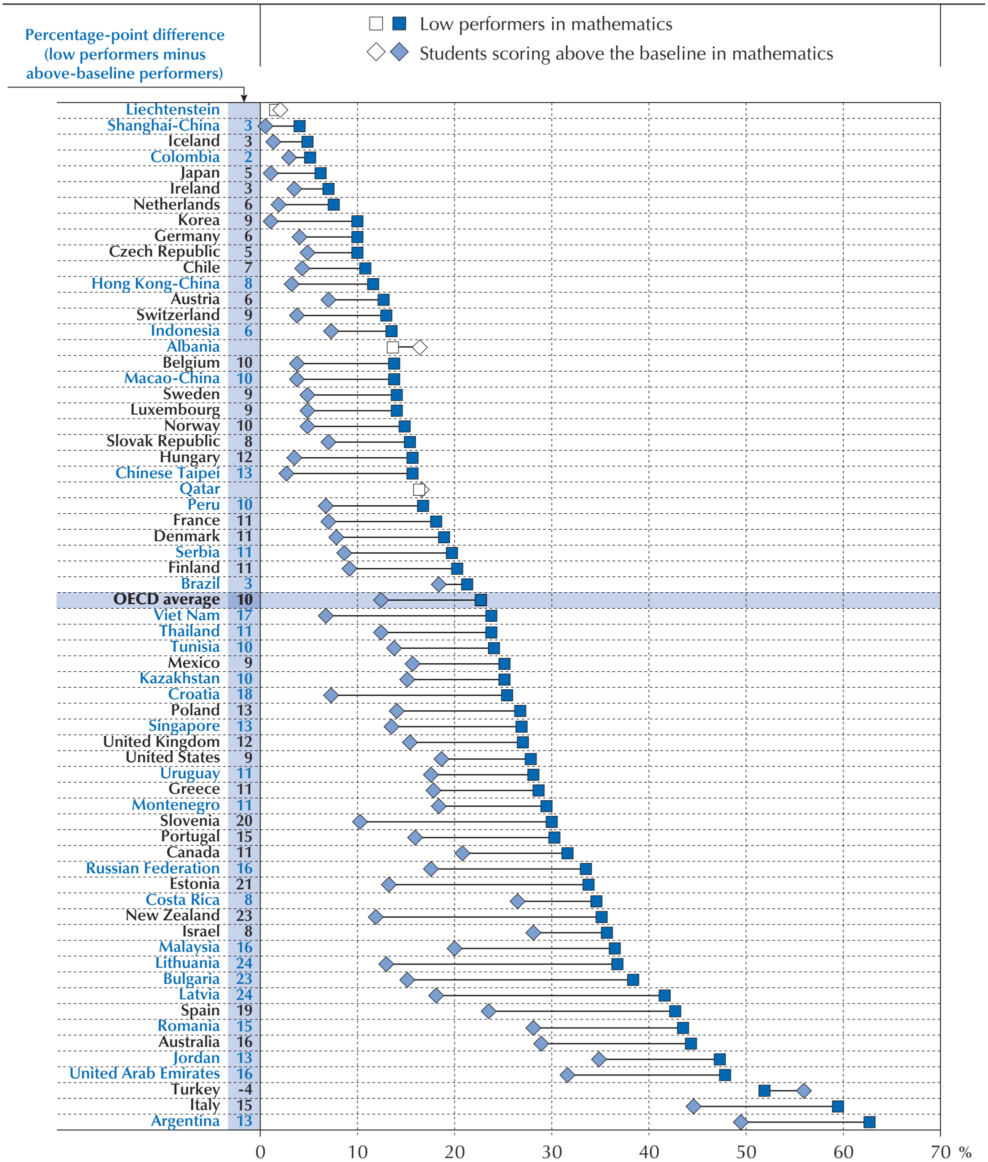
Most education systems expect 15-year-olds to complete academic tasks after school hours. Homework is generally assigned to expand students' knowledge, ensure that the material covered in class is understood and retained, and/or to help low performers catch up with their better-performing peers. Do low performers dedicate enough time to school assignments outside of school?

In PISA 2012, students were asked to report how much time they spend each week on homework or other study set by their teachers. Since the amount of homework assigned depends on teacher practices, school cultures and homework traditions in a given society, the comparison in this chapter is also made among students in the same school in order to assess student self-discipline separately from the amount of homework assigned by their schools.

■ Figure 3.1 ■

Truancy and low performance

Percentage of students who had skipped school at least once in the two weeks prior to the PISA test



Note: Statistically significant percentage-point differences between students who are low performers and those who are not are marked in a darker tone and are shown next to the country/economy name.

Countries and economies are ranked in ascending order of the percentage of low-performing students in mathematics who had skipped school at least once in the two weeks prior to the PISA test.

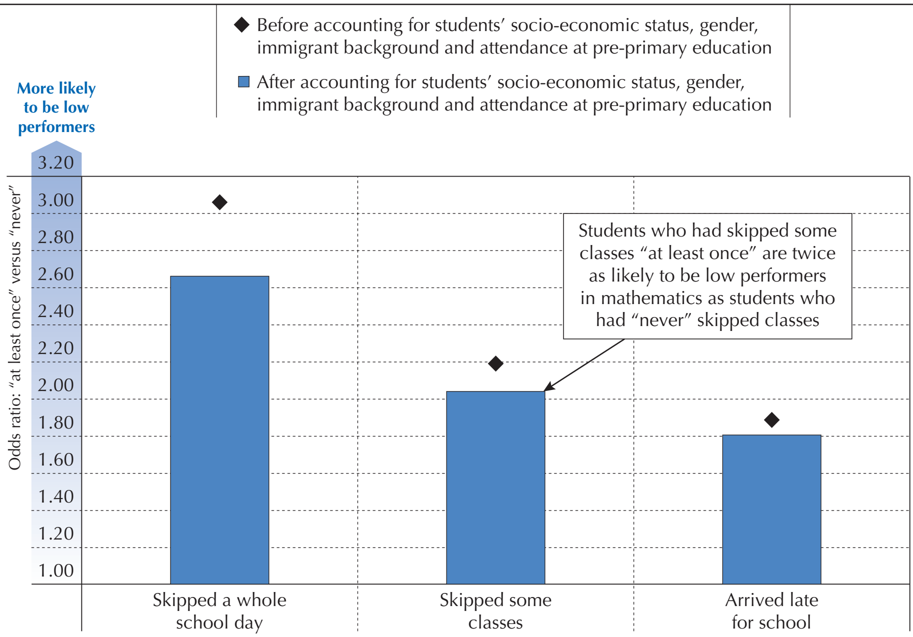
Source: OECD, PISA 2012 Database, Table 3.1.

StatLink http://dx.doi.org/10.1787/888933315463

■ Figure 3.2 ■

Truancy and the likelihood of being a low performer in mathematics

OECD average



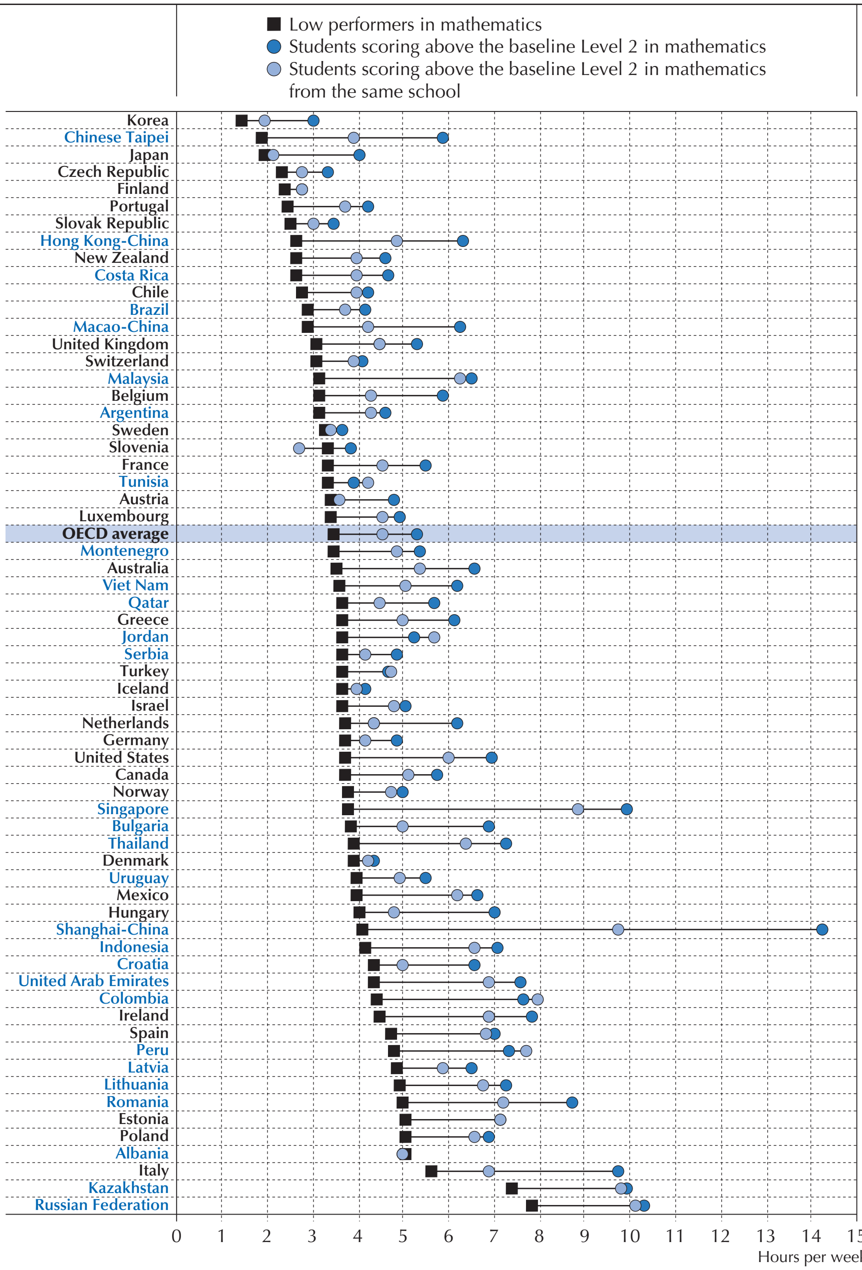
Note: All coefficients are statistically significant.
Source: OECD, PISA 2012 Database, Tables 3.2a, b and c.
StatLink http://dx.doi.org/10.1787/888933315471

Low performers are not devoting enough time to homework – at least not more than their better-performing peers – to close the performance gap. Across OECD countries, low performers in mathematics spend about 3.5 hours per week on homework, almost two hours less than students across the entire school system who score above the baseline proficiency level in mathematics, and about one hour less than better-performing students in their own schools (Figure 3.3). In every PISA participating country and economy except Albania, Iceland and Slovenia, low performers spend less time on homework than better-performing students (Table 3.3). As expected, these absolute differences tend to be smaller in education systems where the average student does less homework, such as in Denmark, Finland, Iceland and Sweden, and greater where there is more homework, as in Italy, Shanghai-China and Singapore. This suggests that there may be more effective ways for school systems to tackle low performance than by assigning more homework – which seems to widen performance differences instead.

The difference in time devoted to homework could shrink by an average of 50 minutes across OECD countries if low performers were not concentrated in schools where the average student does less homework (see Chapter 4 for a discussion on the concentration of low-performing students in schools).

■ Figure 3.3 ■

Hours spent doing homework and low performance



Countries and economies are ranked in ascending order of the number of hours low performers in mathematics spend doing homework.

Source: OECD, PISA 2012 Database, Table 3.3.

StatLink *http://dx.doi.org/10.1787/888933315481*

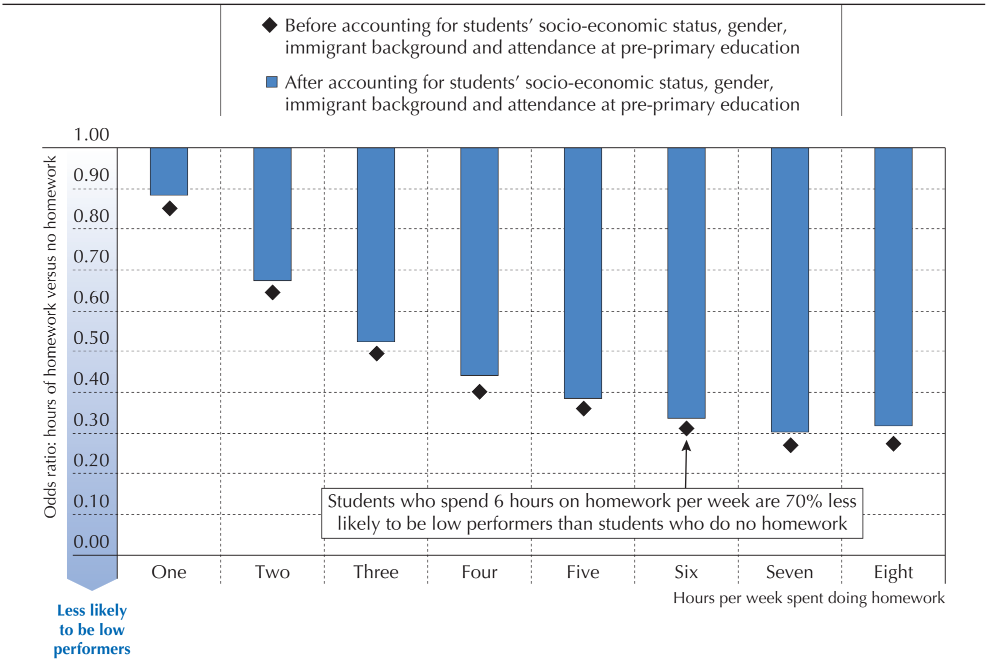
This "homework gap" could narrow by as much as 91% in Japan, 84% in Austria and more than 70% in Croatia, Hungary, the Netherlands and Sweden (Table 3.3). In absolute terms, the difference could shrink the greatest in Hungary, Italy, Macao-China, Shanghai-China and Chinese Taipei. In Shanghai-China, for instance, low performers in mathematics spend almost four hours per week on homework – ten hours less than students who score above the baseline level of proficiency across the school system, but "only" around six hours less than better-performing students in their own schools.

Performance in mathematics is strongly associated with the time spent on homework. On average across OECD countries, students who reported devoting more time to homework were less likely to perform below the baseline level of proficiency in mathematics, even after accounting for their socio-economic status, gender, immigrant background and attendance at pre-primary education (Figure 3.4). Spending one hour per week on homework may seem trivial, but it is associated with a 15% reduction in the probability of being a low performer in mathematics compared to doing no homework. Devoting two hours per week is associated with a 36% reduction in that likelihood, and spending three hours per week is associated with a 50% reduction. The probability keeps decreasing as the number of hours spent on homework increases – but only up to a point, after which there are diminishing returns on the investment.

■ Figure 3.4 ■

Hours spent doing homework and the likelihood of being a low performer in mathematics

OECD average



Note: All coefficients are statistically significant.
Source: OECD, PISA 2012 Database, Table 3.4.
StatLink http://dx.doi.org/10.1787/888933315490

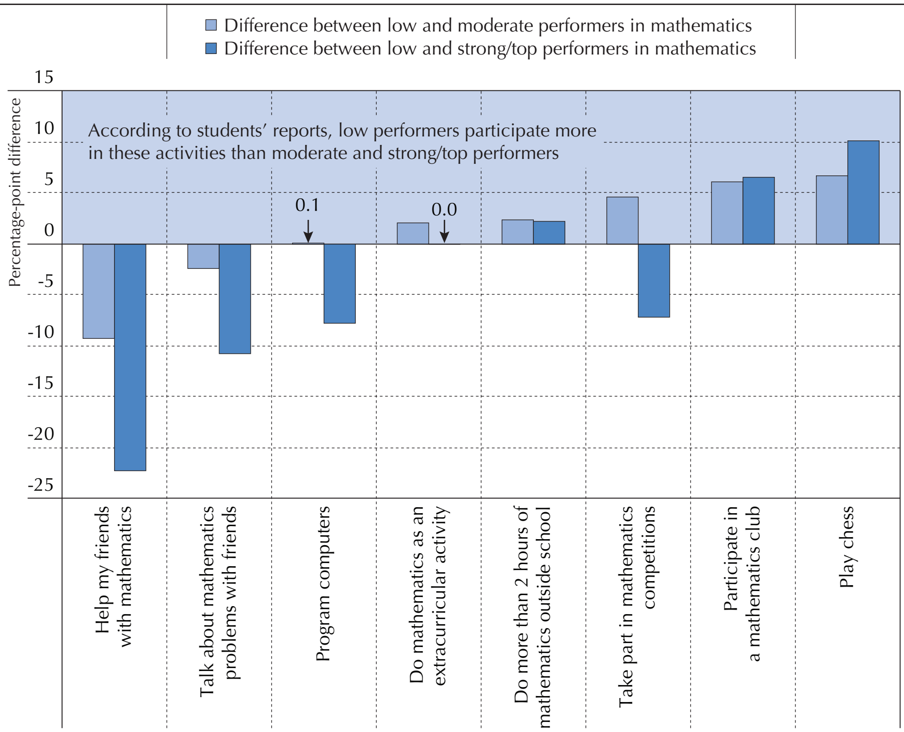
The reasons for this vary: students may lose their concentration after a certain amount of time; spending more hours on homework may be associated with repetitive learning tasks; or low-performing students may require more time to complete tasks, as suggested in Figure 3.6.

While low performers are less likely than their better-performing peers to devote their spare time to compulsory educational activities, such as attending school and doing homework, they are, perhaps surprisingly, as likely as better-performing students to participate in voluntary activities that help them to develop their numeracy skills. On average across OECD countries, low performers are somewhat more likely than students who score at Level 2 or 3 in mathematics (moderate performers) to do mathematics as an extracurricular activity and study mathematics for more than two hours every day after school (Figure 3.5). While low-performing

■ Figure 3.5 ■

Participation in mathematics-related activities, by performance in mathematics

Students who reported participating in mathematics-related activities "sometimes", "often" or "always", OECD average



Notes: All differences are statistically significant, with the exception of the difference between low and moderate performers in mathematics for the "program computers" category and the difference between low and strong/top performers in mathematics for the "do mathematics as an extracurricular activity" category.
Moderate performers score at Level 2 or 3 in mathematics, strong performers score at Level 4, and top performers score at Level 5 or 6.
Source: OECD, PISA 2012 Database, Tables 3.5a to 3.5h.
StatLink http://dx.doi.org/10.1787/888933315502

students may be encouraged or compelled by their parents and schools to do so, both behaviours are associated with an interest in mathematics (see discussion below and Figure 3.11).

Among all PISA-participating countries and economies, only in Greece, Japan, Korea, Malaysia, Portugal, Shanghai-China, Singapore, Chinese Taipei and Viet Nam are moderate performers in mathematics more likely than low performers to report doing mathematics more than two hours a day outside of school, and only in Austria, Estonia, Finland, Greece, Korea, Malaysia, Chinese Taipei and Viet Nam are they more likely to report doing mathematics as an extracurricular activity (Tables 3.5c and e). Measuring and understanding the participation rates in extracurricular activities is crucial if governments, particularly those with a long tradition of private tutoring and large participation gaps in favour of top performers, like East Asian countries/economies (Bray and Lykins, 2012), want to make sure that their efforts to develop more inclusive school systems are not undermined by what happens outside of school.

Low performers also appear to be more likely than better-performing students to participate in some voluntary mathematics-related activities, such as mathematics clubs and playing chess. For instance, on average across OECD countries, low performers in mathematics are 7 percentage points more likely to report playing chess than moderate performers, and more than 10 points more likely than strong and top performers, or students who score at Level 4, 5 or 6 (Figure 3.5 and Table 3.5g). This means that many low performers do not necessarily shun activities that require numeracy skills and mental effort, at least when these are presented as recreational and are based on social interactions. The challenge for education systems is to make school activities and tasks more engaging so that every student wants to participate and invest effort in solving mathematics problems.

Using school time productively

Everyone has experienced, at some point, the crucial difference between being only physically present and being actively engaged in a task. Spending more time in educational activities will not automatically result in better social, emotional and academic skills (Kohn, 2006). The quality of those activities is as important, if not more so, than the amount of time spent on them (Shernoff, 2010). Across OECD countries, low performers invest less of their time in compulsory academic activities after school, particularly homework (Figure 3.3); but do they also use that time less productively?

In PISA 2012, students were asked to report if they work hard on mathematics homework and study hard for mathematics quizzes. These are good indicators of effort and self-discipline because, even if disadvantaged students face some barriers when studying at home (OECD, 2014a), in most cases these barriers are not too serious to prevent them from working and studying hard. Also, by comparing these questions with the expected outcomes of doing homework and studying, such as “finish homework on time” or “being prepared for exams”, it is possible to determine how productive students perceive their efforts to be.

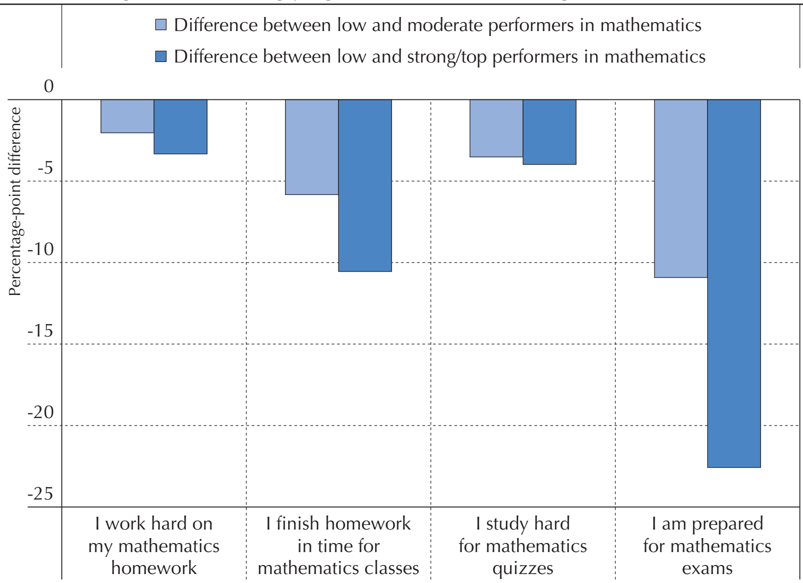
Students above the baseline level of proficiency are much more likely than low performers to agree or strongly agree with statements about learning outcomes, such as that they complete homework or that they are well-prepared for mathematics exams, as opposed to statements that mainly describe the effort that students invest in after-school learning activities (Figure 3.6).

These results suggest that low performers perceive their investment to be relatively ineffective; they need more time to complete mathematics tasks. Which comes first, inefficiency or disengagement, is difficult to tell with the available data. Still, this perceived lack of efficiency seems to be the product of reinforcement and cumulative effects (Nurmi et al., 2003) and may explain why low-performing students spend less time doing assigned homework.

■ Figure 3.6 ■

Differences in mathematics work ethic between low performers and better-performing students

Students who "agree" or "strongly agree" with the following statements, OECD average



Notes: All differences are statistically significant.
Moderate performers are students scoring at Levels 2 and 3 in mathematics, strong performers at Level 4, and top performers at Levels 5 and 6.
Source: OECD, PISA 2012 Database, Tables 3.6a, b, c and d.
StatLink http://dx.doi.org/10.1787/888933315514

There are probably many reasons for this perceived lack of effectiveness, such as an inappropriate place to study at home, inadequate parental guidance and supervised learning, or the fact that these students are starting out with an academic disadvantage. However, PISA 2012 shows that low performers also find it difficult to concentrate fully on the task at hand. As Tables 3.6e and f show, in most education systems that participated in PISA 2012 low performers are less likely than the best-performing students to "agree" or "strongly agree" that they pay attention or listen in mathematics class. The largest differences in self-reported concentration are observed mainly in East Asian and Scandinavian countries, a pattern that is observed when analysing other attitudes towards learning. Low-performing students reported more attitudinal problems in education systems where they are a minority, at least when they are compared to better-performing students in the same education system (see Box 3.2 on the Korean paradox).

Another indication of the lack of concentration among low performers is found in students' attitudes towards the PISA test itself. After they had completed the assessment, students were asked to indicate how much effort they had invested in it compared to the effort they would have invested in a real situation that is highly important to them. On a scale of 1 to 10, where 1 represents minimum effort and 10 maximum effort, on average across OECD countries, students who score above the baseline level of proficiency in mathematics reported an investment of effort that was about half a point more than that reported by low performers (Figure 3.7). This difference might seem trivial, but it is significant in 7 out of 10 PISA-participating countries and economies. The largest differences were observed in Scandinavian and East Asian countries, with English-speaking countries, including Australia, Canada, New Zealand and the United Kingdom, following closely behind.

Although students who felt that they performed badly on the test might be reluctant to accept they had invested the same effort as other students, these figures offer yet another indication that low-performing students are not investing enough of themselves in academic activities.

CONNECTING BELIEFS, EMOTIONS AND BEHAVIOUR

PISA 2012 asked students a series of questions about their attitudes towards school, problem solving and mathematics. These questions were later converted into indices by scaling the responses using Item Response Theory. Values were then standardised so that zero represents the OECD average and two-thirds of OECD students lie within the values of 1 and -1. To understand how students' beliefs, emotions and behaviour are interrelated, seven of these indices, plus a newly created *index of school attendance*,[1] are analysed below, focusing specifically on how they interact among low performers.

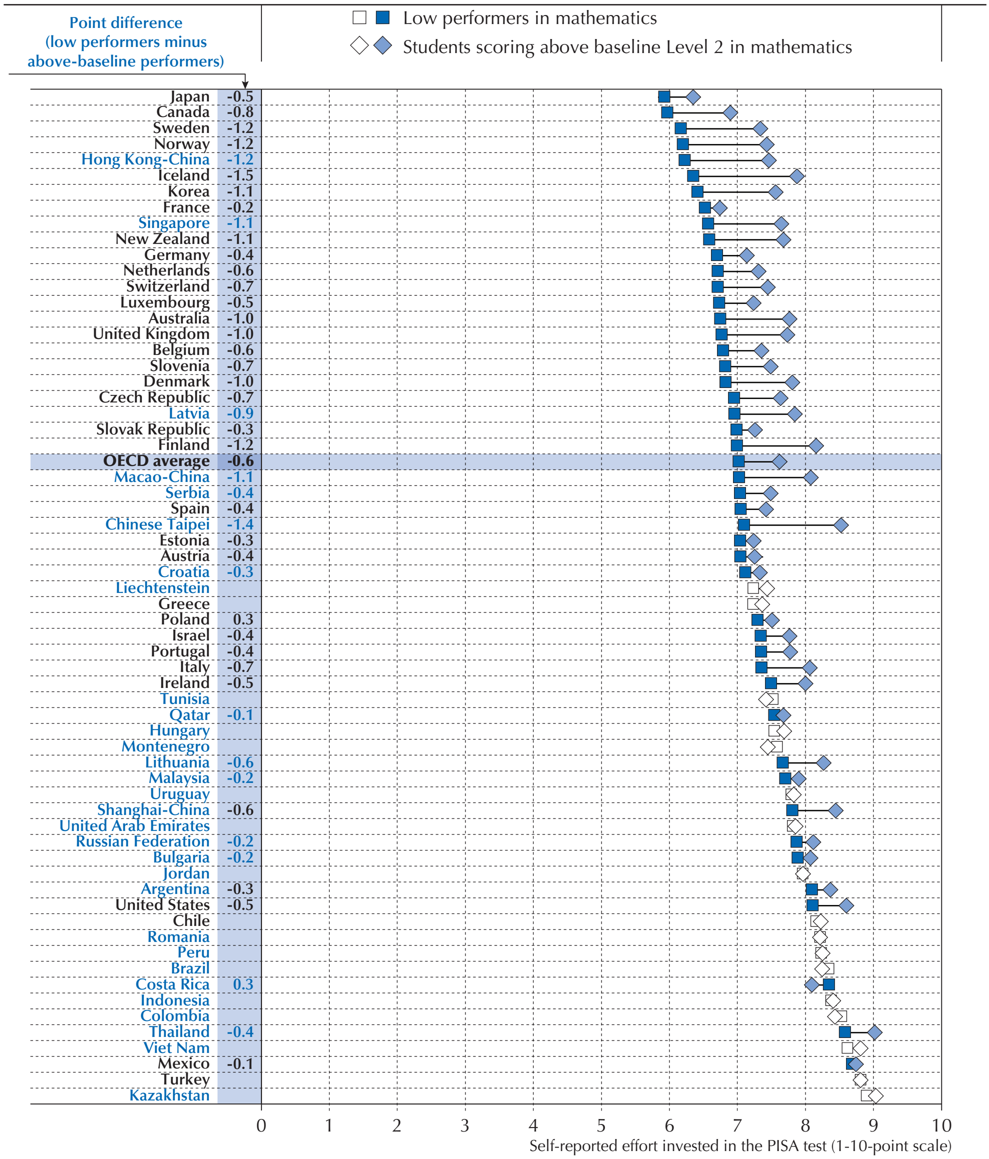
General perseverance and the work ethic in mathematics

Perseverance refers to actual behaviour and can be defined as a general predisposition towards completing goals despite difficulty, lack of progress, failure and lack of motivation (Duckworth and Quinn, 2009). Previous OECD reports and a large body of research show that being perseverant and determined is important for academic success (Duckworth and Seligman, 2006; OECD, 2013a). In PISA 2012, students were asked whether they identified with statements such as "when confronted with a problem, I give up easily" or "I continue to work until everything is perfect". An *index of perseverance*[2] was created to scale and standardise the responses to these statements.

Across OECD countries, low performers in mathematics reported less perseverance than better-performing students (Figure 3.8). In fact, in 59 PISA-participating education systems, low performers scored lower on the *index of perseverance* than their better-performing peers. The largest differences between the groups were observed in Iceland, Jordan, Norway and Portugal. However, this relationship can only be confirmed if students who consider themselves perseverant prove to be so in mathematics tasks (Maehr, 1984; Pintrich, Marx and Boyle, 1993). Mathematics is a challenging subject for many students, and students' general disposition to persevere despite hardship might be true for sports or video games, but not necessarily for mathematics.

■ Figure 3.7 ■

Effort thermometer in the PISA test



Notes: Statistically significant differences between students who are low performers and those who are not are marked in a darker tone and are shown next to the country/economy name.

The PISA effort thermometer measures the effort students invested in the PISA test. The scale ranges from 1 to 10, where 10 indicates that students consider they put as much effort in the PISA test as they would in a real situation that is highly important to them.

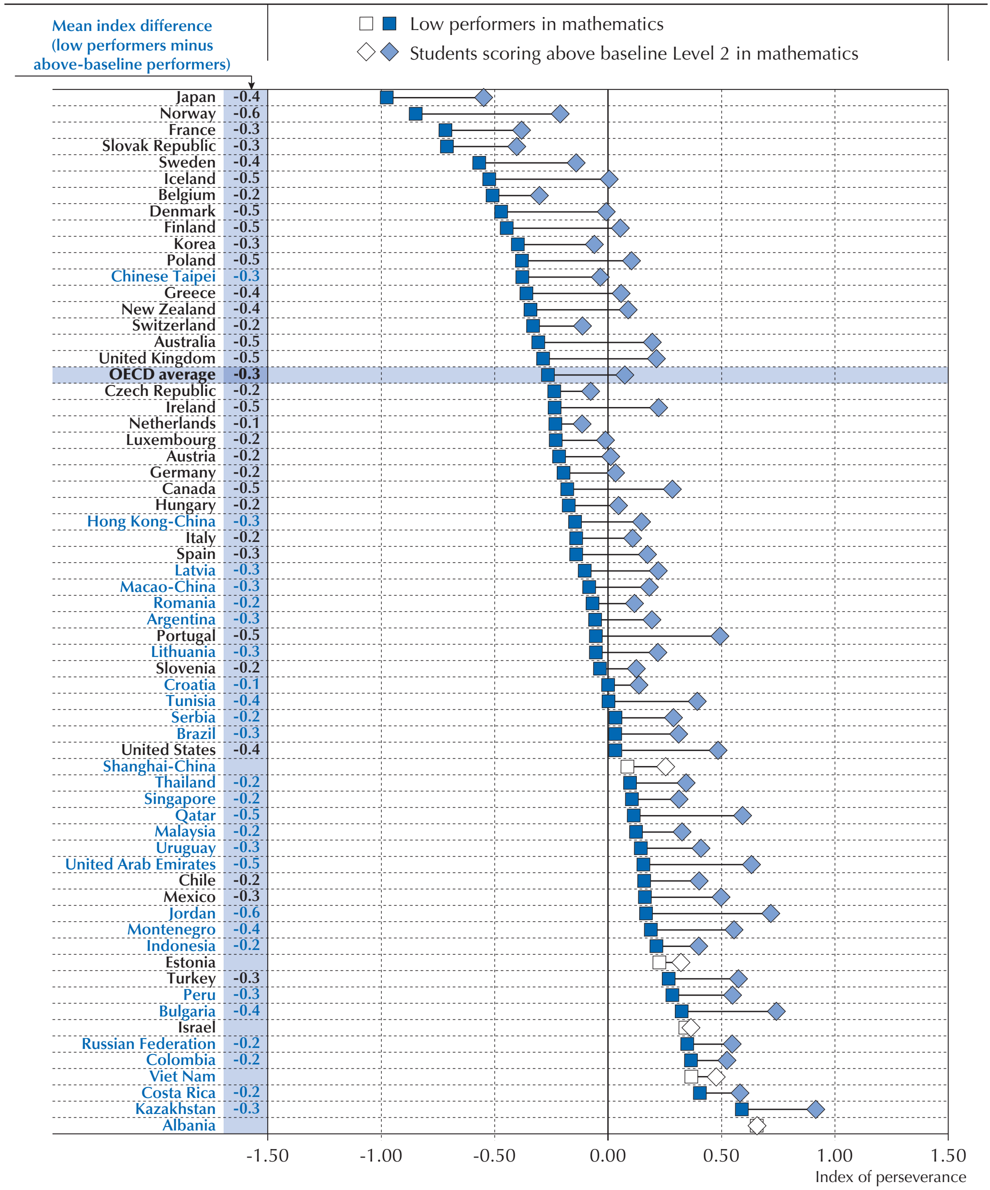
Countries and economies are ranked in ascending order of the effort low performers in mathematics reported that they invested in the PISA test.

Source: OECD, PISA 2012 Database, Table 3.7.

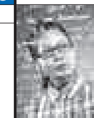
StatLink http://dx.doi.org/10.1787/888933315529

■ Figure 3.8 ■

Differences in perseverance between low performers and better-performing students



Note: Statistically significant differences between students who are low performers and those who are not are marked in a darker tone and are shown next to the country/economy name.
Countries and economies are ranked in ascending order of the index of perseverance *among low-performing students in mathematics.*
Source: OECD, PISA 2012 Database, Table 3.8.
StatLink http://dx.doi.org/10.1787/888933315534



As expected, in every PISA-participating country and economy, the indices of perseverance and mathematics work ethic are associated; but, as Figure 3.9 shows, the association is stronger among students who perform better in mathematics, and varies significantly across education systems. In some countries, low-performing students who perceive themselves as perseverant are only slightly more likely to describe themselves as hard-working in mathematics. For instance, in the Russian Federation, low performers in mathematics who "remain interested in the tasks that they start", and agree with other similar statements of the *index of perseverance*, are only marginally more likely to say they "work hard on mathematics homework" and agree with other statements that form the *index of mathematics work ethic*[3]. This weak relationship between perseverance and work ethic in mathematics is not observed among better-performing students in the Russian Federation, where the association is similar in strength to that found on average across OECD countries.

Understanding why the relatively high levels of perseverance among low-performing students in the Russian Federation (Figure 3.8) do not translate into a greater mathematics work ethic merits further attention. Is this a problem specific to mathematics or does it apply to all academic tasks? Why are low performers in the Russian Federation and in other countries and economies that show similar differences compared with better-performing students, like Peru, Shanghai-China and Chinese Taipei, not applying their perseverance to mathematics tasks?

Motivation and mathematics behaviour

Students are more likely to invest more of their time and effort to improve their performance when they are motivated to do so (Box 3.1). Motivation is an affective state that guides behaviour and helps to explain why some individuals engage with the task at hand and continue to work until the task is completed – even until individuals believe it is completed perfectly (Eccles and Wigfield, 2002).

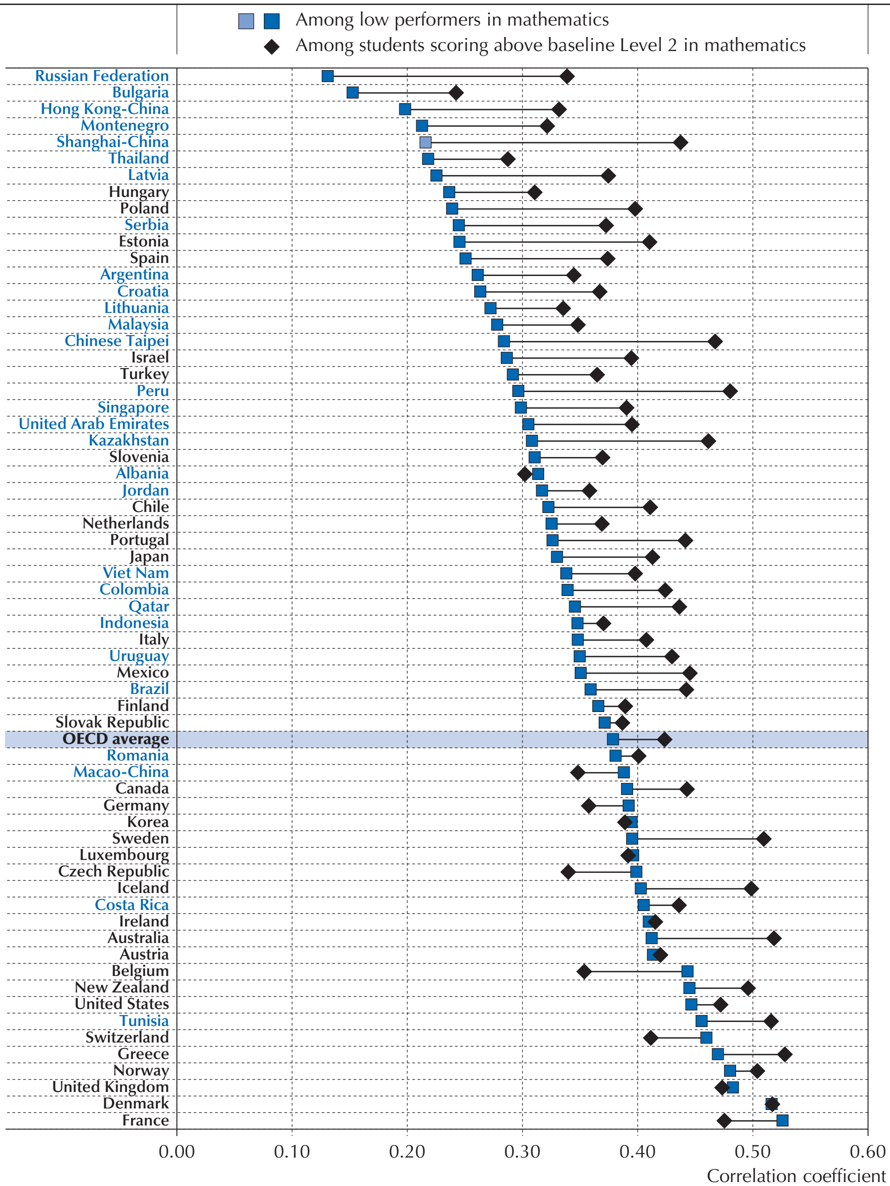
Students can be motivated by their interest in the task at hand (i.e. intrinsic or task-specific motivation) or by external factors (i.e. instrumental motivation). In other words, they can be motivated because they are interested in and stimulated by mathematics activities or because they believe that proficiency in mathematics will help them to gain admission to prestigious universities, find a job and/or improve their career prospects. There is widespread acceptance that intrinsic motivation leads to greater engagement and concentration, and better academic outcomes than instrumental motivation, particularly when it comes to the most intellectually demanding and complicated tasks (Gottfried, 1990; Voss and Schauble, 1992). For this reason, and because the results for instrumental motivation are not particularly revealing, the analysis in this section focuses exclusively on students' intrinsic motivation, measured as their interest in mathematics.

On average across OECD countries, low-performing students are less interested in mathematics than better-performing students in about two out of three countries and economies that participated in PISA, particularly Hong Kong-China, Japan, Korea and Norway (Figure 3.10). Meanwhile, in six countries and economies, low performers show greater interest in mathematics than students who score above the baseline level of proficiency in mathematics.

■ Figure 3.9 ■

Association between perseverance and mathematics work ethic

Correlation between the index of perseverance *and the* index of mathematics work ethic



Notes: Statistically significant correlation coefficients for low performers in mathematics are marked in a darker tone.
All correlation coefficients for students scoring above baseline Level 2 in mathematics are statistically significant.
Countries and economies are ranked in ascending order of the correlation coefficient among low-performing students in mathematics.
Source: OECD, PISA 2012 Database, Table 3.9.
StatLink *http://dx.doi.org/10.1787/888933315545*

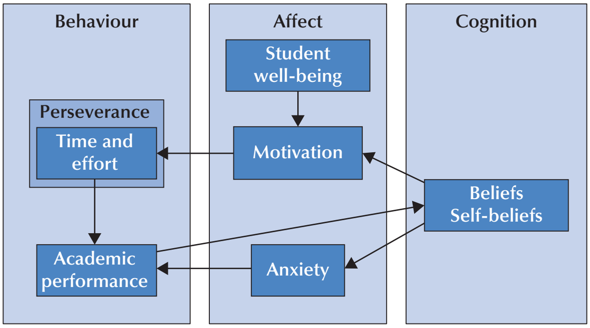
Box 3.1. A conceptual map describing the relationship between students' attitudes and performance

Behind every success is effort...
Behind every effort is passion...
Behind every passion is someone with the courage to try.
- Unknown

Understanding the network of relationships that connects students' attitudes with academic performance is both a necessary and complicated task. Psychologists and educators have proposed relationships in every possible direction: from perseverance to academic success (Duckworth and Seligman, 2006); from self-efficacy to perseverance, motivation and academic performance (Bandura, 1997; Schunk and Pajares, 2009); from mathematics anxiety to cognitive resource activation, and then to mathematics performance (Ashcraft and Kirk, 2001; Hembree, 1990; Kellogg, Hopko and Ashcraft, 1999); from school attachment to academic skills, school dropout and even juvenile delinquency (Finn, 1989; Hirschi, 1969; Valeski and Stipek, 2001); or from intrinsic motivation to school truancy, academic engagement, student performance and depth of understanding (Hardré and Reeve, 2003; Reeve, 2012; Schiefele, 2009).

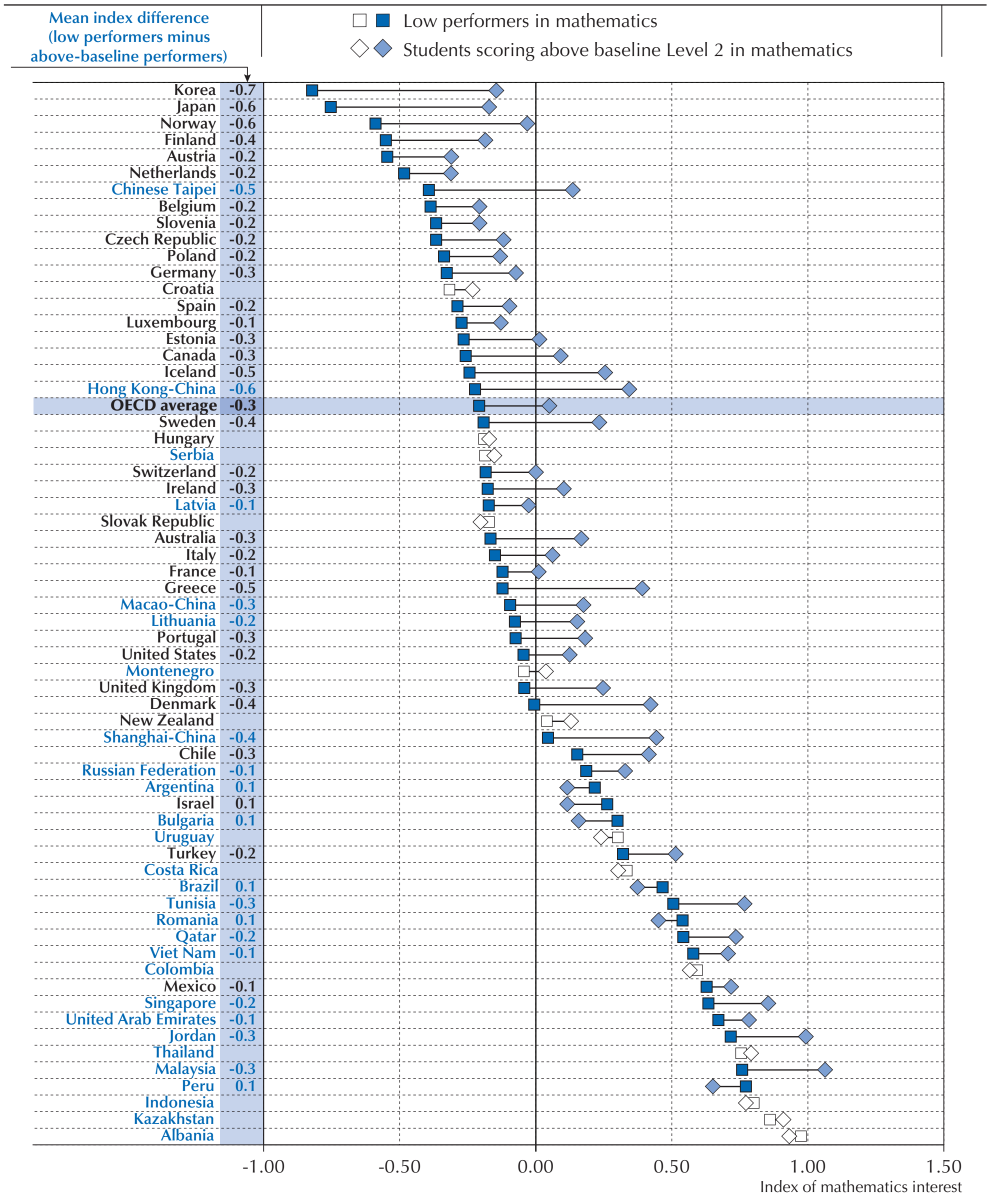
Based on previous research and the results presented here, a simplified conceptual framework (see figure below) shows only the most relevant relationships between students' attitudes and academic performance. For students (see following chapters for classroom, school and system-level perspectives), there are two ways to improve academic performance: invest more time and effort (behavioural) and/or reduce their levels of anxiety (affective). Both of these strategies require some changes in students' beliefs and self-beliefs. For example, improving students' confidence in their abilities, knowledge and skills, and instilling in them the conviction that success is the result of hard work, and not of innate and fixed traits (Dweck, 2006), or the belief that academic success leads to professional success, can help to reduce anxiety and foster motivation (Schunk and Pajares, 2009). When students feel they belong at school, they are also more motivated. The virtuous circle is complete because students invest more of their time and effort in their school work when they are motivated.

A simplified conceptual map describing the interplay between students' attitudes and academic performance



■ Figure 3.10 ■

Differences in interest in mathematics between low performers and better-performing students



Note: Statistically significant differences between students who are low performers and those who are not are marked in a darker tone and are shown next to the country/economy name.

Countries and economies are ranked in ascending order of the index of mathematics interest *among low-performing students in mathematics.*

Source: OECD, PISA 2012 Database, Table 3.10.

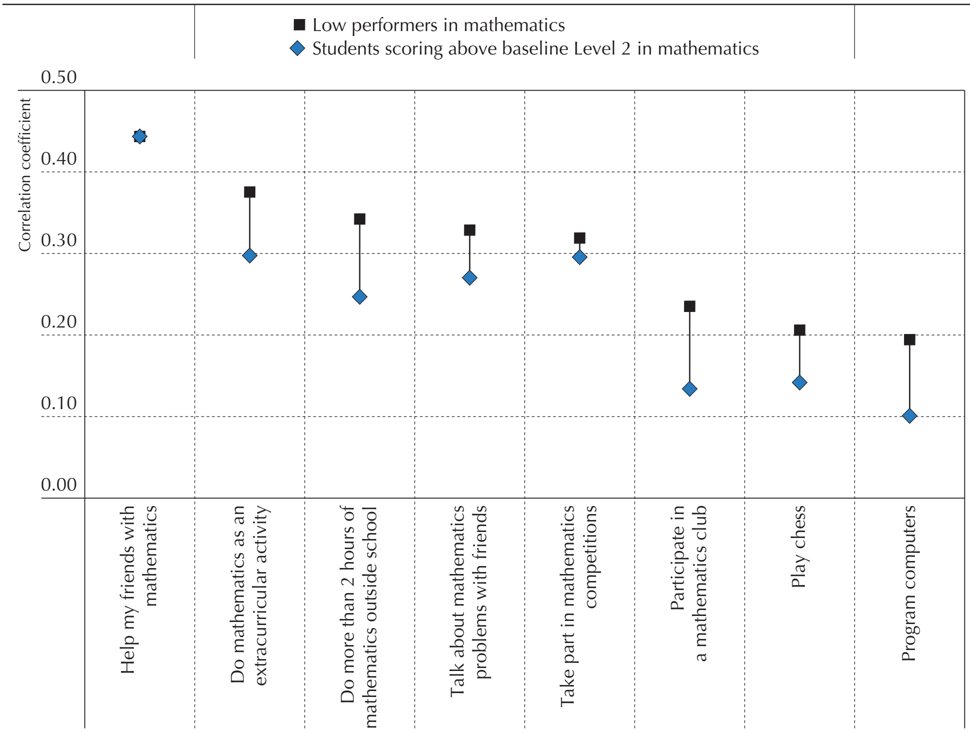
StatLink http://dx.doi.org/10.1787/888933315554

More important than these differences is the extent to which this interest in mathematics is reflected in greater participation in mathematics-related activities. Figure 3.11 shows that, across OECD countries, the association between the *index of mathematics interest*[4] and participation in mathematics-related activities is consistent, and even somewhat stronger among low-performing students. Interestingly, being interested in mathematics is more strongly associated with doing mathematics as an extracurricular activity than with other mathematics-related behaviour, such as "doing more than two hours of mathematics outside of school", "talk about mathematics problems with friends" or "participate in a mathematics club". This positive association between participation and interest can be interpreted in two ways: either extracurricular mathematics activities arouse a genuine interest in mathematics, or students who are interested in mathematics are more apt to participate in those extracurricular activities.

■ Figure 3.11 ■

Association between interest in mathematics and participation in mathematics-related activities

Correlation between the index of mathematics interest *and the participation in mathematics activities, OECD average*



Notes: All correlation coefficients are statistically significant.
Positive values indicate that students with more interest in mathematics are more likely to participate in mathematics-related activities.
Source: OECD, PISA 2012 Database, Table 3.11.
StatLink http://dx.doi.org/10.1787/888933315567

PISA results also show that activities that require numeracy skills but are not strictly related to mathematics, such as playing chess and programming computers, show the weakest association with an interest in mathematics. Given that low performers in mathematics are much more likely to play chess than better-performing students, and are as likely to program computers as moderate performers (Figure 3.5), teachers could try to make classroom mathematics tasks more engaging by creating stronger links between them and games, programming and other non-academic activities that require numeracy skills.

Self-beliefs, anxiety and low performance in mathematics

Students' sense of self-efficacy (the extent to which students believe in their own ability to solve specific mathematics tasks) and self-concept (their beliefs in their own mathematics abilities) have a considerable impact on their self-confidence, perseverance, motivation and, ultimately, their performance in school (Bandura, 1997; Schunk and Pajares, 2009). Students who lack self-confidence in their ability to complete particular tasks may wrongly assume that investing more effort is a waste of time, which, in a self-fulfilling prophecy, leads to less engagement at school and poor performance (OECD, 2013a).

More than any other attitude analysed so far, self-efficacy and self-concept in mathematics differ significantly between low performers and better-performing students (Figure 3.12 and Table 3.12). Figure 3.13 shows that for every one-unit increase on the *index of mathematics self-efficacy*[5], the probability of being a low performer in mathematics decreases by 67%, on average across OECD countries. This probability falls to around 60% when students reported similar levels of mathematics anxiety[6]. Thus, the suggestion that mathematics anxiety plays a mediating role (see Box 3.1) is probably accurate: students who lack confidence in their mathematics skills report higher levels of mathematics anxiety, and performance suffers when students are anxious (Ashcraft and Kirk, 2001; Kellogg, Hopko and Ashcraft, 1999).

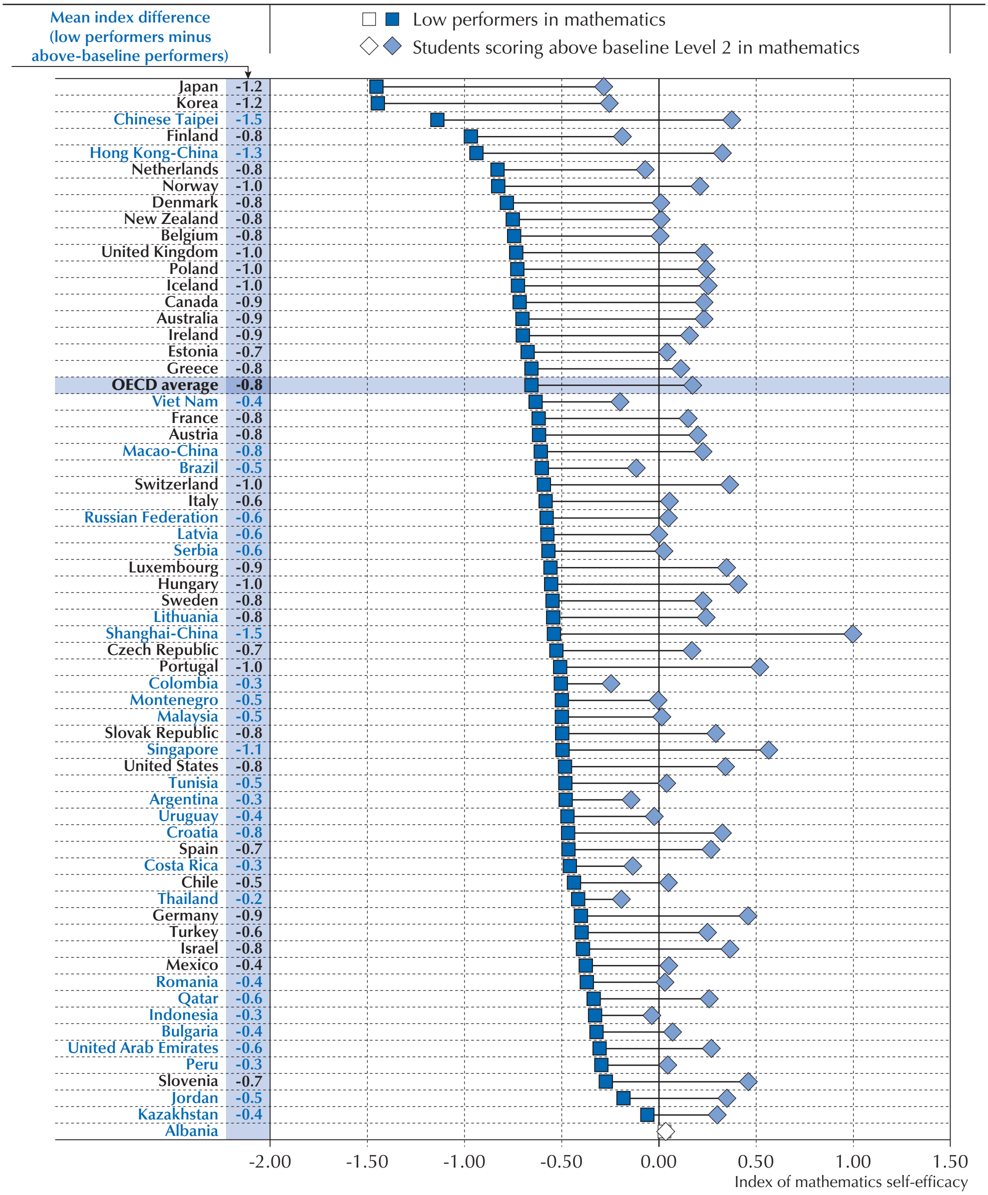
This result should encourage schools to reduce mathematics anxiety as a way of improving student performance. But this is easier said than done. In contrast to what is observed among better-performing students, mathematics anxiety is only weakly associated with other student attitudes among low performers (Table 3.14). For example, low performers who reported higher mathematics self-efficacy show similar levels of mathematics anxiety as students who reported lower levels of self-efficacy. So improving these other attitudes among low performers will do little to reduce students' mathematics anxiety. Instead, policy interventions to reduce mathematics anxiety could focus on improving teaching practices and classroom dynamics.

Students' well-being and low performance

Previous research has shown that happiness, life satisfaction and well-being share a common basis (Argyle and Crossland, 1987; Inglehart and Rabier, 1986). Of course, school is not the only environment that plays a role in students' well-being, but it is crucial one, particularly for adolescents (Baumeister and Leary, 1995), who spend a considerable amount of time in school and among friends whom they have met at school. And since school attendance is compulsory, it is often difficult for students to "escape" from negative peer pressure, such as bullying and harassment (Juvonen, Wang and Espinoza, 2010; Glew et al., 2005).

■ Figure 3.12 ■

Differences in mathematics self-efficacy between low performers and better-performing students



Note: Statistically significant differences between students who are low performers and those who are not are marked in a darker tone and are shown next to the country/economy name.

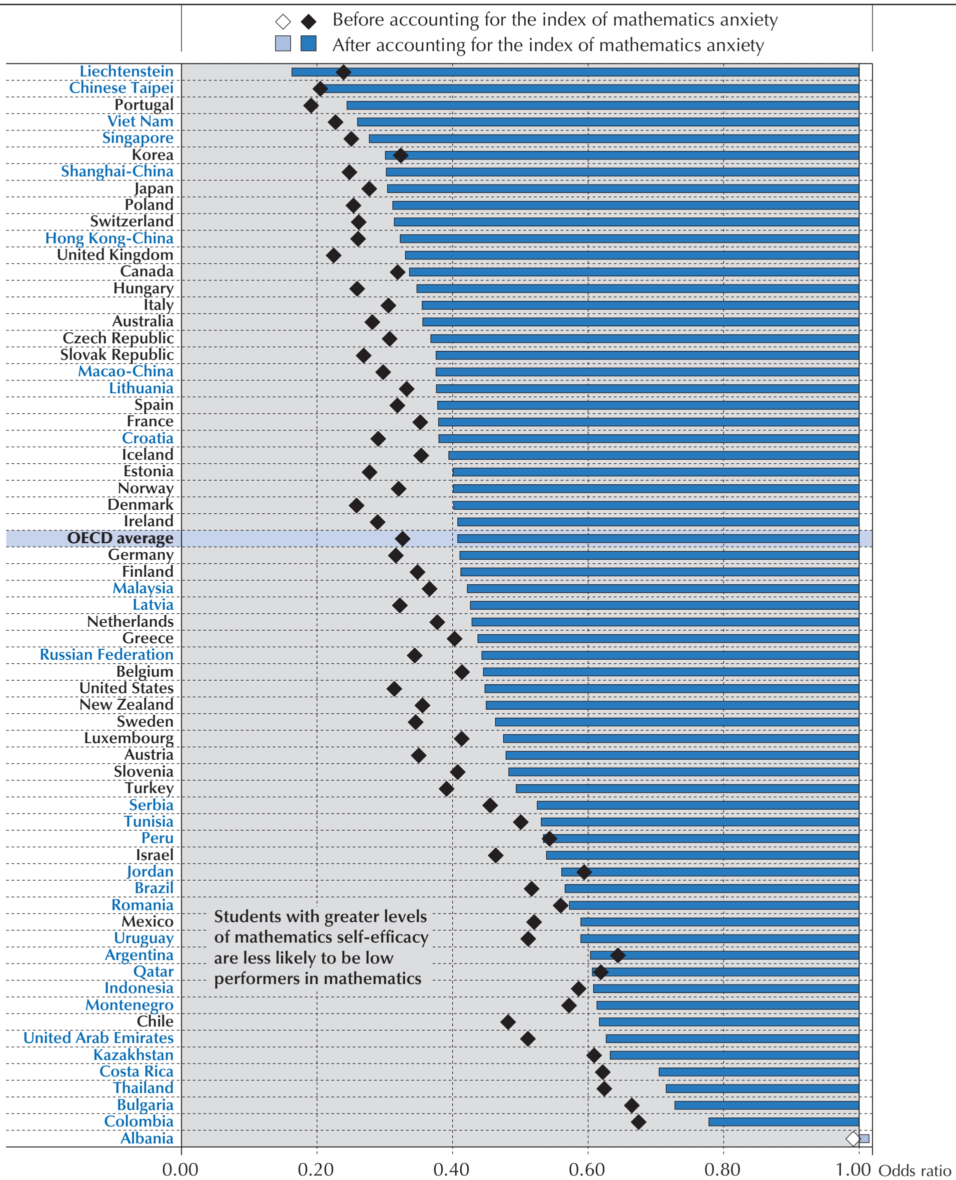
Countries and economies are ranked in ascending order of the index of mathematics self-efficacy *among low-performing students in mathematics.*

Source: OECD, PISA 2012 Database, Table 3.12.

StatLink *http://dx.doi.org/10.1787/888933315572*

■ Figure 3.13 ■

How mathematics anxiety affects the association between mathematics self-efficacy and the likelihood of being a low performer in mathematics



Note: Statistically significant odds ratio are marked in a darker tone.
Countries and economies are ranked in ascending order of the odds ratio of being a low performer in mathematics, after accounting for the index of mathematics anxiety.
Source: OECD, PISA 2012 Database, Table 3.13.
StatLink http://dx.doi.org/10.1787/888933315581

Feeling happy, comfortable and part of the school community matters in its own right. This is reflected in the importance parents attach to certain criteria beyond academic achievement, such as a pleasant, active and safe environment, when choosing a school for their child (OECD, 2015a). On average across OECD countries, low performers show somewhat lower values on the *index of sense of belonging at school*[7] than better-performing students (Figure 3.14). Low-performing students in the Czech Republic, Korea and Macao-China reported the weakest sense of belonging among all PISA-participating countries and economies; but the difference between low performers and better-performing students on this index is the largest in France, Korea, Lithuania, Luxembourg and Qatar.

Students tend to succeed academically when they feel socially connected, satisfied and at ease at school (OECD, 2013a). Those who feel lonely and out of place in school are more likely to drop out and act out their disengagement through vandalism, drug use and other forms of delinquency (Finn, 1989; Hirschi, 1969; Valeski and Stipek, 2001). While PISA has no data on such behaviour, it can determine whether students who have no sense of belonging at school are more likely to play truant, and whether this association is stronger among low performers.

Indeed, PISA data show that feeling comfortable and connected at school is more strongly associated with school attendance among low performers in mathematics than among better-performing students (Figure 3.15), although the correlation is weak even among low performers. The difference is apparent only when low performers are compared with the best-performing students, and only in a few education systems. Only in Belgium, Norway and Shanghai-China is there a difference between low and high performers in the strength of the relationship between feeling happy at school and regular school attendance. In other words, only in these countries do low-performing students have a greater need than high-performing students to feel happy at school before they are willing to attend classes regularly (Table 3.16).

LOW PERFORMANCE IN MATHEMATICS, SOCIO-ECONOMIC STATUS AND STUDENTS' ATTITUDES

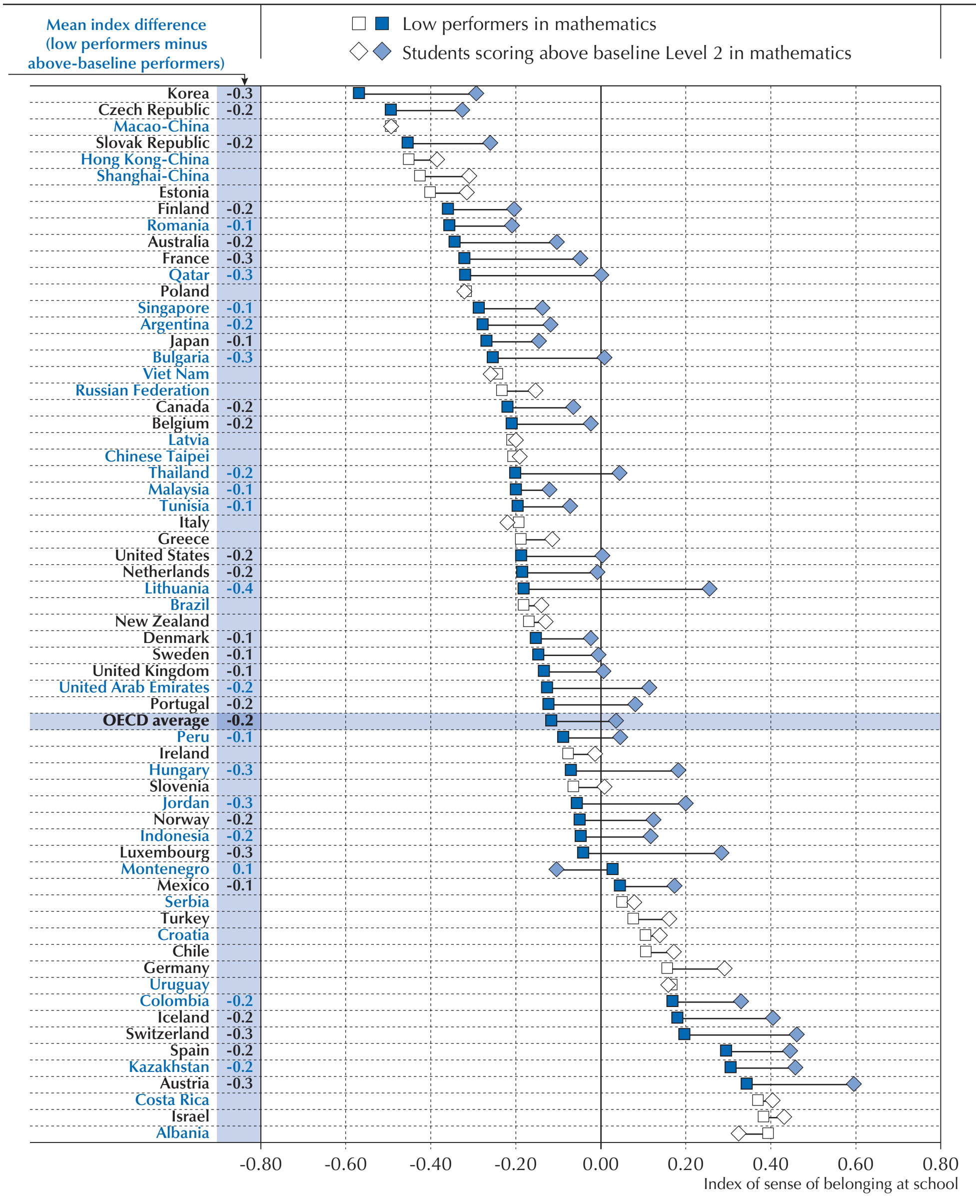
Chapter 2 revealed that the socio-economic status of students is probably the most important risk factor associated with low academic performance (see Figure 2.19). It seems obvious, then, to ask whether low performers lack engagement, perseverance and self-confidence because they are low performers or because they come from a disadvantaged background. To answer this question, four groups of students were formed using different combinations of the top and bottom quartiles of students in the socio-economic and performance distributions within countries:[8]

1. Disadvantaged students/Low performance in mathematics.
2. Advantaged students/Low performance in mathematics.
3. Disadvantaged students/High performance in mathematics (resilient students).
4. Advantaged students/High performance in mathematics.

The data that emerge based on these four groups show that, regardless of their socio-economic status, low-performing students attend school less regularly and reported less perseverance and confidence in their mathematical skills than better-performing students (Figure 3.18).

■ Figure 3.14 ■

Differences in the sense of belonging at school between low performers and better-performing students



Note: Statistically significant differences between students who are low performers and those who are not are marked in a darker tone and are shown next to the country/economy name.

Countries and economies are ranked in ascending order of the index of sense of belonging at school *among low-performing students in mathematics.*

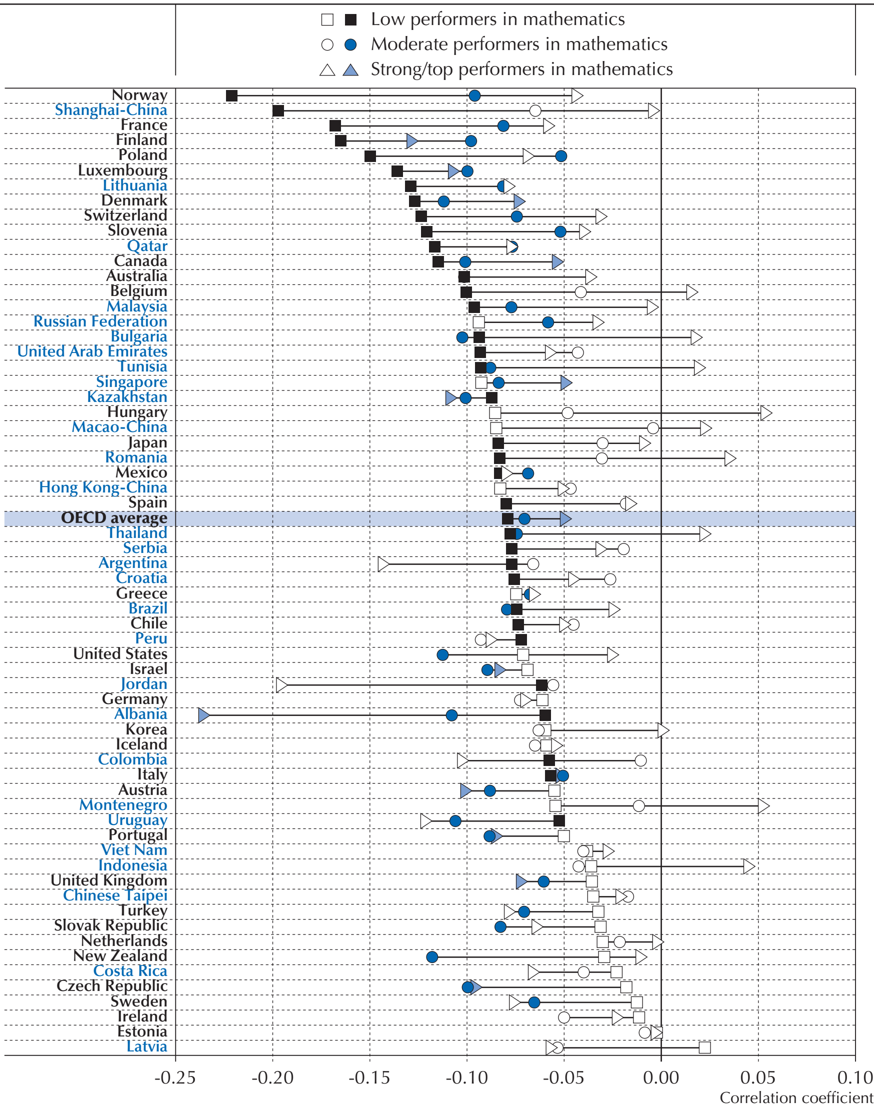
Source: OECD, PISA 2012 Database, Table 3.15.

StatLink http://dx.doi.org/10.1787/888933315593

■ Figure 3.15 ■

Association between sense of belonging at school and skipping a whole day of school

Correlation between the index of sense of belonging at school *and skipping a whole day of school*



Notes: Statistically significant coefficients are marked in a darker tone.
Moderate performers score at Level 2 or 3 in mathematics, strong performers score at Level 4, and top performers score at Level 5 or 6.
Countries and economies are ranked in ascending order of the correlation between the index of sense of belonging at school *and skipping a day of school among low-performing students in mathematics.*
Source: OECD, PISA 2012 Database, Table 3.16.
StatLink http://dx.doi.org/10.1787/888933315602

There is only one exception: disadvantaged low performers do not feel as strong a sense of belonging at school as advantaged low performers do. This suggests that the types of schools that disadvantaged students attend do not foster the same sense of belonging as the schools with more advantaged students do. Or it might simply be that more advantaged students tend to have a greater sense of belonging at school than disadvantaged students, even when both groups attend the same schools.

Box 3.2. **Learning from the Korean paradox**

Korea has the smallest proportion of students who score below the baseline level of proficiency in mathematics among all OECD countries – barely 9% compared to 23% on average across OECD countries (Figure 1.5). However, based on their answers to the PISA student questionnaire, Korean students show particularly low levels of perseverance, motivation and self-beliefs compared with students from other education systems; and the "attitudes gap" between low performers and better-performing students is one of the largest among all PISA participating countries. What can we make of this apparent paradox?

The first reason why low performers in Korea appear to show comparatively "poor" attitudes is that the average score in the PISA tests of the benchmark group – students scoring above the baseline proficiency level – is much higher than in other OECD countries. In mathematics, for instance, students scoring above the baseline proficiency level score 572 points, on average, in Korea, but 530 points on average across the OECD and 470 points, on average, in Indonesia.

When considering student behaviour, Korean students are among the most diligent: they skip school days or classes less often, and are more likely to participate in mathematics-related extracurricular activities for more than two hours a day, than are students across all OECD countries, on average (Figure 3.16). They also spend much more time in after-school classes – three hours more per week than the OECD average – even though they spend two hours less per week on homework than their peers across OECD countries (Figure 3.17).

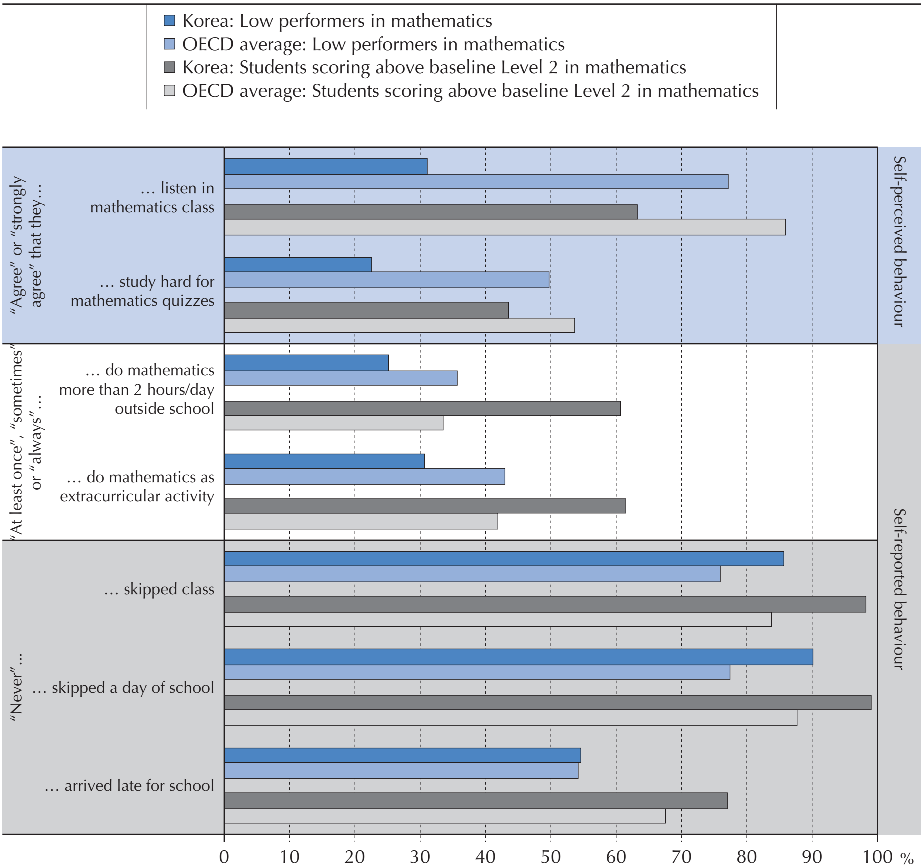
But Korean students have very different perceptions of their own attitudes and behaviours, probably because they hold high expectations for themselves. For instance, comparatively few 15-year-old students in Korea agree or strongly agree that they study hard for quizzes, or that they listen and pay attention in mathematics class (Figure 3.16). Korean students are certainly among the least likely to feel that they belong at school or to report that they are happy at school. But these indicators of well-being, while important, are only weakly associated with mathematics performance (OECD, 2013a).

...

■ Figure 3.16 ■

Truancy, participation in mathematics-related activities and effort invested, Korea and OECD average

Percentage of students who reported the following:



Source: OECD, PISA 2012 Database, Tables 3.1, 3.5c, 3.5e, 3.6d and 3.6e.

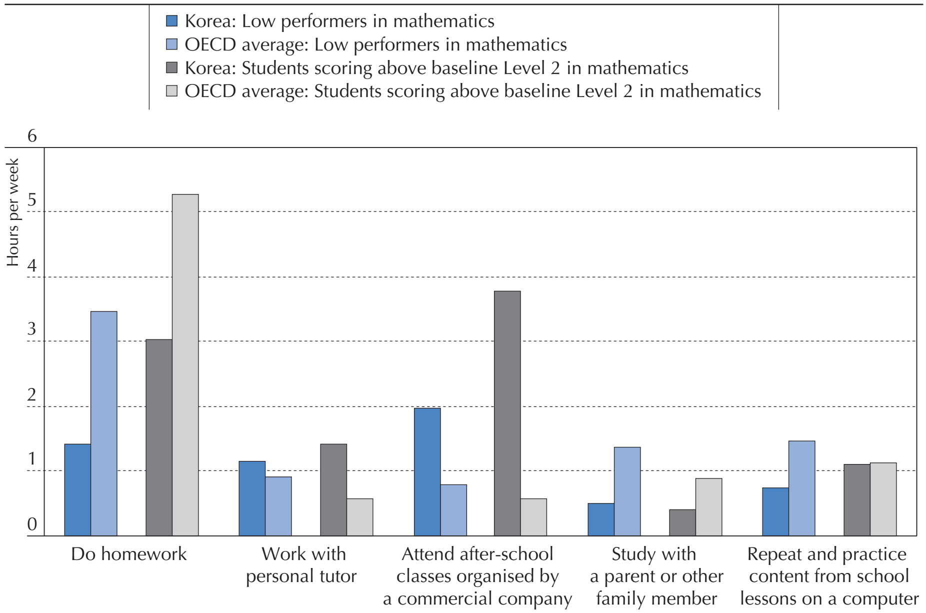
StatLink *http://dx.doi.org/10.1787/888933315611*

Low performers in Korea might be much less motivated, less self-confident and less engaged at school compared to their better-performing peers, but only 3% of students score at Level 1 in mathematics, and 6% score below Level 1, compared to 8% and 15%, respectively, across OECD countries (Table 1.2). While the Korean education system may have a problem with its low performers, low performance, in itself, is not a serious problem in the country.

…

■ Figure 3.17 ■

Hours spent on after-school mathematics activities, Korea and OECD average



Source: OECD, PISA 2012 Database, Table 3.20.
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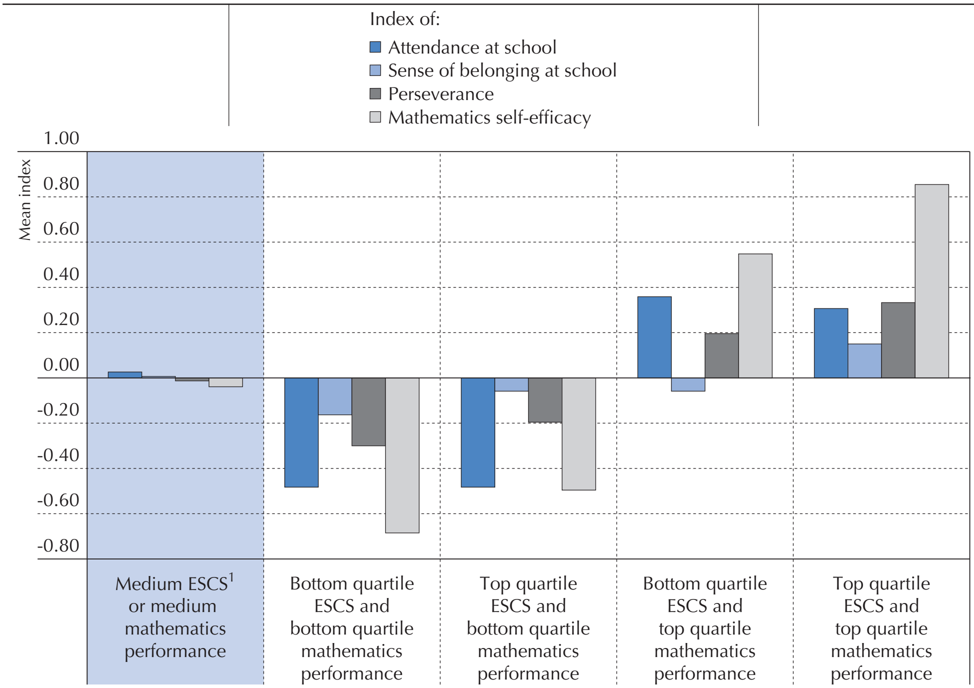
In addition, the high value placed on education in Korea, and the associated belief that "anyone can succeed with enough dedication", may help to explain why Koreans have improved so much in numeracy and literacy skills over the generations without necessarily enjoying the best in educational resources and infrastructure. In the 2012 Survey of Adult Skills, a product of the OECD Programme for the International Assessment of Adult Competencies, Korea showed the largest differences in these skills between 55-65 year-olds and 16-24 year-olds among the 22 countries that participated in the survey (OECD, 2013c).

An emphasis on hard work may also help to reduce inequalities in education opportunities, if only because time and effort are two resources that are distributed relatively evenly across the income distribution. Not surprisingly, in Korea only 10% of the variation in mathematics performance is explained by socio-economic status, compared to the OECD average of 15% (OECD, 2013b). Equality in education opportunities could improve even further if the link between the participation rate in after-school education and students' socio-economic status weakens (Kim and Lee, 2010) and if the Korean government succeeds in limiting the duration of these supplemental activities (Bray and Lykins, 2012).

■ Figure 3.18 ■

Attitudes towards school and learning, by performance in mathematics and socio-economic status

OECD average



1. ESCS refers to the *PISA index of economic, social and cultural status*.

Notes: The *index of school attendance* is the average of the three questions on school absenteeism reversed and standardised: skip a day of school, skip some classes, arrive late for school.

Positive values indicate better attendance than the average OECD student.

Source: OECD, PISA 2012 Database, Table 3.17.

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THE ATTITUDES OF LOW PERFORMERS IN READING, MATHEMATICS AND SCIENCE

Another way of measuring the "attitudes gap" between low performers and better-performing students is to compare student performance across different subjects. As might be expected, across OECD countries, low performers in any of the three core subjects assessed in PISA (reading, mathematics and science) express more negative attitudes towards school than students who score above the baseline proficiency level in the three subjects, but the profile differs, depending on the subject (Figure 3.19). The sense of belonging at school is somewhat weaker among students who underachieve in reading, probably because they are mainly boys who, in general, tend to be less engaged at school (OECD, 2015b). Mathematics self-efficacy is particularly low among students who are low performers only in mathematics; in fact, these students have even less self-efficacy than students who are low performers in all three subjects.

These results suggest that students not only develop self-beliefs by comparing themselves to their peers, but also by comparing their own performance in the different subjects.

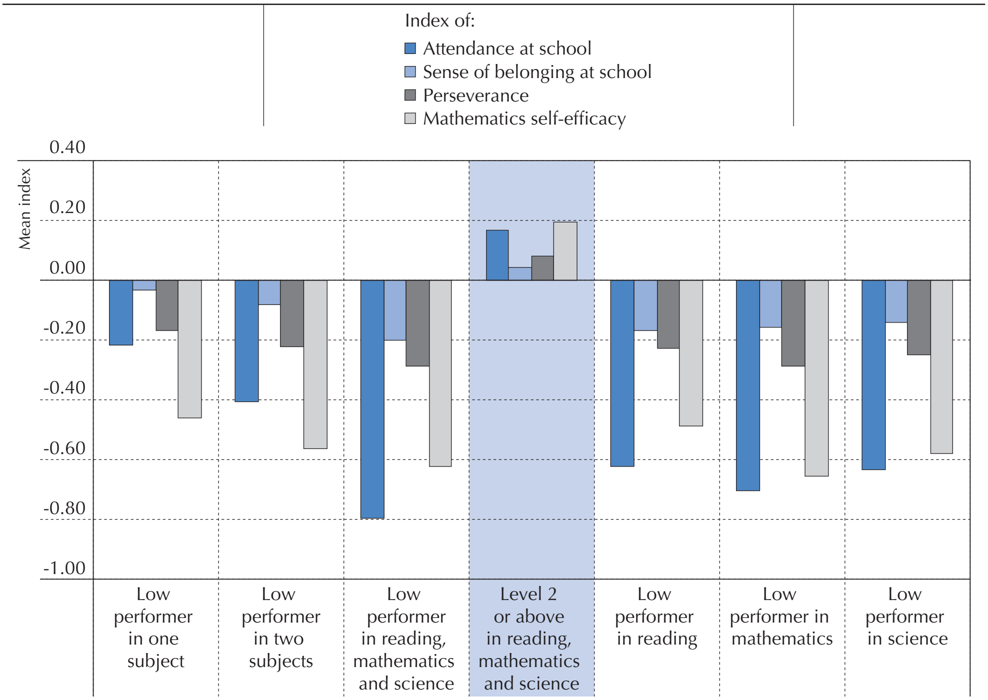
PISA also finds that low performers in mathematics reported less perseverance than low performers in reading and science. This might indicate that mathematics is a particularly challenging subject that requires more persistence and motivation of students.

As Figure 3.19 shows, the gap in attitudes between low performers and better-performing students also grows, in a non-linear fashion, as the number of subjects in which students are low performers increases. There is a large gap in the indices of perseverance and mathematics self-efficacy between students who perform above the baseline level of proficiency in the three core subjects and students who are low performers in one subject only, probably because six out of ten of these students are low performers in mathematics. Another large gap is observed in the *indices* of *school attendance* and *sense of belonging at school* between students who are low performers in two subjects and those who are low performers in all three subjects.

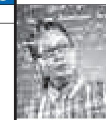
■ Figure 3.19 ■

Low performers' attitudes towards school and learning, by school subject

OECD average



Notes: The *index of school attendance* is the average of the three questions on school absenteeism reversed and standardised: skip a day of school, skip some classes, arrive late for school.
Positive values indicate better attendance than the average OECD student.
Source: OECD, PISA 2012 Database, Tables 3.18 and 3.19.
StatLink *http://dx.doi.org/10.1787/888933315641*



Understanding students' attitudes and self-beliefs, and the factors that bolster or undermine them, is critical for identifying at-risk students and designing appropriate policy interventions. Students who are low performers only in mathematics may lack perseverance and self-confidence in mathematics, but they may still be engaged enough at school to participate in remedial classes and extracurricular activities aimed to improve their performance. These kinds of school-based interventions, however, might not be effective for students who fail to make the grade in all three subjects. Not only do these students lack persistence and self-confidence, but they are also disengaged at school, which means they are unlikely to participate in such activities. Breaking the vicious circle of low performance and low motivation in which these students are trapped may require interventions that start in primary school – or earlier – and initiatives that extend beyond school walls.

Notes

1. The *index of school attendance* is the average of three questions on school absenteeism reversed and standardised: skip a day of school, skip some classes and arrive late for school.

2. For detailed information on the construct of this index, please refer to the *PISA 2012 Technical Report* (OECD, 2014b).

3. For detailed information on the construct of this index, please refer to the *PISA 2012 Technical Report* (OECD, 2014b).

4. For detailed information on the construct of this index, please refer to the *PISA 2012 Technical Report* (OECD, 2014b).

5. For detailed information on the construct of this index, please refer to the *PISA 2012 Technical Report* (OECD, 2014b).

6. For detailed information on the construct of the *index of mathematics anxiety*, please refer to the *PISA 2012 Technical Report* (OECD, 2014b).

7. For detailed information on the construct of this index, please refer to the *PISA 2012 Technical Report* (OECD, 2014b).

8. The logic follows the within-country perspective described in *Against the Odds* (OECD, 2011). Students in Group 1 are called "expected" low performers because disadvantaged students have, on average, a higher probability of low performance compared with advantaged students. The inverse is true about "expected" top performers. These labels do not in any way mean to suggest any deterministic relationship between socio-economic status and student achievement.

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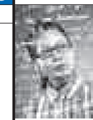

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4

How School Characteristics are Related to Low Performance

This chapter examines the incidence of low performance across schools, and the school characteristics that are most strongly related to poor student performance. It focuses on the socio-economic profile of schools, school leadership, teachers' practices and behaviour, extracurricular activities, and the resources, both human and material, available at schools that can affect student performance.

The statistical data for Israel are supplied by and under the responsibility of the relevant Israeli authorities. The use of such data by the OECD is without prejudice to the status of the Golan Heights, East Jerusalem and Israeli settlements in the West Bank under the terms of international law.

Student performance at school is influenced not only by students' individual backgrounds, attitudes and behaviours, as discussed in Chapters 2 and 3, but also by the school they attend. This chapter examines new analyses that offer an in-depth look at how teachers' attitudes, expectations and behaviour can influence the likelihood of low performance. The chapter concludes with a description of how the educational resources available to schools and the administration of schools are linked to students' low performance (Figure 4.1).

What the data tell us

- Around 35% of the variation in the proportion of low performers in mathematics within countries can be traced to differences between schools, on average across OECD countries.
- Around 14% of all students attend schools where at least one in two students are low performers.
- Students attending schools where teachers are more supportive and have better morale are less likely to be low performers, while students whose teachers have low expectations for them and are absent more often are more likely to be low performers in mathematics, even after accounting for the socio-economic status of students and schools.
- The quality of educational resources is lower, and the incidence of teacher shortage is higher, in schools that have a large concentration of low performers, on average across OECD countries, even after accounting for students' and schools' socio-economic status.

■ Figure 4.1 ■

School characteristics and low performance

Potential areas of risk	Sub-areas	Risk factors
School composition	Socio-economic profile	Concentration of disadvantaged students
School learning environment	School leadership	Low expectations for students
		Ability grouping
	Teaching practices	Weak teachers' support for students
		Weak teacher morale
		Teacher absenteeism
	After-school opportunities	Lack of academic extracurricular activities
		Lack of creative extracurricular activities
	Parents involvement in school	Lack of parental pressure for high achievement
School resources and administration	Educational resources	Quality of school's educational resources
		Teacher shortage
	School type	Public school/Private school

HOW ARE LOW PERFORMERS DISTRIBUTED ACROSS SCHOOLS?

Variations in low performance between schools

Research examining the effects of school quality, compared with family background, on student achievement has shown that within-school differences in student achievement tend to be greater than between-school differences (e.g. Coleman et al., 1966; Baker, Goesling and LeTendre, 2002). On average across OECD countries, about 37% of the variation in student performance in PISA 2012 was observed between schools, while the remaining 63% was observed within schools (OECD, 2013a). This shows that the influence of schools on student achievement is substantial, even if students' own backgrounds are relatively more influential (student background is explored in Chapter 2 of this report). Other studies have identified a number of school characteristics and practices that seem to be the most effective for learning and for improving student achievement (Scheerens, 2000; Hopkins et al., 2014; Madden, 2001; Creemers, 2006; Lenkeit and Caro, 2014).

In order to pinpoint where the low performers are, it is important to determine whether variations in low performance stem from differences within or between schools. The larger the percentage of the variation in low performance observed between schools, the more concentrated are low performers in particular schools; the larger the percentage that is explained by differences within schools, the more evenly distributed are low performers across a school system.

Figure 4.2 shows that on average across OECD countries, around 35% of the variation in low performance in mathematics in each country/economy can be traced to differences between schools. This substantial between-school variation indicates that low performers are concentrated in particular schools of the education system. In 23 out of the 64 countries and economies that participated in PISA 2012, between-school differences explain 40% or more of the variation in low performance in mathematics. In Germany, Hungary, Liechtenstein, the Netherlands and Slovenia, between-school differences explain 55% or more of the variation, indicating significant concentrations of low performers within particular schools. By contrast, in Albania, Finland, Iceland, Norway, Poland and Sweden, between-school differences explain only 15% or less of the variation in low performance observed, indicating that low performers in these countries are more likely to attend the same schools as better-performing students.

There are several possible reasons why low performers are more heavily segregated in particular schools in some countries, as opposed to being spread out in a variety of schools. For example, institutional arrangements of the educational system, such as the timing and intensity of curricular differentiation (e.g. vocational and academic programmes) can lead to greater segregation (Oakes, 2005; LeTendre et al, 2003; Van de Werfhorst and Mijs, 2010). Greater school segregation can also be the result of parents' and schools' decisions in systems that grant more options for families to choose their children's schools and for schools to select their students based on achievement or other criteria (OECD, 2012a; Forsey et al, 2008; Chakrabarti and Peterson, 2008; Mizala and Torche, 2012). Greater school segregation can also be caused by factors unrelated to education, such as residential segregation (Orfield et al., 2003).

Because PISA focuses on 15-year-olds, who may be in different grades, cross-country differences in the concentration of low performers in schools may also be due to the timing of students' progress through the school system. For example, in Sweden and other Nordic countries, pupils' age at entry to primary school is relatively late, and most students who participate in PISA are still in lower secondary school and have not yet been sorted into programmes with different curricula. This may partly explain why these countries show smaller variations in performance between schools. By contrast, in Japan, Korea and Turkey, most students who participate in PISA are in upper secondary school, where this type of curricular sorting has already occurred.

A high incidence of segregation by educational achievement, combined with larger shares of low-performing students, lead to schools where most students are low performers. Figure 4.3 shows the percentage of students who attend schools where 30% or more, 50% or more, or 80% or more of students in the school are low performers in mathematics. On average across OECD countries, about 15% of students attend schools where at least one in two students score only at or below Level 1 in mathematics; and 4% of students attend schools where at least four out of five students in the school perform at this level. In Albania, Colombia, Indonesia, Jordan and Peru, at least 80% of students attend schools where at least one in two students are low performers. These are countries that also have very large proportions of low performers. By contrast, in Canada, Estonia, Finland, Hong Kong-China, Korea, Macao-China, Poland, Shanghai-China, Singapore and Switzerland, only 2% or less of students attend schools where the majority of students are low performers.

Across OECD countries, an average of 23% of students are low performers in mathematics. More than one in three students in Greece, Hungary, Israel, Italy, Luxembourg, the Slovak Republic, Sweden and the United States attend schools where at least 30% of students are low performers in mathematics; in Chile, Mexico and Turkey, more than two out of three students attend such schools.

The socio-economic profile of schools

Students learn not only from teachers, but also from their peers. If most of their schoolmates are low performers and socio-economically disadvantaged, students may have a more difficult time learning, as not all teachers are adequately trained to handle high concentrations of such students. PISA 2012 found that more than half of the variation in mathematics scores between schools was associated with the socio-economic profile of the school (OECD, 2013b).

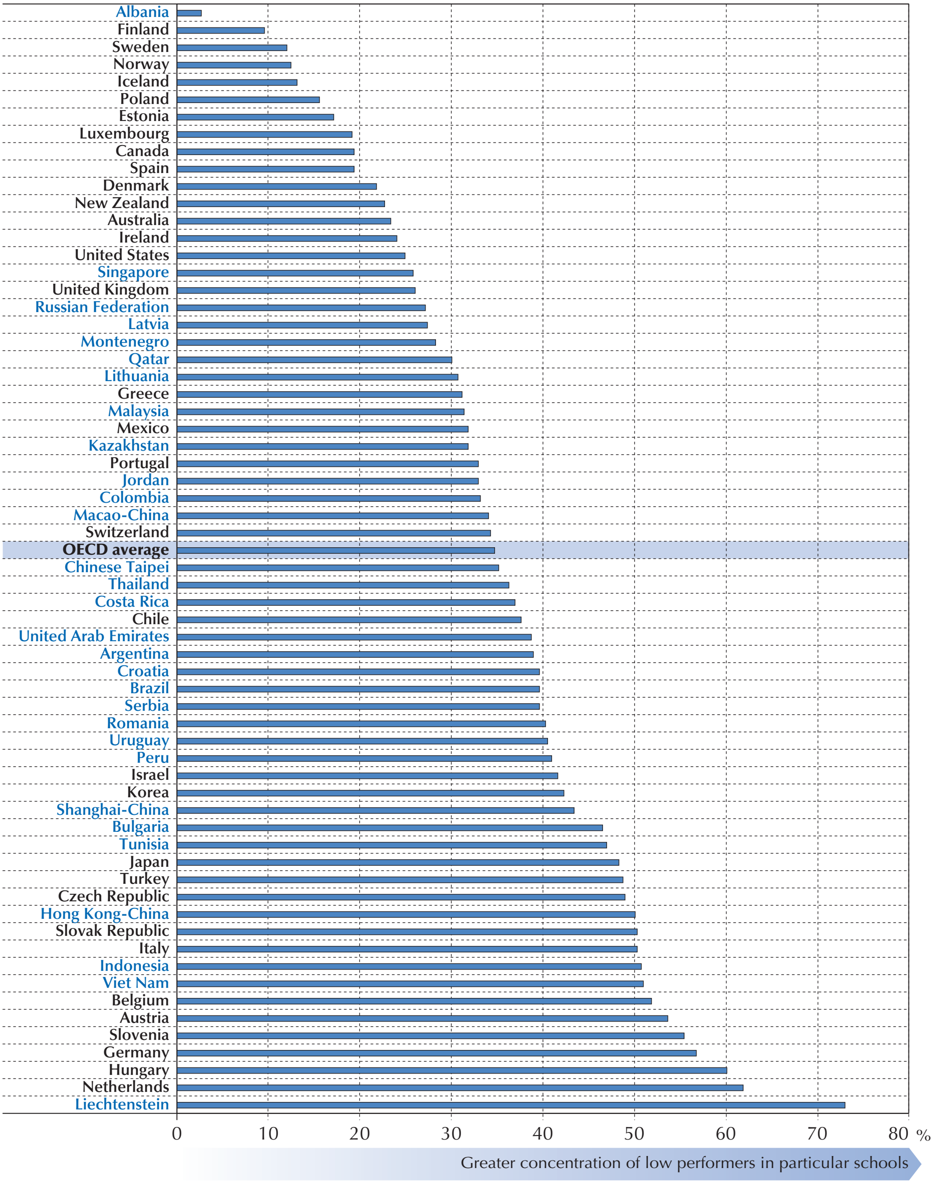
In every country and economy that participated in PISA 2012, low-performing students attended schools with a more disadvantaged student body than students who scored above the baseline level of proficiency in mathematics. On average across OECD countries in 2012, low-performing students attended schools with an average socio-economic profile of -0.3 on the *PISA index of economic, social and cultural status* (ESCS), while students who scored at proficiency Level 2 or above attended schools with an average socio-economic profile of 0.1 on the index (the difference of -0.4 index point is statistically significant). In Brazil, Chile, Hungary and Peru, the difference between the socio-economic profiles of the schools attended by these two groups of students is equal to or greater than -0.7 point. By contrast, in Finland and Norway, the difference is only -0.1 point (Table 4.3).

The correlation between schools that are more disadvantaged (i.e. a school at the bottom quarter of the ESCS index) and larger shares of low performers in these schools is strong and statistically significant in all countries and economies that participated in PISA 2012 (Table 4.4).

■ Figure 4.2 ■

Between-school variation in low performance in mathematics

Percentage of variation in low performance in mathematics explained by differences between schools



Countries and economies are ranked in ascending order of the percentage of variation in low performance in mathematics explained by differences between schools.

Source: OECD, PISA 2012 Database, Table 4.1.

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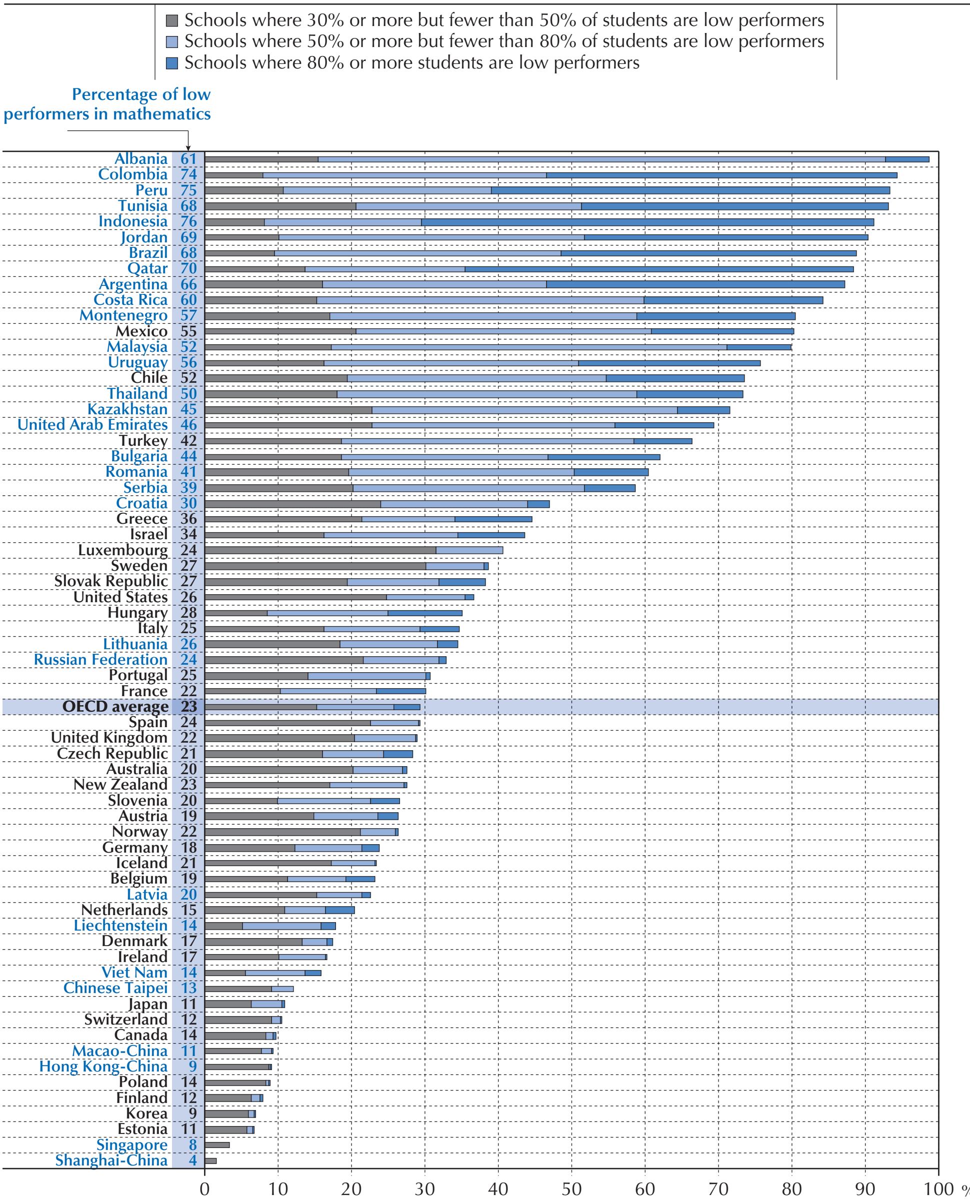
■ Figure 4.3 ■

Schools' share of low performers

Percentage of students who attend schools where 30% or more, 50% or more, or 80% or more of students are low performers in mathematics



Countries and economies are ranked in descending order of the percentage of students who are in schools where 30% or more of students are low performers in mathematics.

Source: OECD, PISA 2012 Database, Table 4.2.

StatLink http://dx.doi.org/10.1787/888933315665

Figure 4.4 shows the average socio-economic profile of the schools attended by students at different levels of mathematics proficiency. In every country and economy that participated in PISA 2012, students with greater proficiency in mathematics attended more advantaged schools.

Some of the differences shown in Figure 4.4 are related to schools' socio-economic profile and some are related to the background of individual students. On average across OECD countries, a student who attends a disadvantaged school is 17 times more likely to be a low performer in mathematics than a student who attends a school with an advantaged student body (i.e. a school in the top quarter of the ESCS index). After the student's socio-economic status is taken into account, the student in the disadvantaged school is 11 times more likely to be a low performer. This means that while a student's own background has a significant influence on the likelihood of his or her being a low achiever in mathematics, the school's socio-economic profile has an even stronger impact (Table 4.5).

THE LEARNING ENVIRONMENT IN SCHOOLS

School leadership

Recent research has highlighted the key role of school leaders in education (Leithwood et al., 2006; Pont, Nusche and Moorman, 2008; Barber, Whelan and Clark, 2010). The most effective schools are led by individuals who set and communicate clear goals and define plans of action according to those goals, including specific tasks for teachers and all actors in the school community. Effective school leaders promote a positive school climate, collaboration among teachers, and teachers' professional development that is adapted to students' learning needs. These leaders welcome and encourage teacher participation in school decisions, and create ways to involve parents in school life. Through all of these practices, effective leaders set high expectations for student achievement while nurturing students' well-being, and are particularly supportive of struggling students. Often, school principals are also responsible for deciding how the school is organised and how education is provided, such as whether to group students by ability or how to address student heterogeneity within classrooms.

Expectations for students

Schools leaders and teachers sometimes respond to low-performing students by lowering their expectations for these students and even reducing the scope of the curriculum these students are taught. However, this type of response can turn into a self-fulfilling prophecy, whereby lower expectations lead to poorer performance (Eder, 1981; Rist, 1970). School principals and teachers with leadership roles can promote, develop and sustain a culture in schools where academic success is expected of all students, including those from disadvantaged backgrounds and those who have performed poorly in previous years.

PISA 2012 asked school principals whether teachers' low expectations for their students hinder learning in their school. On average across OECD countries, 15% of students attend schools whose principals reported that low expectations hinder student learning "a lot" or "to some extent". Low performers are more often found in schools where teachers' low expectations for their students are more prevalent than in schools where teachers' low expectations for students are rare. Some 31% of students who attend schools where teachers have low expectations for their students are low performers, compared to 22% of students who attend schools where teachers' low expectations are not identified as an issue. This difference is observed in 34 out of the 62 countries and economies with available data. Only in Macao-China is the share of low performers significantly smaller in schools whose principals reported that teachers have low expectations for their students (see Table 4.6 for variations across countries).

Teachers' expectations are strongly linked to the socio-economic profiles of schools and students. In nine countries that participated in PISA 2012, the relationship between teachers' low expectations and student low performance in mathematics is statistically significant even after accounting for the socio-economic status of students and schools. Figure 4.5 shows that on average across OECD countries, and before adjusting for socio-economic variables, students enrolled in schools whose principals reported that teachers have low expectations for their students are 1.71 times more likely to score below proficiency Level 2 in mathematics, compared with students in schools where teachers have higher expectations for them. After accounting for socio-economic status, students in schools where teachers have low expectations are 1.2 times more likely to perform poorly in mathematics.

The relationship between teachers' expectations and low performance in mathematics is particularly strong in Chile, Indonesia, Korea and Qatar, where the odds of low performance among students in schools whose principals reported that teachers' low expectations hinder learning are at least 1.5 times higher than in schools where teachers have greater expectations for students. However, in the majority of countries and economies that participated in PISA 2012, the relationship between teachers' expectations and low performance is not significant after accounting for socio-economic status. This indicates the great degree to which students' and schools' socio-economic disadvantage affects teachers' expectations for students' performance. After accounting for socio-economic status, only Macao-China shows significantly higher odds of low performance among students who attend schools where school principals reported that teachers have low expectations for their students.

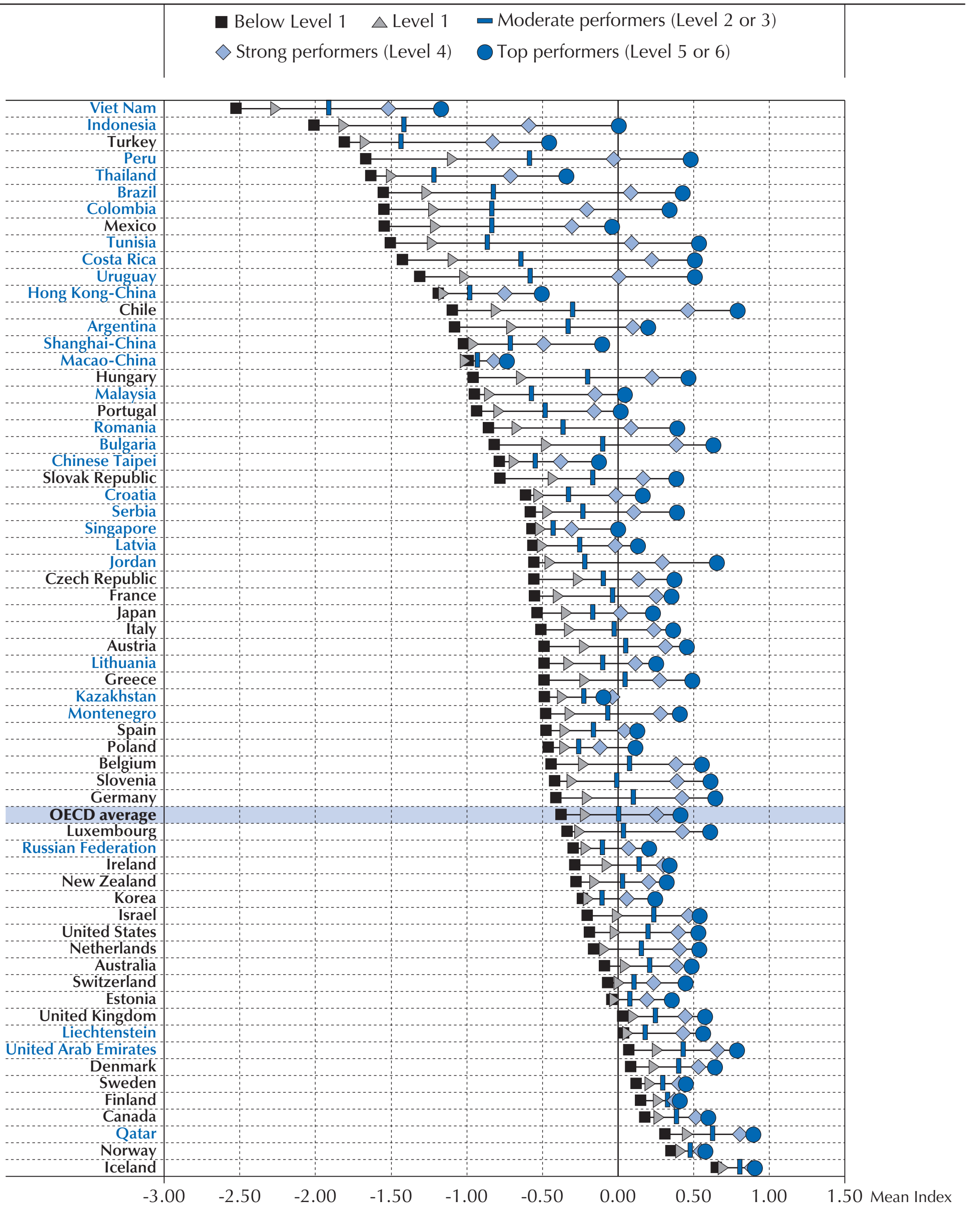
Ability grouping

Nearly all schools have to decide how to handle diversity in students' learning abilities and interests. Some schools mix students of all levels of performance into the same classrooms and teach them the same curriculum. This approach relies heavily on teachers' capacity to engage students with a wide range of abilities, which can be challenging, but can create greater opportunities for students to learn from one another. Other schools sort their lowest-performing and highest-performing students into different classrooms, and offer them different curricula or the same curricula, but at different levels of difficulty ("ability grouping"). While grouping by ability creates more homogeneous classes, students in lower-ability groups often do not benefit as much as those in the higher-ability groups, partly because underachieving students cannot learn from or be inspired by higher-performing peers if they aren't sitting in the same classroom (Lucas, 1999). Many schools use a mix of the two approaches and sort students into different classrooms or ability groups in only some subjects. On average across OECD countries, 26% of students attend schools whose principal reported that ability grouping is not used in any classes, 40% of students attend schools where ability grouping is used for some classes, and 34% of students attend schools with some ability grouping in all classes (Table 4.8).

■ Figure 4.4 ■

Socio-economic profile of schools by proficiency levels in mathematics

Schools' mean value on the PISA index of economic, social and cultural status



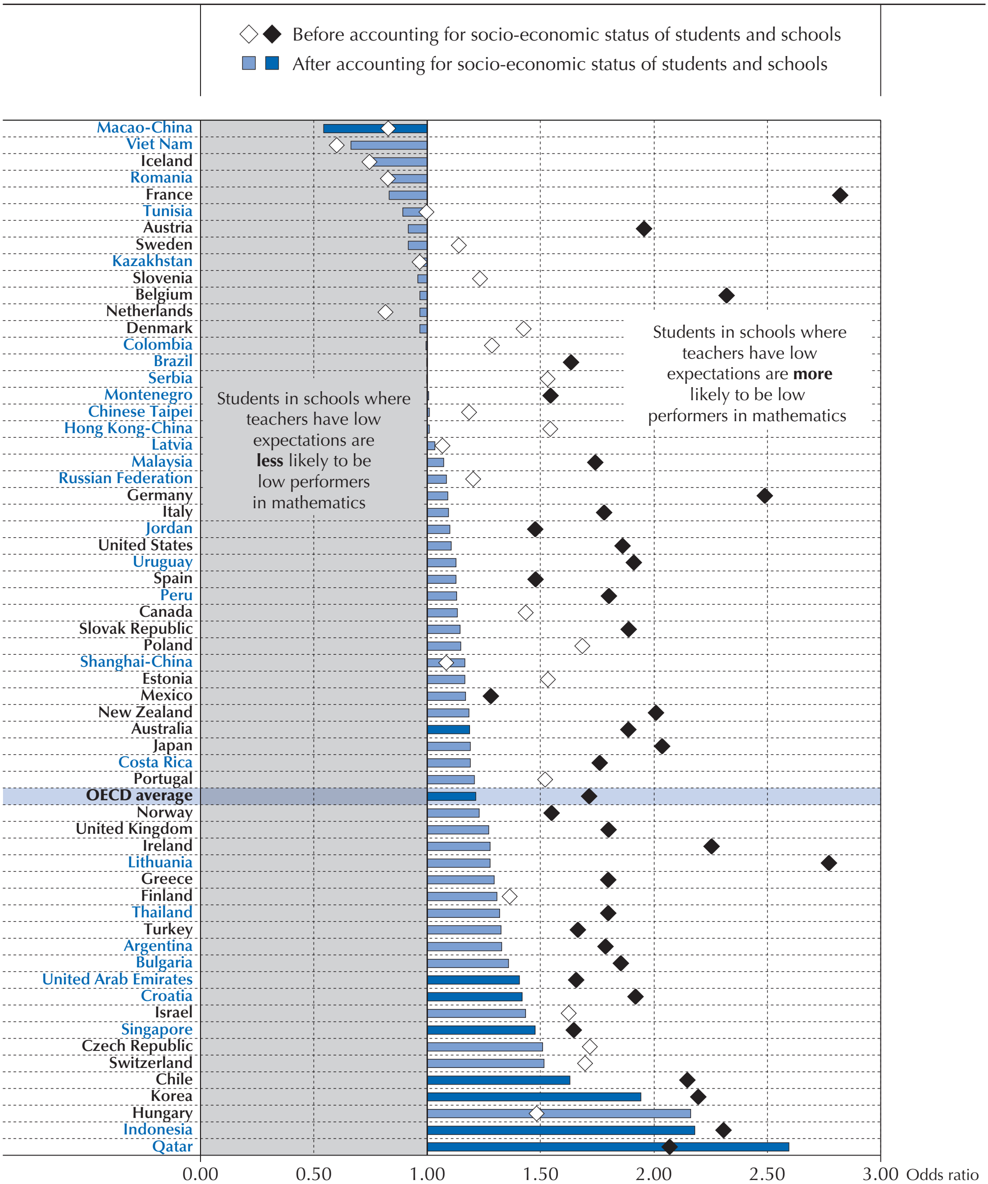
Countries and economies are ranked in ascending order of the mean PISA index of economic, social and cultural status *(ESCS) of the schools attended by students who score below Level 1 in mathematics.*

Source: OECD, PISA 2012 Database, Table 4.4.

StatLink http://dx.doi.org/10.1787/888933315678

■ Figure 4.5 ■

Teachers' expectations and the likelihood of low performance in mathematics



Note: Statistically significant coefficients are marked in a darker tone.

Countries and economies are ranked in ascending order of the odds ratio of low performance in mathematics among students who attend schools whose principals reported that teachers' low expectations for students hinder student learning a lot or to some extent, compared with students who attend schools whose principals reported that teachers' low expectations hinder student learning very little or not at all, after accounting for students' and schools' socio-economic status.

Source: OECD, PISA 2012 Database, Table 4.7.

StatLink http://dx.doi.org/10.1787/888933315687

The proportion of low performers is larger in schools with more ability grouping. On average across OECD countries, 20% of students in schools with no ability grouping in any class are low performers, while in schools with ability grouping in some classes, 24% of students are low performers, and in schools with ability grouping in all classes, 26% of students are low performers (Table 4.8). In 15 countries and economies that participated in PISA 2012, the difference in the share of low performers between schools with ability grouping for all classes and schools with no ability grouping is 10 percentage points or larger. In Austria, the share of low performers is 33 percentage points larger in schools with ability grouping in all classes than in schools with no ability grouping in any class. In Montenegro the difference in the shares of low performers between the two types of schools is 22 percentage points, and in Turkey it is 20 percentage points.

Figure 4.6 shows that the relationship between ability grouping in mathematics (as measured by the *index of ability grouping between mathematics classes*[1]) and low performance in mathematics persists even after accounting for the socio-economic status of students and schools. Before accounting for these factors, students who attend schools with more ability grouping are 1.24 times more likely to score below Level 2 in mathematics than students in schools with less ability grouping, on average across OECD countries. After accounting for the socio-economic status of students and schools, students in schools with more ability grouping are 1.13 times more likely to perform below Level 2, on average across OECD countries. In Austria, Greece, Italy, Luxembourg, Macao-China, Montenegro, the Netherlands, Switzerland and Turkey, the relationship between ability grouping and a greater likelihood of low performance is statistically significant even after accounting for socio-economic factors. These findings suggest that part, but not all, of the association between ability grouping and low performance can be explained by the fact that ability grouping is more common in schools with more disadvantaged student bodies.

The issues involved in deciding how to handle student diversity within a school are analogous to those faced by policy makers when deciding whether policies should encourage the sorting of low performers and top performers into different schools, curricular tracks or grade levels (e.g. through academically selective and vocational schools, grade repetition). Countries with policies that promote and foster more academically inclusive schools expect schools to find ways to handle student heterogeneity. These issues are further explored in Chapter 5, where low performance is analysed in the context of vertical and horizontal stratification in school systems.

Teachers' practices

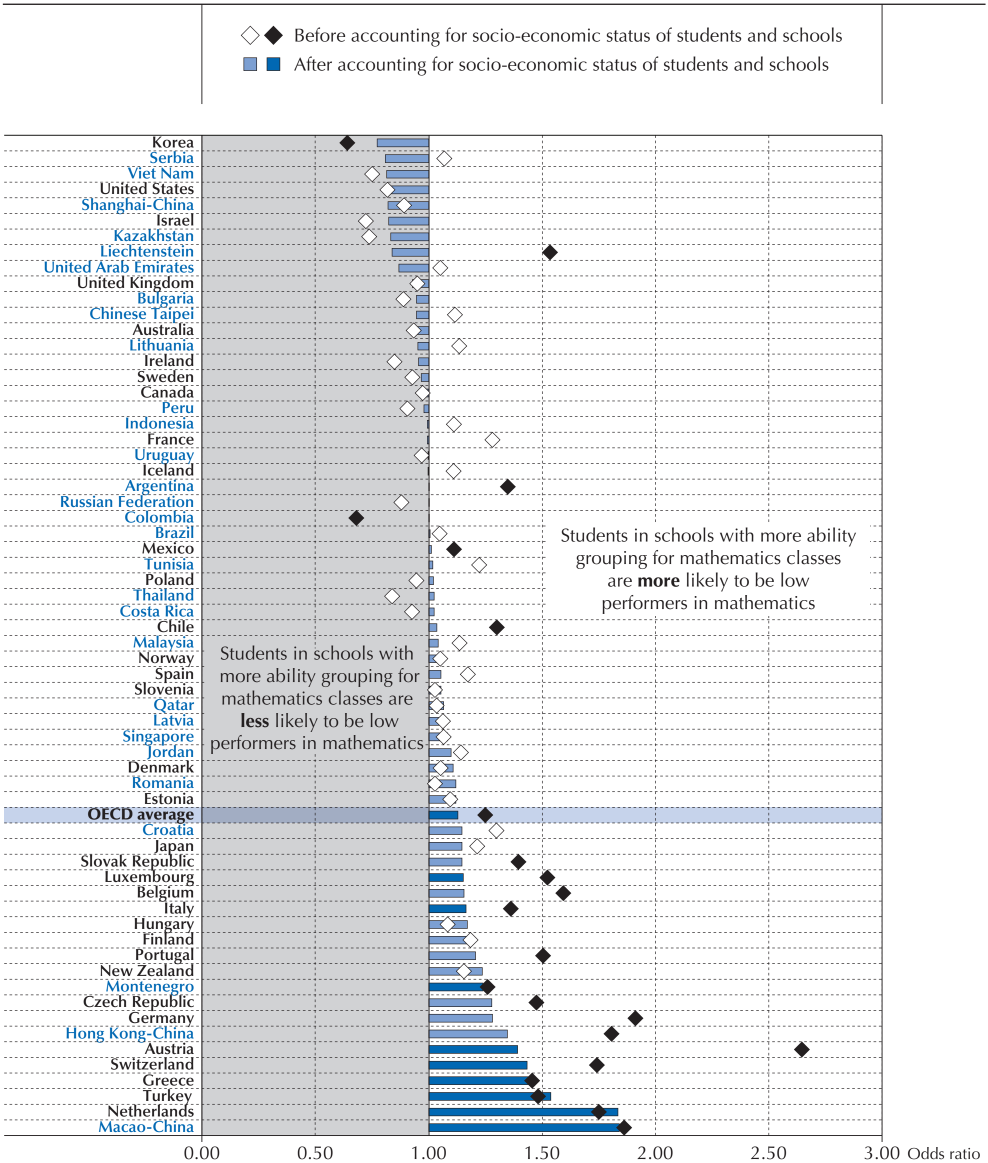
Previous studies have identified certain teaching practices, including planning lessons, using formative assessments, encouraging student participation and providing early support for struggling students, as being particularly effective for learning (Hopkins et al., 2014). PISA finds that some teachers' practices that are related to a positive school climate, such as better teacher morale, teachers' support for students, and no teacher absenteeism, are also related to a reduction in the likelihood of low performance among students.

Teachers' support for students

PISA's definition of teachers' support includes showing an interest in every student's learning, giving extra help when students need it, working with students until they understand the material, and giving students an opportunity to express their opinions. The *index of teacher support* measures these practices based on student responses to questions in the student questionnaire.

■ Figure 4.6 ■

Ability grouping for mathematics classes and the likelihood of low performance in mathematics



Note: Statistically significant coefficients are marked in a darker tone.

Countries and economies are ranked in ascending order of the odds ratio of low performance in mathematics among students who attend schools with more ability grouping for mathematics classes, compared with students who attend schools with less ability grouping, after accounting for students' and schools' socio-economic status.

Source: OECD, PISA 2012 Database, Table 4.9.

StatLink http://dx.doi.org/10.1787/888933315693

Before accounting for socio-economic factors, there is no clear relationship between low performance and teachers' support, on average across OECD countries. Raw differences in the *index of teacher support* show that in 22 countries and economies that participated in PISA 2012, low performers in mathematics attended schools with more supportive teachers than students who performed at or above baseline Level 2, whereas in 17 countries and economies, low performers attended schools with less supportive teachers (Table 4.10).

Figure 4.7 shows the relationship between teachers' support and low performance after accounting for the socio-economic status of students and schools. On average across OECD countries, students who attend schools with less supportive mathematics teachers are slightly more likely (odds ratio of 1.06) to be low performers in mathematics compared with students of similar socio-economic status who attend schools with a similar socio-economic profile, but where teachers are more supportive. A statistically significant relationship between less teacher support and a greater likelihood of low performance is observed in 19 countries and economies.

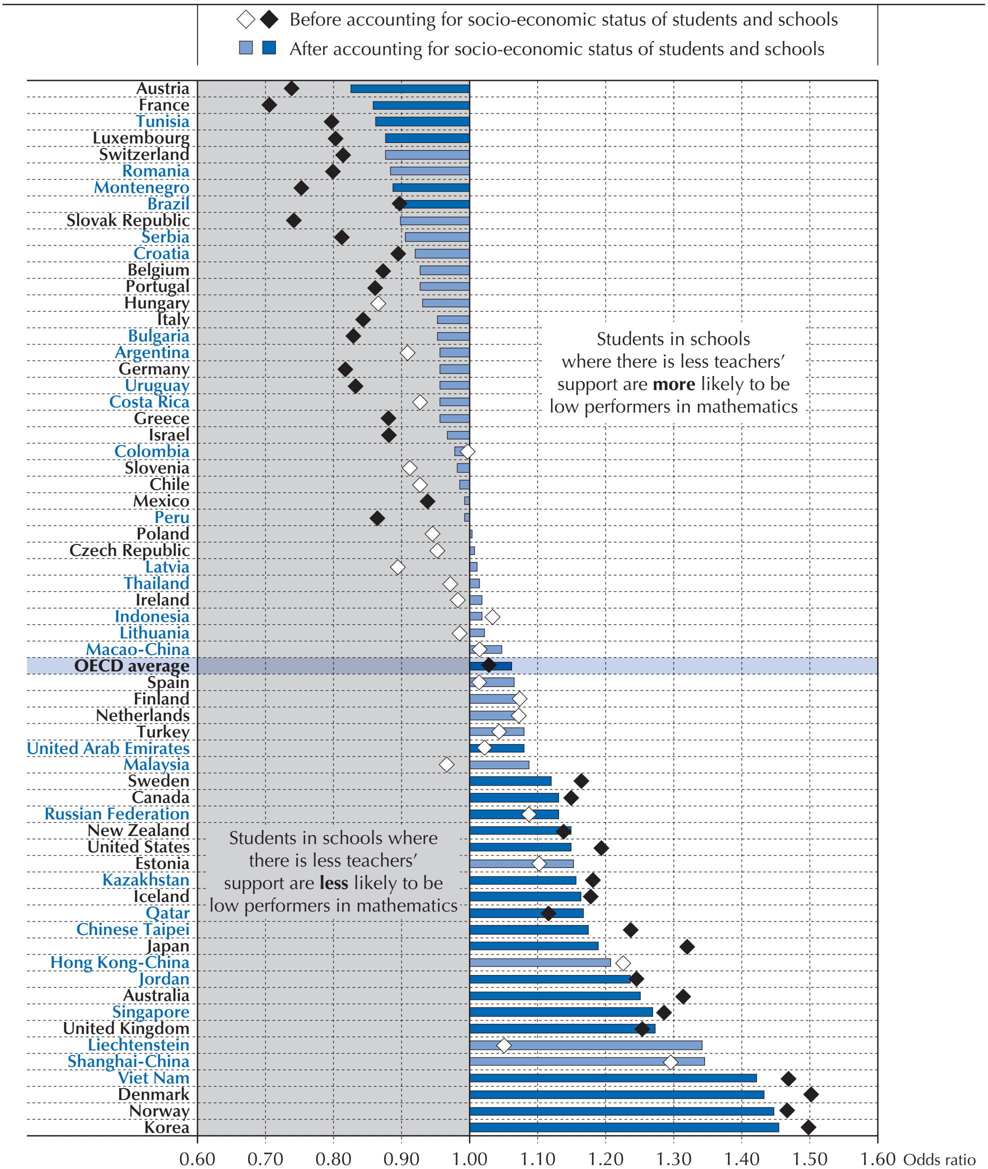
In most of the countries where a link between less teacher support and less low performers is observed, the association is statistically insignificant. However, there are six countries (Austria, Brazil, France, Luxembourg, Montenegro and Tunisia) where students in schools with less supportive teachers are significantly less likely to be low performers in mathematics after accounting for socio-economic factors. This finding suggests that teachers' expectations for their students have a complex interaction with other features of the school system. It could be the case, for example, that in countries where students with different needs are sorted into different schools or ability groups, such as in Austria and France, teachers with more supportive attitudes are more commonly found in academically less-demanding schools, where students are in greater need of support. In countries where students are not necessarily sorted into different schools, such as Korea, teachers have to accommodate students with diverse educational needs, and work with students at risk of failing in order to achieve the education goals that are set for all students. This hypothesis is partly supported by preliminary analyses that show greater between-school variation in teachers' support in Austria and France than in Korea. However, further analysis is required to understand why the effect of teachers' support for students varies so much across countries.

Teacher morale

Teacher morale refers to the degree of enthusiasm with which teachers conduct their work, teachers' pride in their school, and the extent to which teachers value academic achievement. PISA measures teachers' morale in two different ways. First, the school questionnaire asks principals whether the morale of teachers in their schools is high. On average across OECD countries, 91% of students attend schools whose principal agreed or strongly agreed that the morale of teachers is high (Table 4.12). According to this measure, teacher morale is highest in Albania, Indonesia, Latvia, Liechtenstein and Montenegro, where all students attend schools whose principals reported that their teachers enjoy high morale. Teacher morale is lowest in Brazil, Hong Kong-China, Italy, Portugal, Spain and Tunisia, where approximately three out of four students attend schools whose principals reported high teacher morale.

■ Figure 4.7 ■

Teachers' support for students and the likelihood of low performance in mathematics



Note: Statistically significant coefficients are marked in a darker tone.

Countries and economies are ranked in ascending order of the odds ratio of low performance in mathematics among students who attend schools where there is less teachers' support for students, after accounting for students' and schools' socio-economic status.

Source: OECD, PISA 2012 Database, Table 4.11.

StatLink http://dx.doi.org/10.1787/888933315705

Second, the *index of teacher morale* is a more comprehensive measure that combines principals' responses to whether they consider that: 1) teacher morale is high; 2) teachers work with enthusiasm; 3) teachers take pride in the school; and 4) teachers value academic achievement. In most countries and economies that participated in PISA 2012, low performers attend schools where teacher morale is lower than in schools where more students perform above the baseline level of proficiency in mathematics (Table 4.12). On average across OECD countries, schools that have a large proportion of low-performing students are 0.19 point lower on the *index of teacher morale*, on average, than schools where most students score at or above proficiency Level 2 in mathematics.

Figure 4.8 illustrates that students who attend schools where teacher morale is lower are more likely to perform poorly in mathematics, compared with students who attend schools where teacher morale is high. This relationship holds even after accounting for the socio-economic status of students and schools. On average across OECD countries, the odds of low performance in mathematics for students attending schools with lower teacher morale are about 1.26 times greater before accounting for socio-economic factors, and remain slightly but significantly higher than 1 (odds ratio of 1.07) after accounting for those factors. In 15 countries and economies, the relationship between lower teacher morale and a greater likelihood of student low performance is statistically significant after accounting for socio-economic status. In no country or economy is high teacher morale significantly related to greater odds of student low performance.

Teacher absenteeism

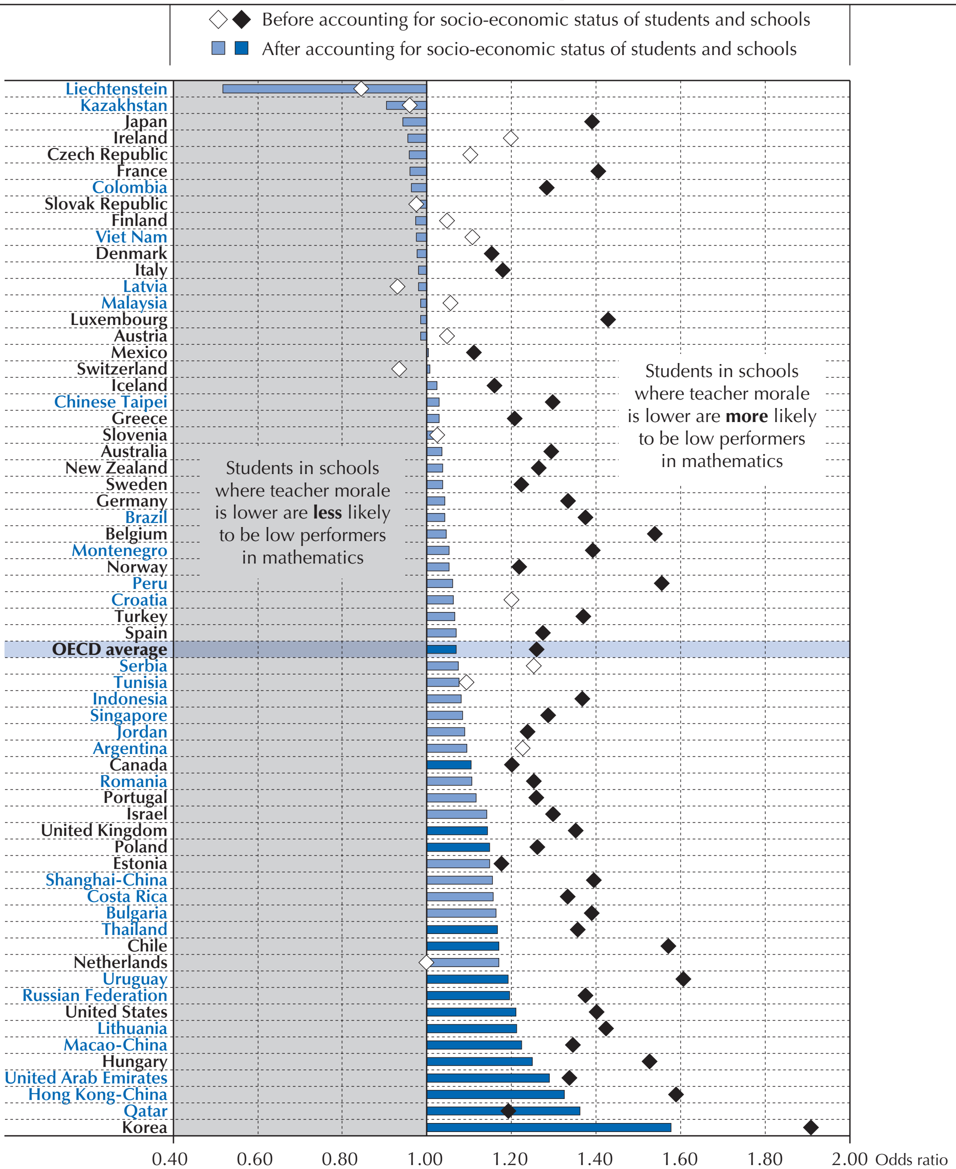
A basic demonstration of teachers' professional responsibility and commitment to students' learning is their showing up for school every day. Teacher absenteeism jeopardises students' opportunities to learn: lessons may be cancelled if no substitute teachers are available, and substitute teachers may not be as well prepared or as effective as regular teachers (Gaziel, 2004; Imants and Van Zoelen, 1995).

PISA 2012 asked school principals whether they considered that teacher absenteeism hindered student learning in their school. On average across OECD countries, 13% of students attend a school whose principals reported that teacher absenteeism hinders learning "a lot" or "to some extent" (Table 4.14). At least 40% of principals in Argentina, Jordan, Kazakhstan, the Netherlands, Tunisia and Uruguay reported that teacher absenteeism hinders learning, while less than 1% of principals in Hungary, Korea and Lithuania so reported.

Schools with larger proportions of low performers tend to suffer more from teacher absenteeism. On average across OECD countries, 28% of low-performing students attend a school whose principal reported that teacher absenteeism hinders student learning, whereas 22% of students who perform below Level 2 in mathematics attend a school where teacher absenteeism hinders learning "very little" or "not at all". The difference in the share of low-performing students between schools where teacher absenteeism hinders student learning and schools where teacher absenteeism is not a problem is equal to or greater than 15 percentage points in Belgium, Portugal, the United Arab Emirates and Uruguay (Table 4.14).

■ Figure 4.8 ■

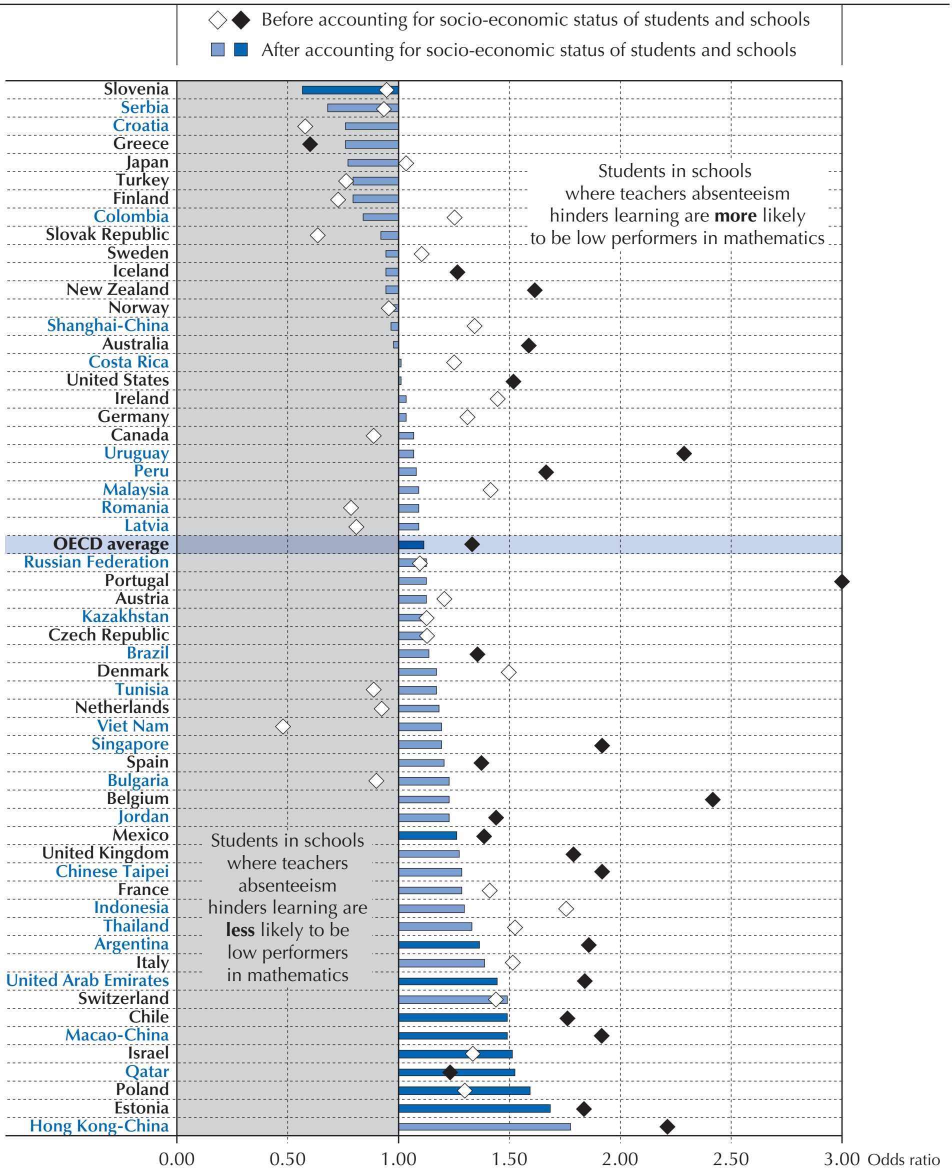
Teacher morale and the likelihood of low performance in mathematics



Note: Statistically significant coefficients are marked in a darker tone.
Countries and economies are ranked in ascending order of the odds ratio of low performance in mathematics among students who attend schools with lower values on the index of teacher morale, *after accounting for students' and schools' socio-economic status.*
Source: OECD, PISA 2012 Database, Table 4.13.
StatLink http://dx.doi.org/10.1787/888933315715

■ Figure 4.9 ■

Teacher absenteeism and the likelihood of low performance in mathematics



Note: Statistically significant coefficients are marked in a darker tone.

Countries and economies are ranked in ascending order of the odds ratio of low-performance in mathematics of students attending schools where the principal reports that teachers absenteeism hinders learning a lot or to some extent, compared with students attending schools where teacher absenteeism hinders learning very little or not at all, after accounting for students' and schools' socio-economic status.

Source: OECD, PISA 2012 Database, Table 4.15.

StatLink http://dx.doi.org/10.1787/888933315723

Figure 4.9 shows that students who attend schools where teacher absenteeism is a problem have a greater likelihood of low performance in mathematics, compared with students in schools where teacher absenteeism is not a problem, even after socio-economic factors have been taken into account. On average across OECD countries, the odds of low performance in mathematics are 1.36 times higher for students in schools whose principals reported that teacher absenteeism hinders learning, before accounting for socio-economic factors. These odds are 1.12 times higher after socio-economic factors are taken into account, as compared with students in schools where teacher absenteeism is not a problem.

After accounting for the socio-economic status of students and schools, teacher absenteeism is significantly linked to a greater likelihood of low performance in Argentina, Chile, Estonia, Israel, Macao-China, Mexico, Poland, Qatar and the United Arab Emirates.

Box 4.1. **Students with special educational needs and low performance: What we can learn from PISA**

Students with special educational needs are defined differently across countries. In some countries, their special needs are related to academic ability, from those who are extraordinarily talented to those with poor cognitive skills. In other countries, young people with physical, sensory or behavioural disabilities are included in this population. Other countries may include socio-economically disadvantaged young people who require extra resources, both human and material, to master the curriculum.

PISA classifies special educational needs into three categories. The first comprises students with functional disabilities, i.e. those with a moderate to severe permanent physical disability. The second includes students with cognitive, behavioural or emotional disability, as determined by a test or professional opinion. The third comprises students who have received less than one year of instruction in the language of assessment.

Why consider students with special educational needs in discussions of low performance?

Many students with special educational needs do not reach baseline levels of proficiency in mathematics, reading and science in PISA. While the reasons for low performance are varied, findings from standardised educational assessments may help educators to identify some of the instructional and environmental factors that prevent these students from performing at higher levels.

Public school enrolment of students with special educational needs has been increasing across the world since the 1970s. Education reforms in the 1990s extended access further by encouraging the inclusion of students with special educational needs in mainstream classrooms and programmes. Both access and inclusion vary widely across countries. According to the United Nations Educational, Scientific and Cultural Organisation (UNESCO), young people with disabilities in low-income countries are rarely in school, while in high-income countries they regularly attend school through upper secondary and even into post-secondary institutions (UNESCO, 2014). Many OECD countries require by law that young people with disabilities learn the same curriculum and participate in the same assessments as their peers.

...

However, in some countries, a lack of targeted teacher preparation or adequate facilities makes it difficult to include students with special educational needs in mainstream classes. As a result, too few students with special educational needs leave public education with the skills needed to participate fully in the workforce and public life. More than 60% of young adults with special educational needs are unemployed, and those who are employed often work in low-skilled and low-paying jobs (WHO, 2011). The majority of young adults with moderate to severe special educational needs remain lifelong beneficiaries of public support systems instead of becoming engaged, taxpaying citizens.

Profile of students with special educational needs in PISA

Since PISA 2003, between 1% and 3% of each subsequent PISA sample has been composed of students with special educational needs. While the PISA inclusion rates for this population vary widely across participating countries and economies (between 0% and 15%), the number of countries that include at least some students with special educational needs in their samples has grown each year, from a low of 27 out of 41 countries in 2003 to a high of 58 out of 64 countries in 2012. However, the sample size of these students in PISA is not large enough to conduct separate analyses by country; thus the information in this section refers to the pooled sample of students with special educational needs in PISA.

In 2012, the prototypical PISA participant with special educational needs was a boy (60%, higher than the 50% among students without special educational needs), with a cognitive, behavioural and/or emotional disability (63%; 23% of these students had limitations in language proficiency and 14% had functional limitations), who lived in a two-parent family (80%, lower than the 84% among students without special educational needs) with well-educated parents (74% of these students' parents completed post-secondary degrees, similar to the parents of students without special educational needs) and who work full time (47%, also similar to students without these special needs). This profile has been consistent across the PISA cycles from 2003 through 2012.

Compared to students without special educational needs, students with these needs report that their classes are smaller (23 students versus 29 students). Some 40% of these classes use ability grouping for instruction and focus more on concrete as opposed to abstract academic concepts. Students with special educational needs report similar amounts of time spent studying and doing homework (four hours per week, on average) as their peers; and they report significantly greater access, familiarity and use of computers and instructional technology at home and in school. These characteristics of student learning environments have been consistent across the PISA cycles.

Performance in PISA among students with special educational needs

The mean scores for students with special educational needs, across academic subjects (mathematics, reading and science), the three categories of students with special educational needs and the four PISA assessment cycles, have been less than 425 points. As a group, students with special educational needs (those in OECD countries only, and all of these students in PISA-participating countries and economies combined) score lower than the OECD average by the equivalent of a year of formal schooling. As shown in the figure hereafter, the majority of students with special educational needs scored at proficiency Level 1 or below in the PISA 2012 mathematics assessment.

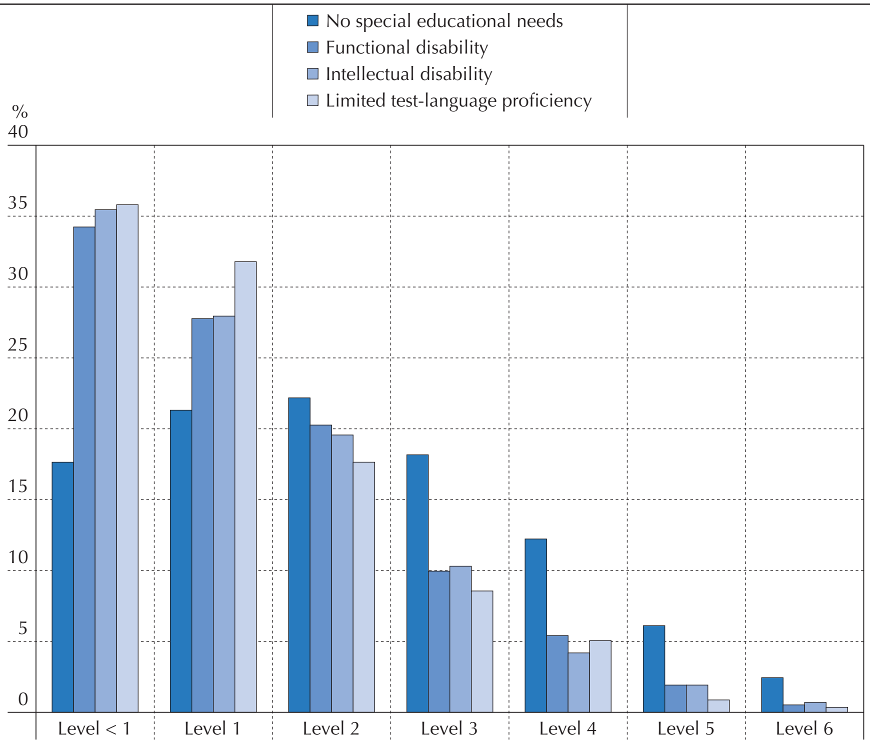
...

Students with special educational needs also have less positive attitudes towards learning and school than their peers. They report feeling less connected to their classmates and learning environments, and are less happy and less convinced that school will matter for their life outcomes than their peers.

While there is no implied causal relationship among performance, attitudes towards learning and special educational needs, these three phenomena are often related.

■ Figure 4.a ■

Special education and needs, by proficiency levels of mathematics



Source: OECD (forthcoming).

The number of students with special educational needs in PISA is steadily rising; but given that these students are unevenly distributed across countries and the sample sizes within countries are small, the use of these data for examining the performance of students with special educational needs is limited. A forthcoming study, *PISA 2012 and the Participation of Students with Special Educational Needs*, will focus on these issues.

Sources:

UNESCO (2014), *Education for All: Global Monitoring Report*, United Nations Educational, Scientific and Cultural Organisation, Paris.

WHO (2011), *World Report on Disability*, World Health Organisation, Geneva.

...

For more information:

OECD (forthcoming), *PISA 2012 and the Participation of Students with Special Educational Needs*, OECD Publishing, Paris.

OECD (2009), "PISA 2006 and the Participation of Students with Special Educational Needs", in OECD/JRC, *Students with Disabilities, Learning Difficulties and Disadvantages in the Baltic States, South Eastern Europe and Malta: Educational Policies and Indicators*, OECD Publishing, Paris, http://dx.doi.org/10.1787/9789264076860-7-en.

OECD (2007), "Participation of students with disabilities, difficulties, and disadvantages in standardised assessments: The case of PISA 2003", *Students with Disabilities, Learning Difficulties and Disadvantages: Policies, Statistics and Indicators*, OECD Publishing, Paris, http://dx.doi.org/10.1787/9789264027619-en.

Extracurricular opportunities after school hours

Students' school life does not always end when the final school bell rings. Many schools offer extracurricular activities, some with an academic focus and some centred on enrichment activities, such as music and arts. Extracurricular activities focused on academic subjects can help to improve student achievement directly by extending learning time or by providing more personalised instruction for struggling or gifted students. Participation in non-academic extracurricular activities, such as sport teams, music groups or volunteering, can help to develop non-cognitive skills, such as persistence, working in groups and socialisation, which are also important for school success (Farb and Matjasko, 2012). Since extracurricular activities involve additional resources, they are more frequently found in socio-economically advantaged schools. Some research finds that extracurricular activities could thus play a role in perpetuating inequalities in education related to socio-economic status (Covay and Carbonaro, 2010; Lareau, 2003).

Schools that offer remedial and enrichment mathematical lessons and other mathematics-related extracurricular activities

Chapter 3 discussed the extent to which low performers participate in activities related to mathematics after school hours and showed that low performers participate in some of these activities as often as better-performing students (Figures 3.5 and 3.6). But to what extent are low performers attending schools that offer these activities? And how is the availability (or lack) of mathematics-related extracurricular activities at school linked to low performance?

On average across OECD countries, 66% of students attend schools that offer mathematics lessons outside of normal school hours. Of the students who attend schools that offer additional mathematics lessons, more than one in two attend schools where these lessons are organised for both enrichment and remedial purposes (54%), about one in three attends schools where the purpose of these lessons is remedial only (32%), and less than one in ten attends schools where additional lessons are organised for enrichment purposes only (6%) or for reasons unrelated to achievement (7%) (Table 4.16).

Across OECD countries, 25% of students who attend schools that offer some kind of additional mathematics lessons are low performers, while 22% of students who attend schools that do not offer additional mathematics lessons are. This difference of 3 percentage points is statistically significant (Table 4.16).

Low performers are fairly evenly distributed across schools that offer different kinds of after-school lessons. On average across OECD countries, in schools that offer additional mathematics lessons for remedial purposes only, 24% of students are low performers; in schools that offer additional mathematics lessons for both enrichment and remedial purposes, 21% of students are low performers; and in schools that offer additional lessons unrelated to previous performance, 24% of students are low performers. Among schools that offer additional mathematics lessons for enrichment purposes only, 26% of students are low achievers (Table 4.16). These numbers suggest that in many schools, the after-school mathematics lessons are not particularly tailored to the needs of low-performing students.

The *index of mathematics-related extracurricular activities at school* is a composite measure of the availability of different kinds of additional mathematics lessons at school and of other mathematics-related extracurricular activities, such as mathematics clubs and competitions, and clubs focusing on computers and information and communication technologies. Figure 4.10 shows the relationship between students' low performance and schools' mathematics-related extracurricular activities, before and after accounting for the socio-economic status of students and schools. The figure shows that, on average across OECD countries, students who attend schools with fewer mathematics-related extracurricular activities are significantly more likely to perform below baseline proficiency Level 2 in mathematics, both before and after accounting for these socio-economic factors. Before accounting for these factors, this relationship is observed in 38 out of the 64 countries and economies that participated in PISA 2012. After accounting for them, the relationship is still significant in 15 countries and economies.

The fact that low performers participate as much as better-performing students in mathematics-related activities, despite the fact that they are more likely to attend schools that have fewer of these opportunities, suggests that low performers could greatly benefit if more of these activities were available in their schools.

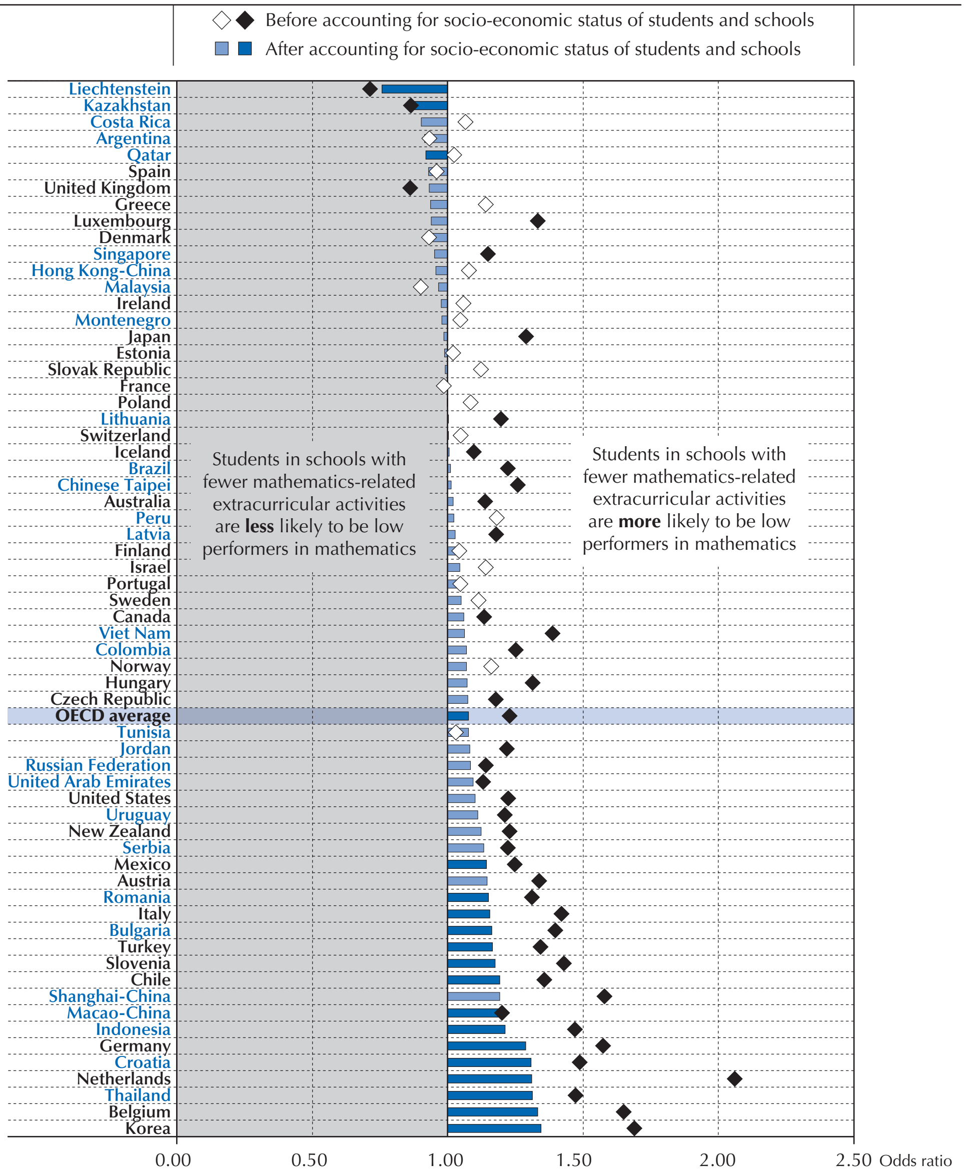
Schools that offer creative extracurricular activities

PISA asked school principals if their schools offer the following creative extracurricular activities: a band, orchestra or choir; a school play or school musical; and an art club or art activities. This information was used to create the *index of creative extracurricular activities*. As discussed in Chapter 3, creative activities may help students to feel a stronger sense of belonging at school.

Figure 4.11 shows that less availability of creative activities after school hours is significantly related to greater chances of poor performance in mathematics among students. Before accounting for other variables, students who attend schools that offer fewer creative extracurricular activities show greater chances of low performance in 45 countries and economies that participated in PISA 2012. After accounting for socio-economic factors, the relationship is still significant among 15 countries and economies. The association between fewer creative extracurricular activities and low performance, after accounting for socio-economic factors, is particularly strong in Indonesia, Korea, Macao-China, Qatar, the United Arab Emirates and the United States.

■ Figure 4.10 ■

Mathematics-related extracurricular activities at school and the likelihood of low performance in mathematics



Note: Statistically significant coefficients are marked in a darker tone.

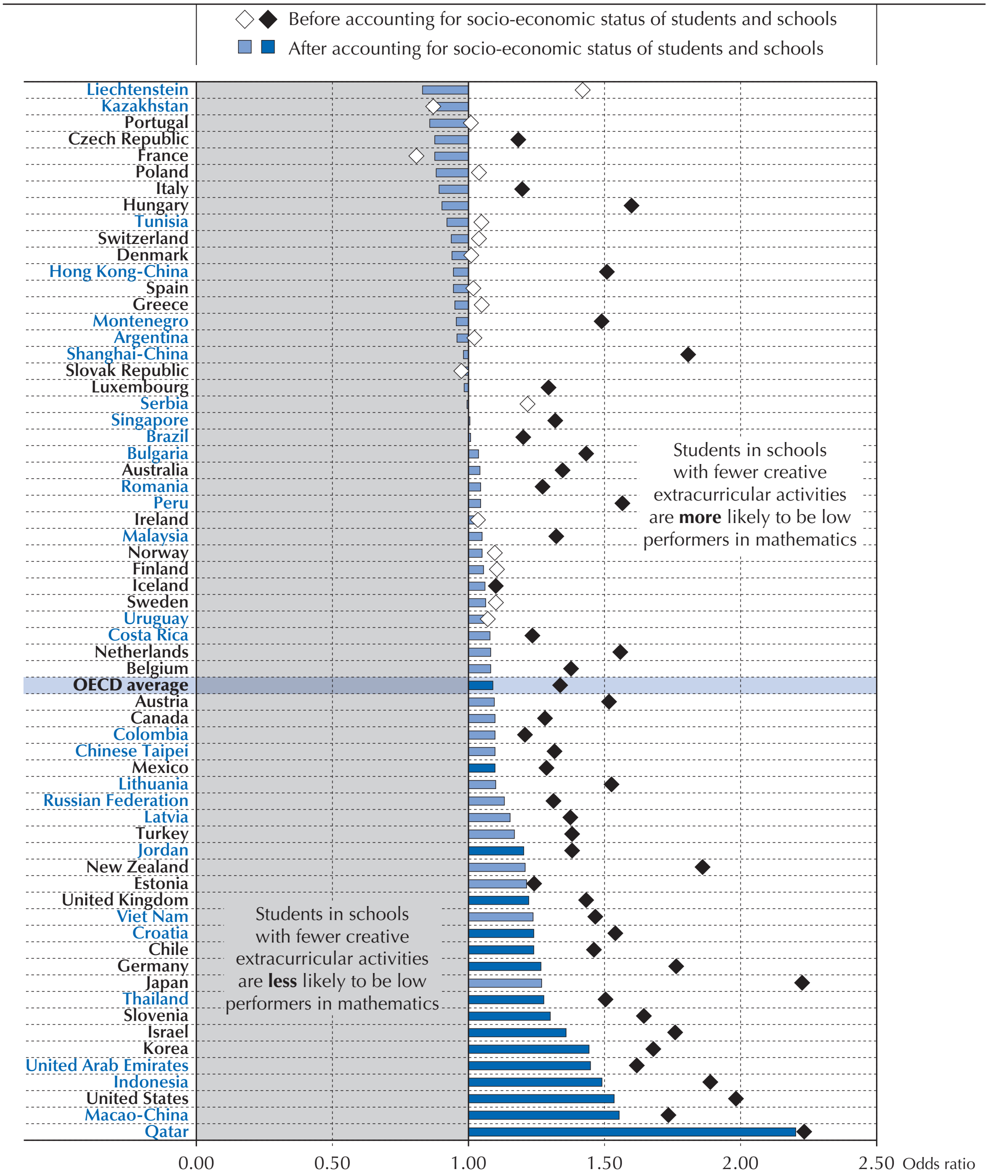
Countries and economies are ranked in ascending order of the odds ratio of low performance among students who attend schools with fewer mathematics-related extracurricular activities, after accounting for students' and schools' socio-economic status.

Source: OECD, PISA 2012 Database, Table 4.17.

StatLink http://dx.doi.org/10.1787/888933315733

■ Figure 4.11 ■

Creative extracurricular activities and the likelihood of low performance in mathematics



Note: Statistically significant coefficients are marked in a darker tone.
Countries and economies are ranked in ascending order of the odds ratio of low performance in mathematics among students who attend schools with fewer creative extracurricular activities, after accounting for students' and schools' socio-economic status.
Source: OECD, PISA 2012 Database, Table 4.19.
StatLink http://dx.doi.org/10.1787/888933315740

Parental pressure

Parents can be a great source of support for struggling students (Rumberger, 1995; OECD, 2012b). Parents can not only invest time to help their child with schoolwork or invest financial resources in educational materials, private tutors or private schools, but they can also discuss their expectations for their child's education directly with principals and teachers. PISA examined this type of parental involvement by asking school principals whether they receive pressure from many parents to achieve higher academic standards, pressure from a minority of parents, or whether they received little or no pressure from parents. On average across OECD countries, 46% of students attend schools whose principal reported that a minority of parents exerted pressure, 33% attend schools where there is little or no parental pressure, and 21% attend schools where parents exercise constant pressure (Table 4.20).

In most countries and economies that participated in PISA 2012, the share of low-performing students is larger in schools where parental pressure is weaker. On average across OECD countries, 29% of students in schools where there is little or no parental pressure are low performers, 24% of students in schools where pressure comes from a minority of parents are low performers, and 15% of students in schools where parental pressure is constant are low performers (Table 4.20).

Since research shows that socio-economically advantaged parents may be better positioned to exert pressure on schools (Lareau, 2000), it is important to determine the degree of influence socio-economic status has on the relationship between parental pressure and student performance. Figure 4.12 shows that weaker parental pressure is associated with a greater likelihood of low performance before and after accounting for the socio-economic status of students and schools. Students who attend schools whose principals reported less parental pressure are 1.62 times more likely, before accounting for socio-economic factors, and 1.11 times more likely, after accounting for these factors, to be low performers in mathematics, compared with students who attend schools where greater parental pressure is reported. After accounting for socio-economic factors, less parental pressure is associated with a greater likelihood of low performance in nine countries.

SCHOOL RESOURCES AND ADMINISTRATION

Quality of schools' educational resources

Previous PISA reports have shown that high-quality material resources in a school, including textbooks and infrastructure, are a necessary precondition for high student performance, but are not sufficient in themselves to ensure academic achievement. The relationship between schools' educational resources and student mathematics performance in PISA is significant. On average across OECD countries, higher-performing students generally attend schools with better educational resources. This relationship weakens after accounting for other student and school characteristics, remaining significant in only three countries – Costa Rica, Qatar and Romania (OECD, 2013a).

The quality of educational resources tends to be lower (a mean value of -0.03 on the *index of quality of schools' educational resources*) in schools with a large proportion of low performers than in schools with a large proportion of students who perform at or above baseline proficiency Level 2 in mathematics (a mean value of 0.09 on the index), on average across OECD countries (Table 4.22). In no country or economy that participated in PISA 2012 did large proportions of low performers attend schools with better educational resources. Most of differences in student low performance related to the quality of schools' educational resources are linked to students' socio-economic status. As shown in Figure 4.13, before accounting for socio-economic factors, in 26 countries and economies the odds of low performance are higher for students in schools with lower-quality educational resources; after accounting for those factors, the likelihood of low performance in mathematics is significantly greater for students in schools with lower-quality resources in nine countries.

Teacher shortage

Teachers are the most valuable resource available in schools, and low-performing students need qualified teachers to help them to improve. PISA finds that low performers in mathematics are more likely than students who perform at or above baseline Level 2 to attend schools that suffer from a lack of qualified teachers. The *index of teacher shortage* measures whether, according to school principals, a lack of qualified teachers hinders instruction in mathematics, science, the language-of-instruction and/or other subjects. Higher values on the index indicate a greater incidence of teacher shortage. On average across OECD countries, the incidence of teacher shortage in the schools attended by low-performing students is 0.13 index point higher than in the schools attended by students who are proficient at or above Level 2. This difference is particularly large (greater than 0.40 index point) in Germany, Indonesia, Liechtenstein, Qatar and Chinese Taipei (Table 4.24).

Differences in teacher shortage are partly explained by socio-economic differences among schools. Figure 4.14 shows that before accounting for the socio-economic status of students and schools, the probability of low performance in mathematics is 23% greater (odds ratio of 1.23) for students who attend schools with a higher incidence of teacher shortage, on average across OECD countries. After accounting for socio-economic factors, the probability is 7% greater, compared with students who attend schools where there is less incidence of teacher shortage.

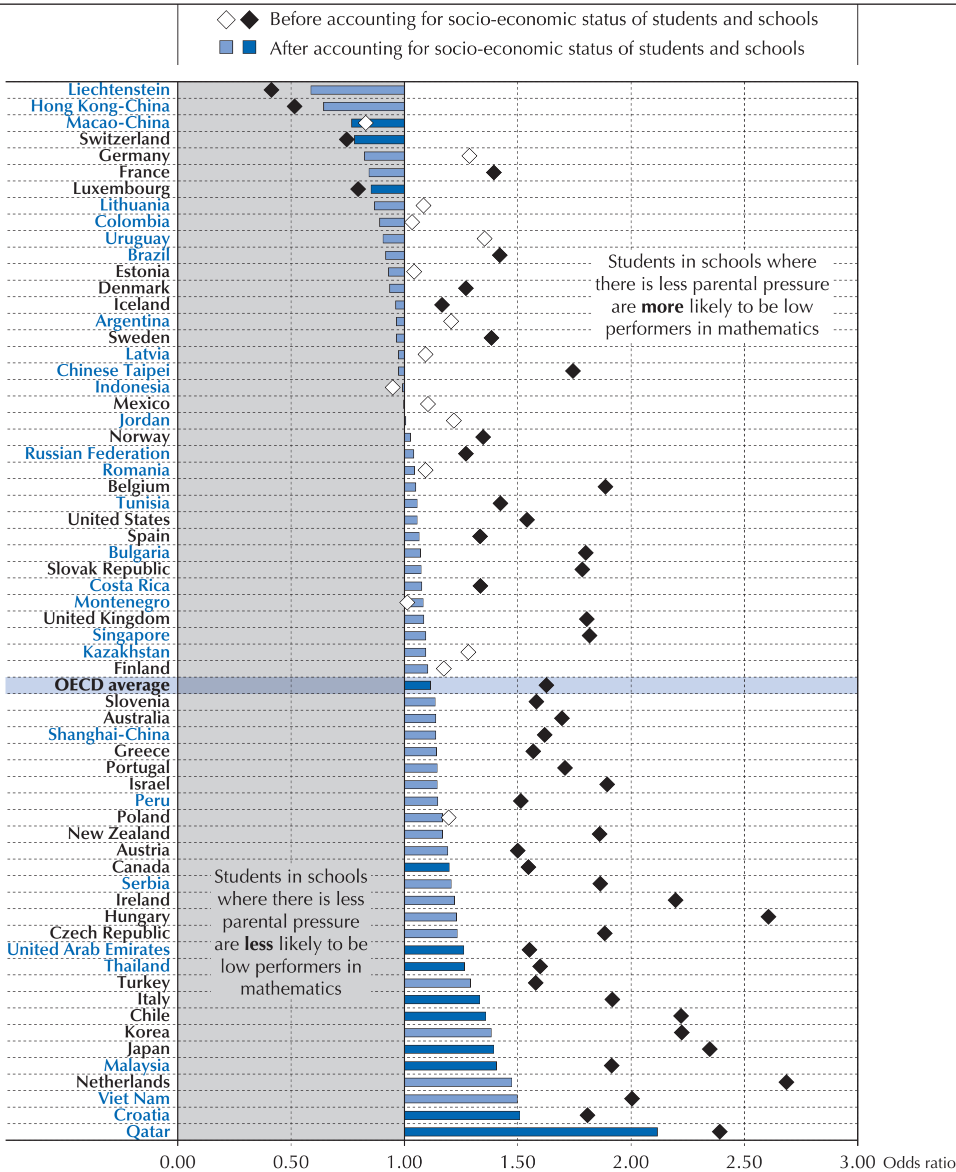
The greater odds of low performance in mathematics associated with teacher shortage are significant in 24 countries, and particularly large in the Czech Republic, Germany, Indonesia, Liechtenstein, Serbia and the Slovak Republic, before accounting for socio-economic status. The odds are greater in eleven countries and economies after accounting for socio-economic factors.

Public vs. private schools

Previous PISA reports have found that in most countries, students who attend private schools perform better than students who attend public schools. However, part or all of these performance differences are accounted for by the socio-economic status of students and/or schools (OECD, 2013a; OECD, 2012a). Little is known about the differences – if any – in the way public and private schools deal with low-performing students.

■ Figure 4.12 ■

Parental pressure for high achievement and the likelihood of low performance in mathematics



Note: Statistically significant coefficients are marked in a darker tone.

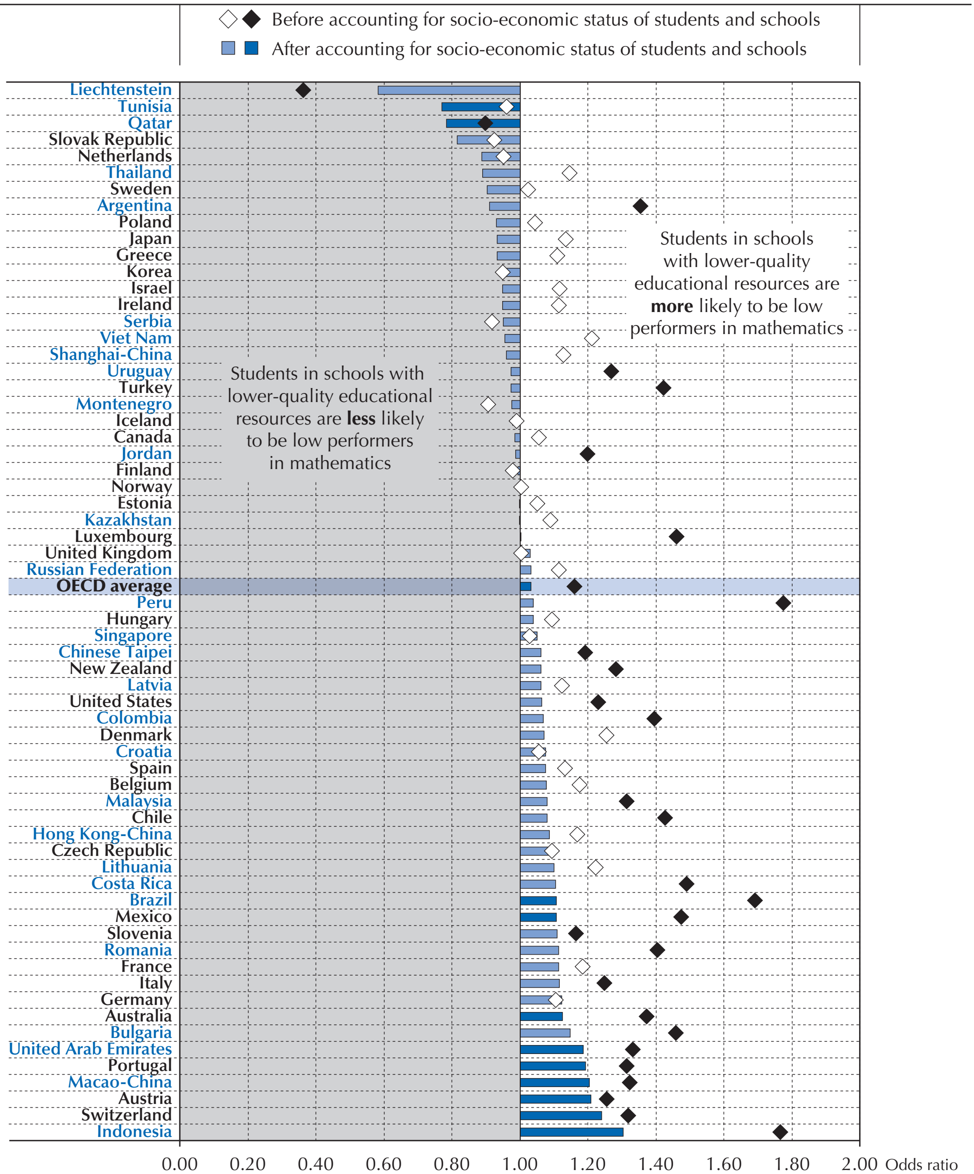
Countries and economies are ranked in ascending order of the odds ratio of low performance in mathematics among students who attend schools where there is less parental pressure for high achievement, after accounting for students' and schools' socio-economic status.

Source: OECD, PISA 2012 Database, Table 4.21.

StatLink http://dx.doi.org/10.1787/888933315758

■ Figure 4.13 ■

Quality of educational resources and the likelihood of low performance in mathematics



Note: Statistically significant coefficients are marked in a darker tone.

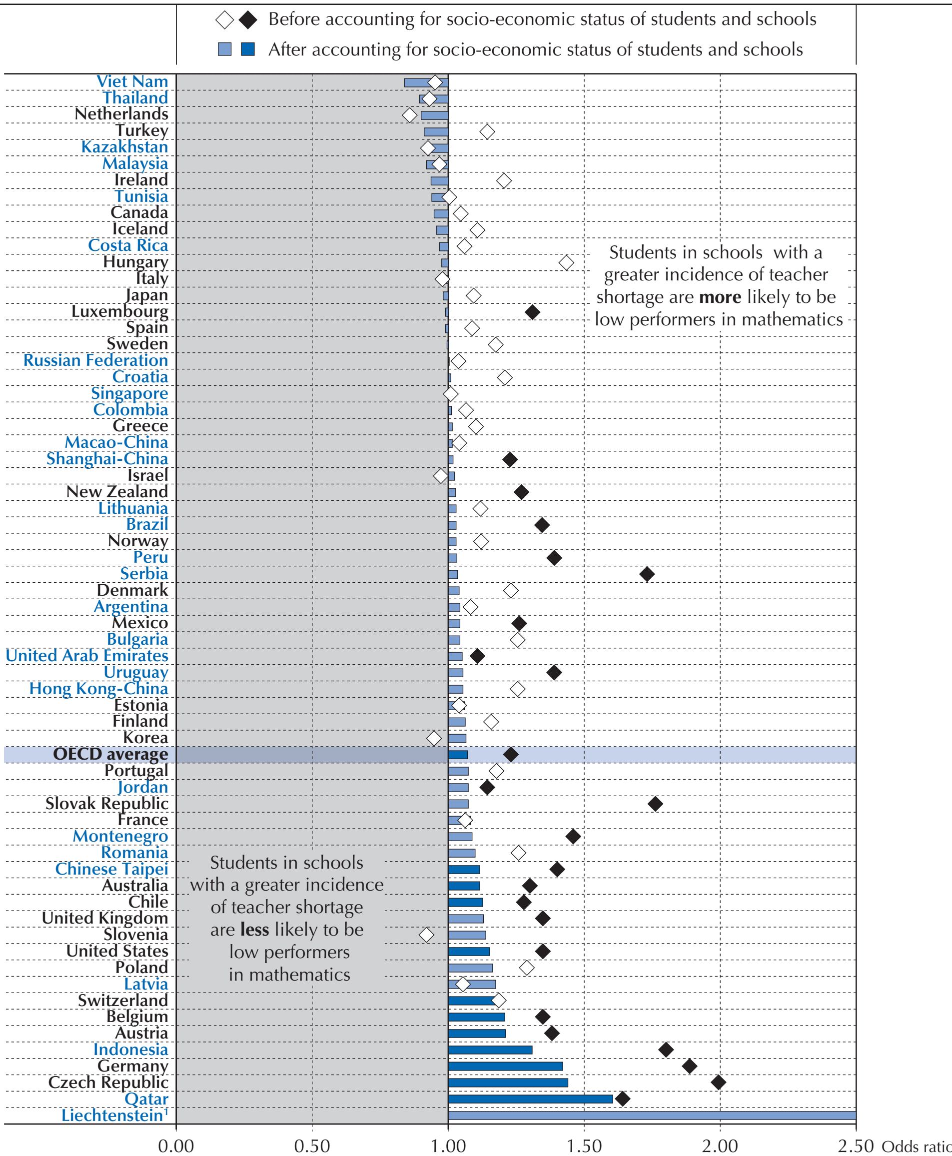
Countries and economies are ranked in ascending order of the odds ratio of low-performance in mathematics of students attending a school with higher values in the index of quality of schools' educational resources*, after accounting for students' and schools' socio-economic status.*

Source: OECD, PISA 2012 Database, Table 4.23.

StatLink http://dx.doi.org/10.1787/888933315761

■ Figure 4.14 ■

Teacher shortage and the likelihood of low performance in mathematics



1. Coefficients for Liechtenstein, corresponding to before and after accounting for socio-economic status of students and schools, are too high to be shown in the figure (12.99 and 8.97, respectively); only the first coefficient is statistically significant.

Note: Statistically significant coefficients are marked in a darker tone.

Countries and economies are ranked in ascending order of the odds ratio of low performance in mathematics among students who attend schools with higher values on the index of teacher shortage*, after accounting for students' and schools' socio-economic status.*

Source: OECD, PISA 2012 Database, Table 4.25.

StatLink http://dx.doi.org/10.1787/888933315777

Private schools, as defined in PISA and in this report, refer to schools managed directly or indirectly by a non-government organisation (such as a church, trade union, business or other private institution). Depending on whether or not they receive funding from the government, private schools can be considered as private-independent schools (50% or more of their funding comes from private sources) or private-dependent schools (at least 50% of their funding comes from the government). Public schools are those managed by a public education authority.

Student enrolment in private schools (both dependent and independent of government funds) varies greatly across countries and economies. In 35 countries and economies that participated in PISA 2012, less than 10% of 15-year-old students were enrolled in private schools. In Hong Kong-China and Macao-China, on the contrary, more than 90% of students were enrolled in private schools; in Chile and the Netherlands, about two out of three students were enrolled in private schools; in Indonesia, Ireland, Korea, the United Arab Emirates and the United Kingdom, more than 40% of students were enrolled in private schools; and in Argentina, Australia, Japan, Qatar, Spain and Chinese Taipei, about one in three 15-year-olds students were enrolled in private schools (Table 4.26).

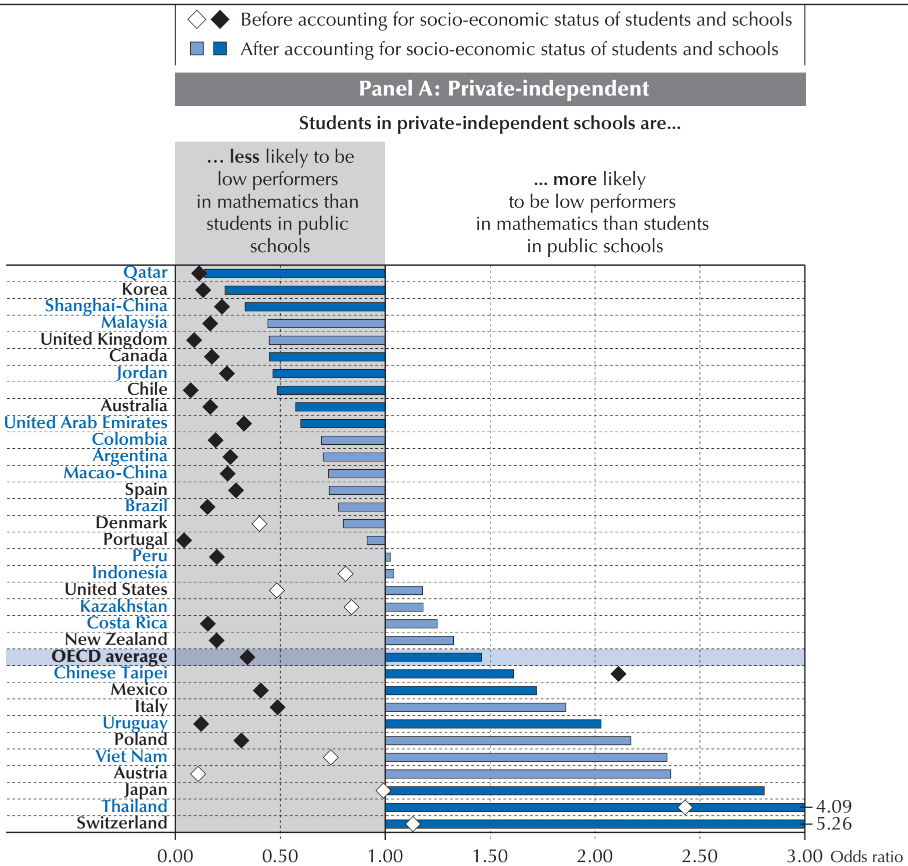
In general, there are more low performers in public schools than in private schools. This is to be expected, given the different socio-economic profiles of public and private schools. On average across OECD countries with sufficient data, 25% of students attending public schools were low performers in mathematics in PISA 2012, 20% of students attending private, government-dependent schools were low performers, and 13% of students attending independently funded private schools were low performers in mathematics (Table 4.26). In some countries, the difference in the percentage of low performers between public and private-independent schools is much larger: in Chile, it is 55 percentage points, and in Brazil, Costa Rica, Qatar and Uruguay, it is over 40 percentage points. By contrast, in Chinese Taipei and Thailand, there are more low performers in private-independent schools than in public schools.

Once the socio-economic status of students and schools are taken into account, the association between school type and low performance changes dramatically, as shown in Figure 4.15. On average across OECD countries, before accounting for socio-economic factors, students enrolled in private-independent schools are significantly less likely to be low performers in mathematics than students in public schools (odds ratio of 0.3); but after accounting for those factors, they are 1.5 times more likely to be low performers. The greater likelihood of low performance among students in private-independent schools, compared with students in public schools, is notable in Switzerland and Thailand, and observable also in Japan, Mexico, Chinese Taipei and Uruguay. In eight countries and economies that participated in PISA 2012, public school students are more likely to be low performers than students enrolled in private-independent schools, even after accounting for socio-economic factors.

Differences in the likelihood of low performance related to whether a student attends a private-dependent or a public school change radically after accounting for socio-economic factors. On average across OECD countries, the odds of low performance are significantly lower among students in private-dependent schools (a statistically significant odds ratio of 0.8) compared with students in public schools, before accounting for socio-economic factors; but those differences disappear after accounting for socio-economic factors (the odds ratio of 1.2 for low performance among students in private-dependent schools is not statistically significant). In five of the countries and economies that participated in PISA 2012 (Estonia, France, Indonesia, Luxembourg and Thailand), students in public schools are significantly less likely to be low performers, as are students enrolled in private-dependent schools in six other countries (Argentina, Brazil, Canada, Macao-China, Portugal, Spain).

■ Figure 4.15 [Part 1/2] ■

School type and the likelihood of low performance in mathematics



Notes: Statistically significant coefficients are marked in a darker tone.

The OECD average shown in this panel represents only the OECD countries with available data.

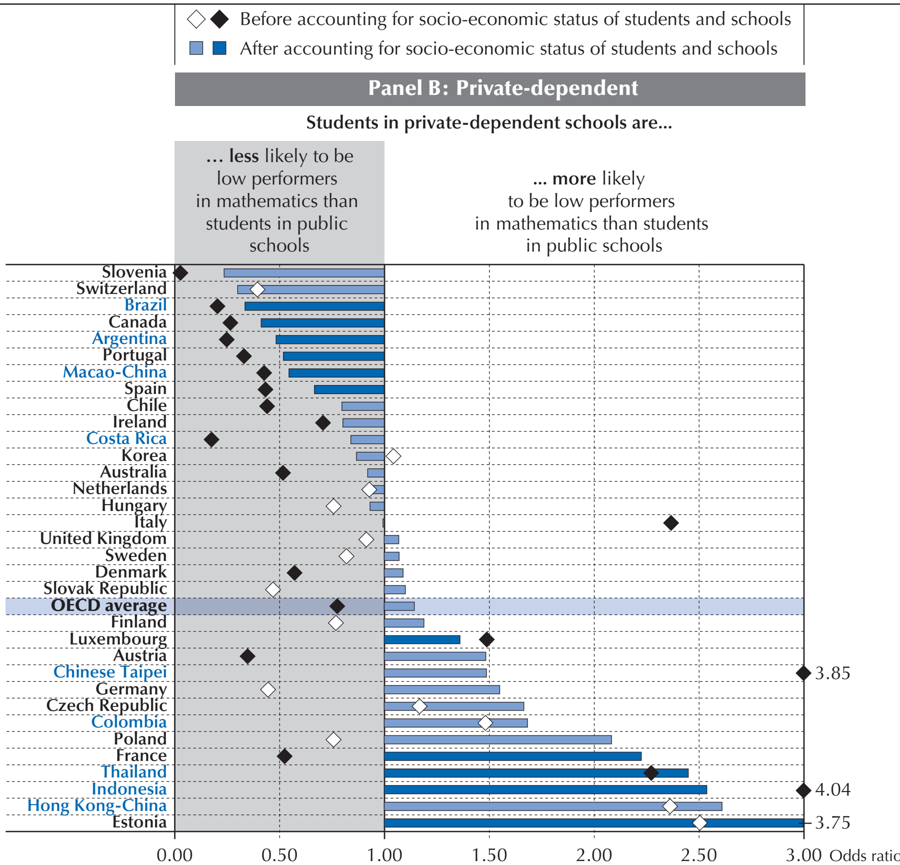
Countries and economies are ranked in ascending order of the odds ratio of low performance in mathematics among students who attend private-independent schools (Panel A), compared with students who attend public schools, after accounting for students' and schools' socio-economic status.

Source: OECD, PISA 2012 Database, Table 4.27.

StatLink http://dx.doi.org/10.1787/888933315786

■ Figure 4.15 [Part 2/2] ■

School type and the likelihood of low performance in mathematics



Notes: Statistically significant coefficients are marked in a darker tone.
The OECD average shown in this panel represents only the OECD countries with available data.
Countries and economies are ranked in ascending order of the odds ratio of low performance in mathematics among students who attend private-dependent schools (Panel B), compared with students who attend public schools, after accounting for students' and schools' socio-economic status.
Source: OECD, PISA 2012 Database, Table 4.27.
StatLink http://dx.doi.org/10.1787/888933315786

These findings confirm that in most countries/economies, socio-economic differences between students and schools account for a considerable part of the differences in the proportions of low-performing students between public and private schools. The greater odds of low performance among students in private-independent schools, after accounting for socio-economic factors, suggest that private-independent schools may not provide the support low performers need. These schools tend to have larger concentrations of advantaged students who are at lower risk of low performance. However, the wide variation across countries makes it hard to draw general conclusions from these findings and further national-level analyses are required.

Note

1. School principals were asked to report the extent to which their mathematics instruction catered to students with different abilities (SC15). The first two items asked about the use of ability grouping into different classes either with similar content but different levels of difficulty or with different content. One item asked about ability grouping within classes and the second asked about the use of different pedagogies within a class rather than ability grouping. Response categories were "For all classes", "For some classes" and "Not for any class". An *index of ability grouping for mathematics classes* (*ABGMATH*) was derived from the first two items by assigning schools to three categories: schools with no ability grouping for any class; schools with one of these forms of ability grouping for some classes; and schools with one of these forms of ability grouping for all classes.

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5

Policies Governing School Systems and Low Student Performance

This chapter explores how some of the policies that govern school systems are associated with low student performance. Specifically, the chapter examines whether the incidence of underperformance in a school system is related to: the allocation of educational resources across schools in the system, the degree of school autonomy, the prevalence of private schools, and/or the grouping or selection of students into different tracks or programmes.

The statistical data for Israel are supplied by and under the responsibility of the relevant Israeli authorities. The use of such data by the OECD is without prejudice to the status of the Golan Heights, East Jerusalem and Israeli settlements in the West Bank under the terms of international law.

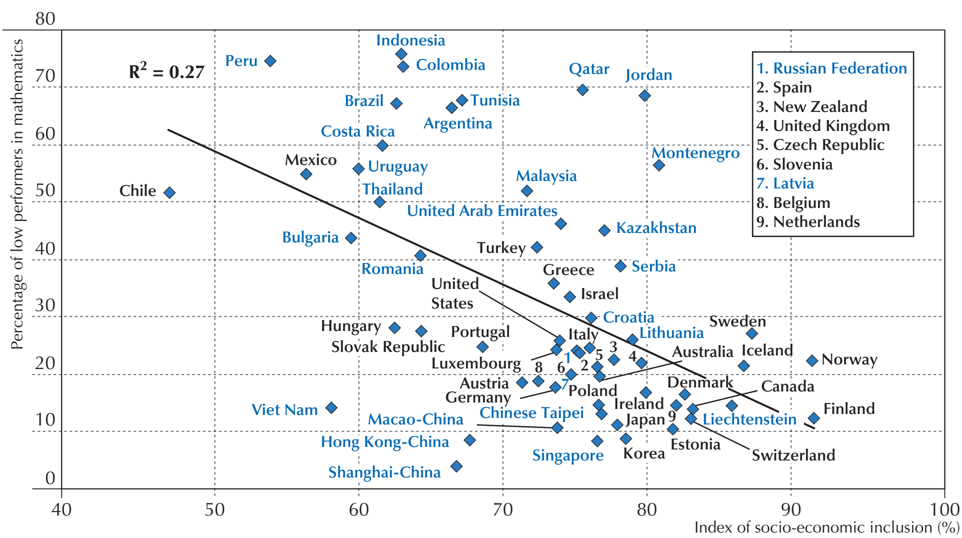
It is clear that students' own behaviour and attitudes have an impact on their learning, as does the quality of resources, both human and material, that schools provide to their students. What might be less evident is the influence of policy, at the school-system level, on student performance. For example, only an analysis at the system level could show that when education systems are more socio-economically inclusive, the share of low performers in mathematics is smaller (Figure 5.1a) and the share of top performers is slightly larger (Figure 5.1b).

What the data tell us

- Across PISA-participating countries and economies, higher-quality educational resources and physical infrastructure are associated with less low performance in mathematics. However, this relationship disappears when the quality of resources is above the OECD average.
- In countries and economies where educational resources are distributed more equitably across schools, the incidence of low performance in mathematics is lower, even when comparing school systems that have educational resources of a similar quality.
- When schools enjoy more autonomy over curricula and assessments, the share of low performers in mathematics across the education system is smaller; but this association is not observed when schools have more autonomy over resource allocation.

■ Figure 5.1a ■

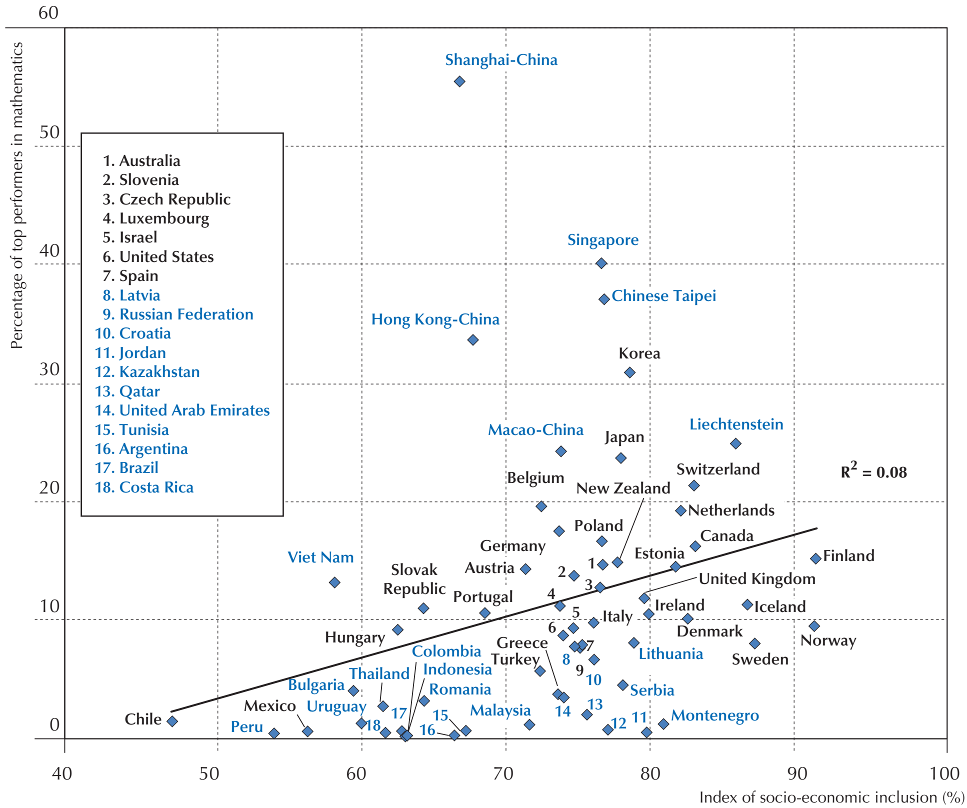
Socio-economic inclusion and percentage of low performers in mathematics



Notes: The *index of socio-economic inclusion* shows the extent to which students' socio-economic status varies within schools, measured as a percentage of the total variation in students' socio-economic status across the school system.
The relationship is statistically significant ($p < 0.10$).
Only countries and economies with available data are included.
Source: OECD, PISA 2012 Database, Table 5.1.
StatLink http://dx.doi.org/10.1787/888933315796

■ Figure 5.1b ■

Socio-economic inclusion and percentage of top performers in mathematics



Notes: The *index of socio-economic inclusion* shows the extent to which students' socio-economic status varies within schools, measured as a percentage of the total variation in students' socio-economic status across the school system.
The relationship is statistically significant ($p < 0.10$).
Only countries and economies with available data are included.
Source: OECD, PISA 2012 Database, Table 5.1.
StatLink *http://dx.doi.org/10.1787/888933315806*

A system-level perspective can also reveal relationships that are hidden or different from those found at the school and student levels. For instance, highly selective schools may benefit their own students through higher-quality resources, but they also tend to increase and reinforce social and academic segregation within a school system.

Some phenomena can only be, or are better, measured at the system level. This is particularly the case with measures of inequality, segregation and heterogeneity. New analyses in this chapter considers whether and how low – and high – performance in mathematics is associated with the quality of educational resources, the type of school governance, the level of school autonomy, and the degree of student grouping in PISA-participating school systems.

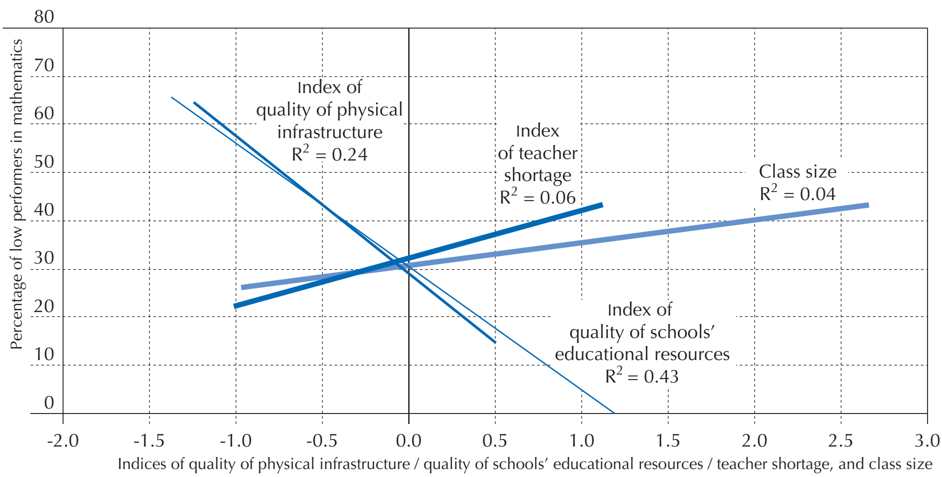
EDUCATIONAL RESOURCES AND LOW PERFORMANCE IN MATHEMATICS

Despite the conventional wisdom that higher investment leads to greater gains, there is no clear evidence that increasing public spending on education guarantees better student performance once a minimum level of expenditure is reached (Burtless, 1996; Hanushek, 1997; Nicoletti and Rabe, 2012; Woessmann, 2003). PISA results have shown that achieving excellence in education is not just about how much is spent, but how, when and where it is spent (OECD, 2013).

PISA 2012 asked school principals to report whether their schools' capacity to provide instruction is hindered by a shortage or inadequacy of: physical infrastructure, such as school buildings, heating and cooling systems, and instructional space; educational resources, such as science laboratory equipment, instructional materials and computers; and/or qualified teachers in key areas. In addition, students who participated in PISA 2012 were asked to report the average number of students who attend their language-of-instruction class. Figure 5.2 shows that of these four factors, the quality of educational resources is most strongly associated with the incidence of low performance in mathematics at the country level, followed by the quality of physical infrastructure. In both cases, better quality means fewer low performers. Teacher shortage and class size are only weakly associated with low performance.

■ Figure 5.2 ■

School resources and percentage of low performers in mathematics



Notes: Class size has been standardised so that the OECD average is zero and the standard deviation across OECD countries is one.
A significant relationship ($p < 0.10$) is shown by a darker line.
Only countries and economies with available data are included.
Source: OECD, PISA 2012 Database, Table 5.2.
StatLink *http://dx.doi.org/10.1787/888933315819*

The association between teacher shortage and low performance is weak largely because school principals in several education systems with a relatively small number of underachievers, such

as Germany, the Netherlands and Shanghai-China, reported that a lack of qualified teachers hinders instruction (Table 5.2). This weak relationship does not contradict the well-established fact that effective teaching is the most important in-school factor influencing strong academic performance (Chetty, Friedman and Rockoff, 2014; Rivkin et al., 2005). It may simply be that principals in different education systems may have different expectations and benchmarks to determine whether there is a lack of qualified teachers.

The weak association between low performance and class size largely reflects the fact that in certain Asian countries and economies, notably Hong Kong-China, Japan, Korea, Macao-China, Shanghai-China, Singapore, Chinese Taipei and Viet Nam, large classes co-exist with small shares of low performers. This is consistent with previous studies that focus on academic performance (Piketty and Valdenaire, 2006; Slavin, 1989), although some studies have also revealed that small classes may be particularly beneficial for at-risk students (Finn and Achilles, 1999; Krueger and Whitmore, 2001). The findings on the importance of different types of resources are in line with those reported by Woessmann (2003), who used data from the third Trends in International Mathematics and Science Study (TIMSS). According to reports by school principals, when there is a shortage or inadequacy of instructional materials, student performance suffers. However, this is not the case when classes are large and student-teacher ratios are high.

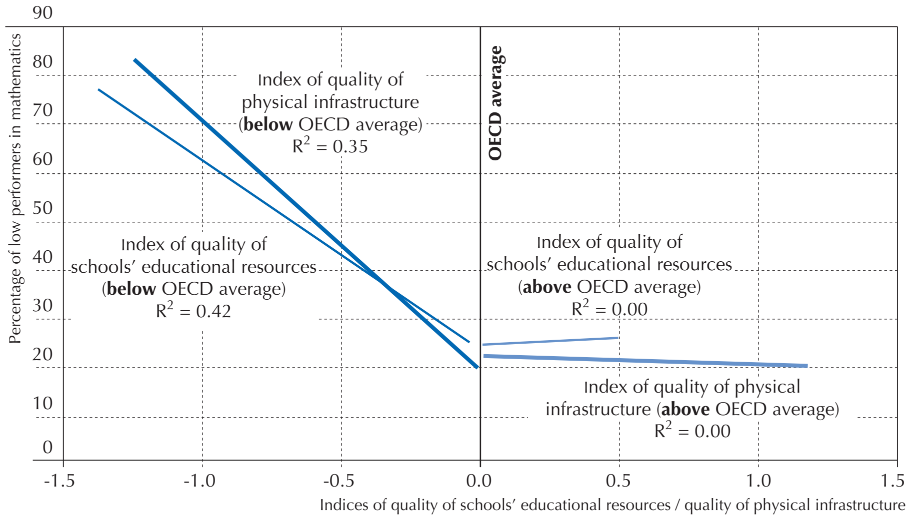
"When" resources are invested in a school system also matters. Improving the quality of a school's physical infrastructure and educational resources can make a big difference for low-performing students when the initial quality of those resources is poor. Once principals in an education system report that the quality of their school resources is satisfactory, additional or better-quality resources appear to have little additional impact on the incidence of low performance (Figure 5.3). In other words, ensuring that every child has access to quality school buildings, teachers, books and other educational material can help to reduce the number of low performers. However, investing beyond a minimum level of quality has no appreciable impact on the incidence of low performance.

Investing resources in a school system is more beneficial for reducing the share of low performers than for increasing the share of top performers. Based on principals' reports aggregated at the system level, the quality of schools' physical infrastructure and educational resources and the degree of teacher shortage are better predictors of low performance in mathematics than of top performance (Figure 5.4 and Table 5.2). Class size has a different impact: larger language-of-instruction classes are associated with larger shares of both low performers and top performers in mathematics (Table 5.2).

"Where" resources are invested also has an impact on the incidence of underperformance (Card and Payne, 2002). Education systems can distribute resources proportionally, based on the number of students in schools; they can provide additional funding to disadvantaged schools to compensate for their larger share of at-risk students; or they may allocate funding that, intentionally or not, reinforces existing socio-economic inequalities. The latter most often occurs when school budgets rely on student fees, alumni donations and local taxes (Fernandez and Rogerson, 2003).

■ Figure 5.3 ■

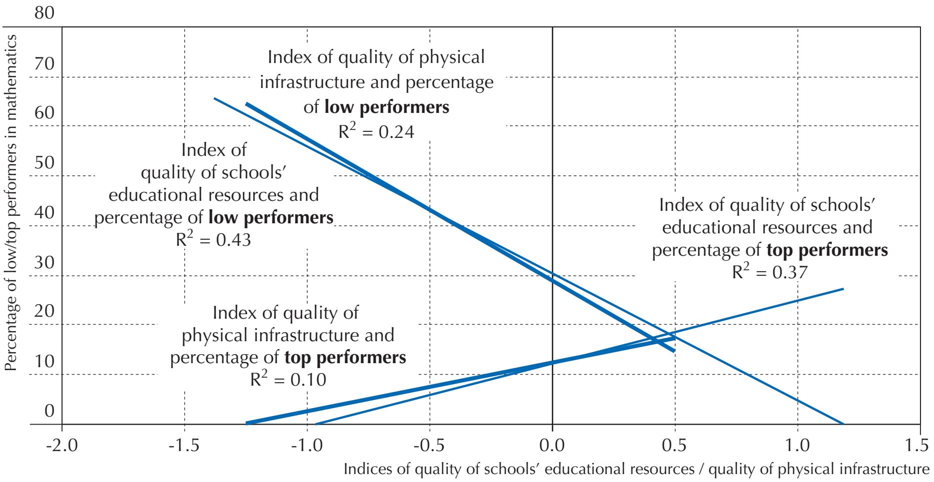
Quality of physical infrastructure/educational resources and percentage of low performers in mathematics



Notes: A significant relationship ($p < 0.10$) is shown by a darker line.
Only countries and economies with available data are included.
Source: OECD, PISA 2012 Database, Table 5.2.
StatLink *http://dx.doi.org/10.1787/888933315824*

■ Figure 5.4 ■

Quality of physical infrastructure/educational resources and percentage of low/top performers in mathematics

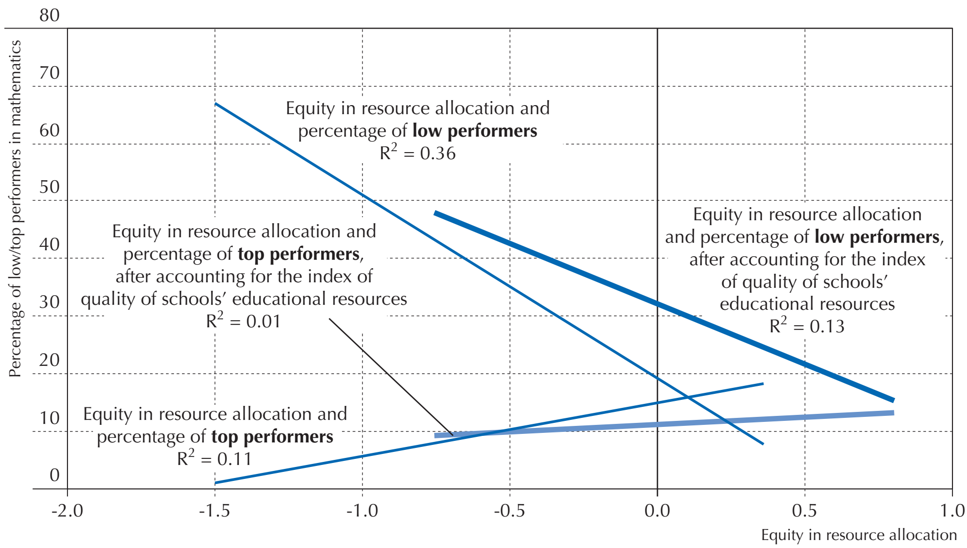


Notes: All relationships are significant ($p < 0.10$).
Only countries and economies with available data are included.
Source: OECD, PISA 2012 Database, Table 5.2.
StatLink *http://dx.doi.org/10.1787/888933315839*

Equity in resource allocation, measured by the difference in the *PISA index of quality of schools' educational resources* between socio-economically disadvantaged and advantaged schools, varies considerably across PISA-participating countries and economies. Croatia, Finland and Norway show the most equity in resource allocation, while Costa Rica, Mexico and Peru show the least equity (Table 5.2). As shown in Figure 5.5, in countries and economies where educational resources are distributed more equitably, the share of low performers in mathematics is considerably smaller, on average, even when comparing education systems with similar quality of educational resources. More important, equity in resource allocation is almost unrelated to the share of top performers in mathematics. This suggests that education systems can tackle inequalities in education while simultaneously promoting – and achieving – academic excellence.

■ Figure 5.5 ■

Equity in resource allocation and percentage of low/top performers in mathematics



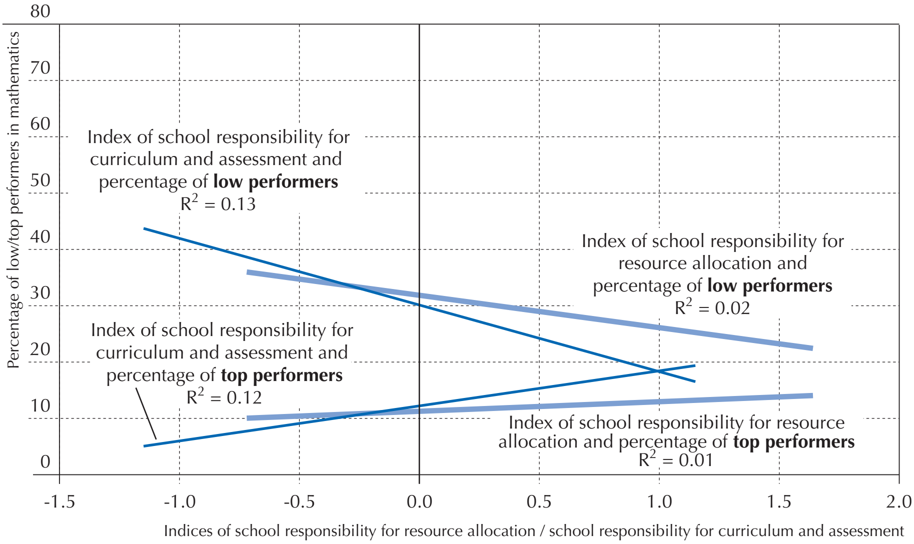
Notes: A significant relationship ($p < 0.10$) is shown by a darker line.
Only countries and economies with available data are included.
Equity in resource allocation refers to the difference in the *index of quality of schools' educational resources* between socio-economically disadvantaged and advantaged schools.
Source: OECD, PISA 2012 Database, Table 5.2.
StatLink *http://dx.doi.org/10.1787/888933315843*

SCHOOL AUTONOMY AND LOW PERFORMANCE

Evidence suggests that school autonomy is beneficial to student performance, which partly explains why education reforms since the early 1980s have focused on giving schools greater autonomy (Clark, 2009; Fuchs and Woessmann, 2004; OECD, 2013; Whitty, 1997). However, school autonomy is positively related to student performance in only certain situations. Using results from PISA 2000, 2003, 2006 and 2009, Hanushek, Link and Woessmann (2013) found that school autonomy is positively related to student performance only in developed and high-performing countries, presumably because in these countries school leaders and teachers are better prepared to reap the benefits of school autonomy. PISA 2012 data also show that only autonomy over curricula and assessments is clearly associated with low and high performance in mathematics (Figure 5.6). School autonomy over resource allocation is only weakly related to the share of low and high performers in mathematics across education systems.

■ Figure 5.6 ■

School autonomy and percentage of low/top performers in mathematics



Notes: A significant relationship ($p < 0.10$) is shown by a darker line.
Only countries and economies with available data are included.
Source: OECD, PISA 2012 Database, Table 5.3.
StatLink http://dx.doi.org/10.1787/888933315855

The share of low performers in mathematics could be further reduced if education systems can increase school autonomy, particularly over curricula and assessments. To make the most of greater school autonomy, governments need to make sure that certain preconditions are met, including: having highly qualified teachers and strong school leaders to (re)design and implement rigorous internal evaluations and curricula, and having effective accountability systems to avoid opportunistic behaviour and identify low-performing schools (Hanushek, Link and Woessmann, 2013; OECD, 2013).

SCHOOL GOVERNANCE AND LOW-PERFORMING STUDENTS

Advocates of private schooling argue that private schools are more responsive to parents, more efficient, and increase competition, accountability and pedagogical diversity throughout the education system. Critics point to the detrimental effects of private schooling and the parental school choice that comes with it, including school segregation and a threat to social cohesion (Renzulli and Evans, 2005; Saporito, 2003; Schneider, Elacqua and Buckley, 2006; Willms, 1999).

Other studies show that when enough middle-class families leave the public school system and the enrolment in private schools surpasses a certain "tipping" point, public schools can then enter a vicious circle of fewer students, less funding and deteriorating quality (Sonstelie, 1979). Equally, private schools can also suffer when the funding and quality of neighbouring public schools improve and the number of students enrolled in these schools increases as a result (Dinerstein and Smith, 2014; Husted and Kenny, 2002).

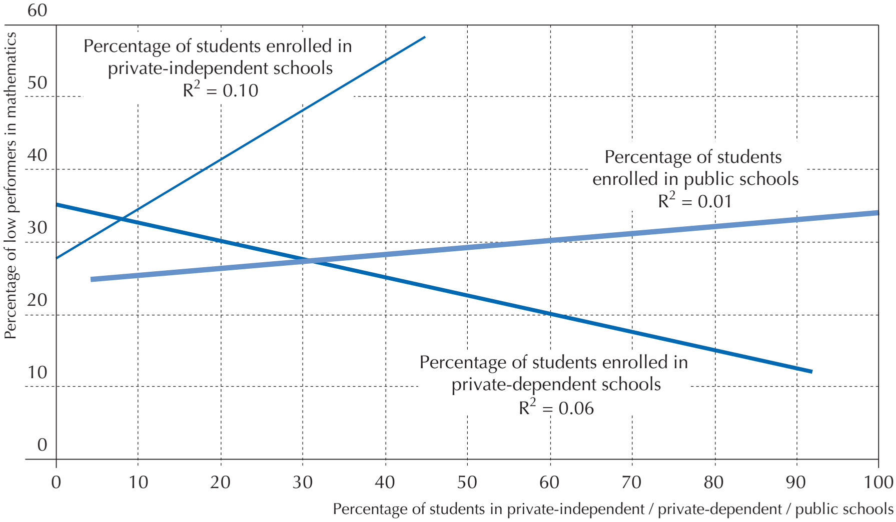
Chapter 4 shows that within education systems, differences in performance between students in public and private schools disappear if the schools have similar socio-economic profiles. But does the relative share of students enrolled in public, private-independent and private-dependent schools in an education system affect the incidence of low performance across the system as a whole? For instance, enrolling in private-independent schools may benefit individual students; but by increasing school segregation and reducing the support for public spending on education, it could weaken the overall performance of an education system. The impact of offering private schooling ultimately depends on why the school system opted to make that choice available, the levels of competition, autonomy and accountability (i.e. market mechanisms) already in place in the public school system, and how students and staff in public schools react to increased competition, if they do at all (Couch, Shughart and Williams, 1993; Ferraiolo et al., 2004; Waslander, Pater and van der Weide, 2010).

Data from PISA 2012 show that the percentage of low performers in mathematics decreases marginally as the percentage of students enrolled in private government-dependent schools[1] rises, and remains virtually unchanged when the share of students in public schools increases (Figure 5.7). But for every additional percentage point of students enrolled in private-independent schools, the share of low performers in mathematics increases by 0.68 percentage point, on average across PISA-participating countries and economies (Figure 5.9). These results change when comparing the relationship between school governance and the share of top performers (Figure 5.8): the percentage of top performers increases as enrolment in government-dependent private schools increases; it decreases as enrolment in public schools increases; and it remains constant as the population of students enrolled in private-independent schools increases. These results suggest that, on average across PISA-participating countries and economies, the greater the number of students enrolled in privately operated, publicly funded schools in a given school system, the smaller the share of low performers and the larger the share of top performers in mathematics in that system. However, the analyses are correlational, certain countries and economies have a disproportionately large influence on the results, particularly Hong Kong-China, Macao-China and the Netherlands, and the coefficients that measure the association are small.

Why do education systems where more students are enrolled in private, government-dependent schools perform better overall, even if only marginally? One reason could be that having more of these schools results in a greater level of school autonomy across the entire school system, including public schools. When education systems grant similar levels of school autonomy over curricula and assessments to schools, the advantage of having a larger proportion of students enrolled in privately managed, publicly funded schools (and thus having a smaller proportion of underperformers) decreases by 50% (Figure 5.9). In other words, having more students enrolled in government-dependent private schools could be beneficial to the school system as a whole, partly

■ Figure 5.7 ■

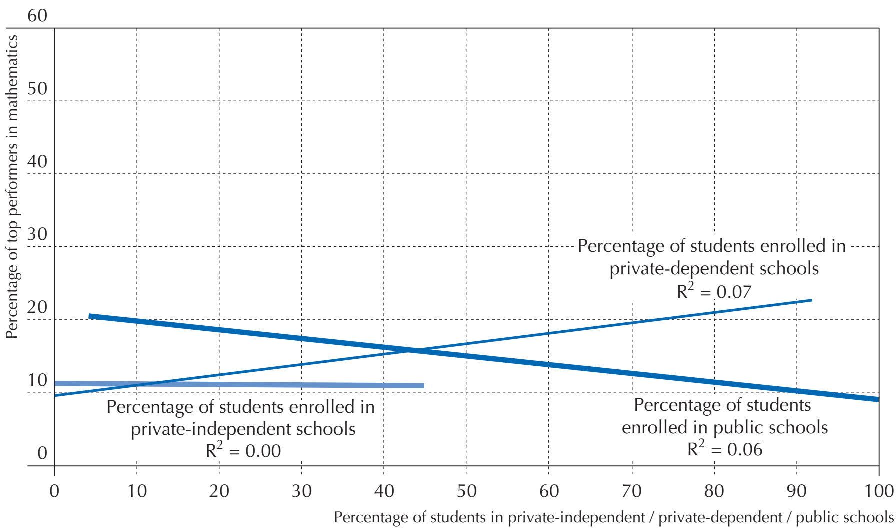
Percentage of students enrolled in public/private schools and percentage of low performers in mathematics



Notes: A significant relationship ($p < 0.10$) is shown by a darker line.
Only countries and economies with available data are included.
Source: OECD, PISA 2012 Database, Table 5.3.
StatLink *http://dx.doi.org/10.1787/888933315865*

■ Figure 5.8 ■

Percentage of students enrolled in public/private schools and percentage of top performers in mathematics

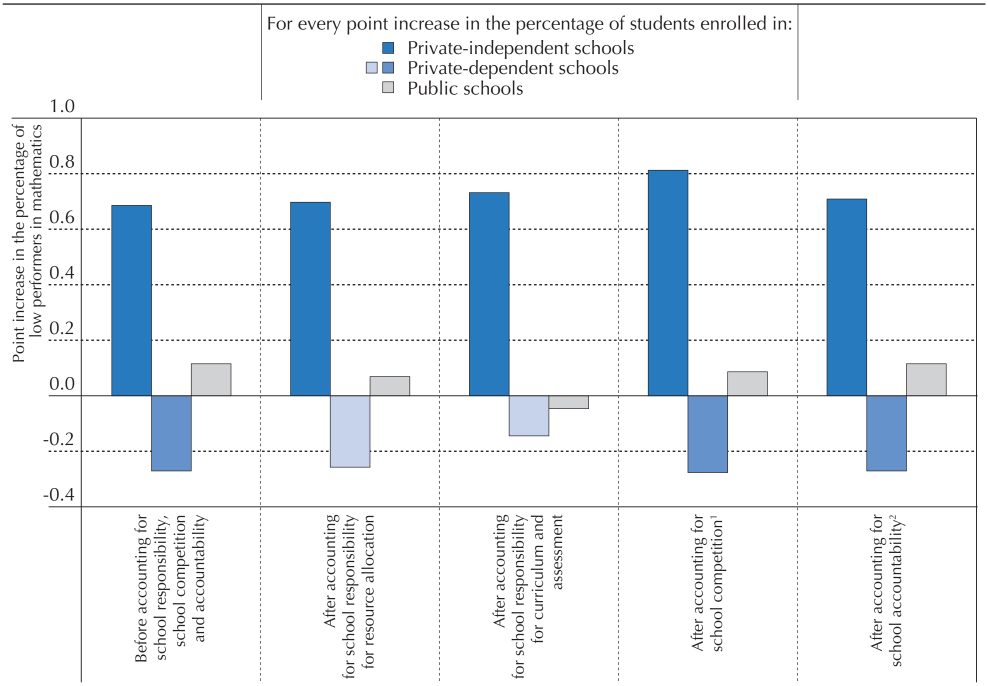


Notes: A significant relationship ($p < 0.10$) is shown by a darker line.
Only countries and economies with available data are included.
Source: OECD, PISA 2012 Database, Table 5.3.
StatLink *http://dx.doi.org/10.1787/888933315875*

because it introduces more school autonomy over curricula and assessments into the entire system (Figure 5.10) – which is associated with having fewer low performers in mathematics (Figure 5.6). Other potential benefits to school systems that are typically associated with having more students enrolled in private government-dependent schools, such as enhancing school competition or accountability, do not explain their negative association with low performance (Figure 5.9).

■ Figure 5.9 ■

School autonomy and percentage of low performers in mathematics

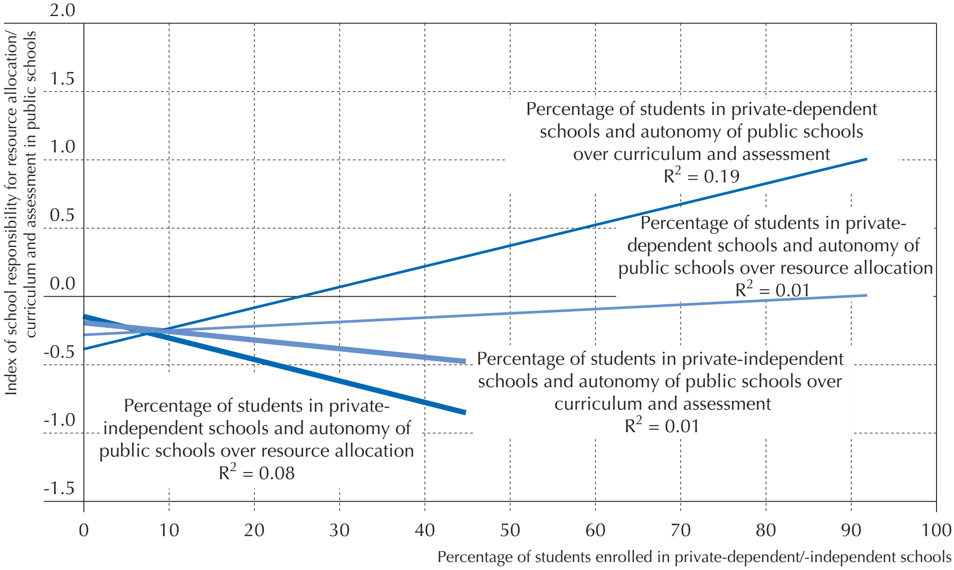


1. Percentage of students in schools whose principal reported that two or more other schools compete for students in the same area.
2. Percentage of students in schools that post achievement data publicly.
Notes: Percentage-point differences for public schools are not statistically significant. Percentage-point differences for private-independent schools are all statistically significant. Statistically significant percentage-point differences for private-dependent schools are marked in a darker tone.
Only countries and economies with available data are included.
Source: OECD, PISA 2012 Database, Table 5.3.
StatLink *http://dx.doi.org/10.1787/888933315886*

SELECTING AND GROUPING STUDENTS

School systems address diversity in students' backgrounds, interests and performance in different ways (OECD, 2013). They can offer a single, comprehensive programme in which students of different abilities and aspirations are exposed to similar content, pedagogy and peers. Or they can group students of similar abilities, interests and motivation so that what is learned (content and difficulty) and how the content is taught (pedagogy and instruction) can be tailored to better meet students' needs. This is known as stratification. However, grouping underperforming students together risks exacerbating their struggles with classwork and increasing inequalities in education (Epple, Newlon and Romano, 2002).

■ Figure 5.10 ■
Percentage of students enrolled in private schools and autonomy of public schools



Notes: A significant relationship ($p < 0.10$) is shown by a darker line.
Only countries and economies with available data are included.
Source: OECD, PISA 2012 Database, Table 5.3.
StatLink http://dx.doi.org/10.1787/888933315891

Ability groups, tracks or streams can be based on several factors: students' age at selection; the flexibility of the grouping system (whether transfers between groups/tracks/streams are easy or difficult); the difficulty of course content; the programme orientation (e.g. academic or vocational); where the selection is applied (within classes, between classes, between grades, between schools); the intensity of the grouping (part/full day, some/all subjects); and selection criteria (students' preference, past marks, placement exam scores, parent/teacher/school recommendations).

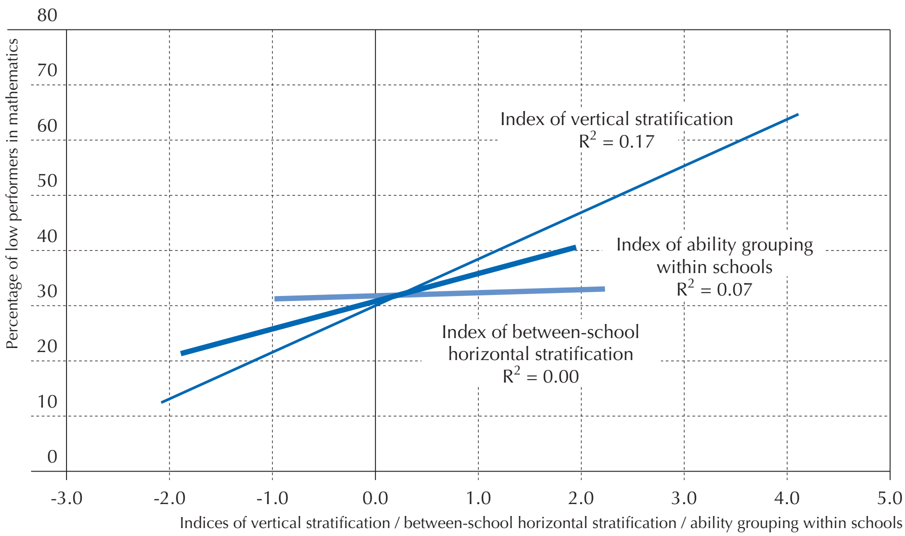
The analysis in this report focuses on three indices created by PISA: the *index of vertical stratification*, the *index of ability grouping within schools* and the *index of between-school horizontal stratification*.[2]

The effects of between-school horizontal stratification depend on the specific characteristics of the grouping. For example, selecting students at an early age strengthens the link between socio-economic background and student performance (OECD, 2013), which is why flexible systems are believed to be better. There is also evidence that placing students in different curricular tracks affects their academic performance, engagement and morale (Lucas, 1999; Trautwein et al. 2006), increases inequality in education opportunities (Maaz et al., 2008), and may be particularly detrimental for disadvantaged students (Epple, Newlon and Romano, 2002; Oakes, 2005; Pekkarinen, Uusitalo and Kerr, 2009).

At the system level, there is no association between the *index of between-school horizontal stratification* and the share of low and top performers in mathematics (Figures 5.11 and 5.12). This result is consistent with previous studies analysing the impact of the *index of between-school horizontal stratification* on countries' and economies' average PISA scores (Hanushek and Woessmann, 2006; OECD, 2013). Austria, Belgium and the Netherlands, for example, have high values on the index but small shares of underachieving students, while Argentina, Brazil and Chile have low values on the index but high percentages of low performers (Table 5.4). Apart from these specific cases, the association remains relatively weak – even after accounting for the share of disadvantaged students in the school system and for a country's/economy's average performance in mathematics (Figure 5.13).

■ Figure 5.11 ■

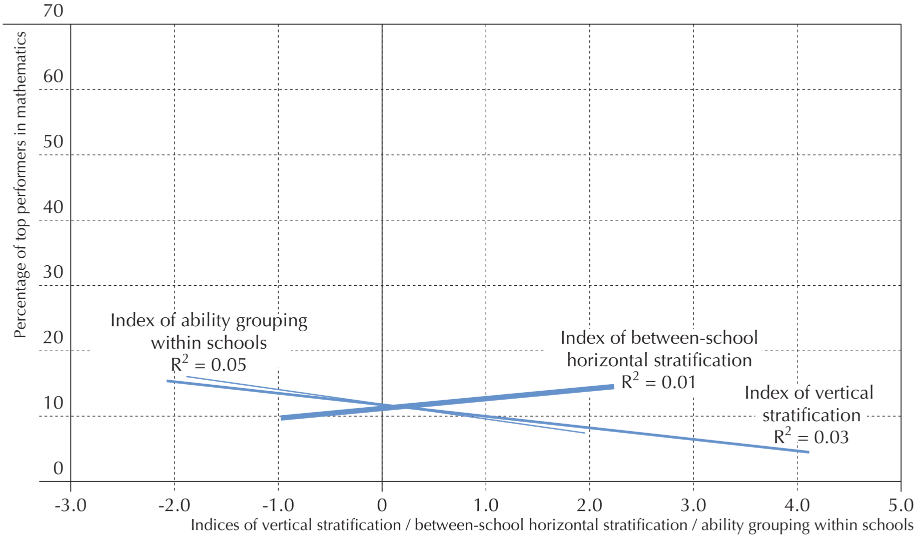
Sorting/selecting students and percentage of low performers in mathematics



Notes: A significant relationship ($p < 0.10$) is shown by a darker line.
The *index of vertical stratification* is based on the degree of variation in the grade levels in which 15-year-old students are enrolled.
The *index of ability grouping within schools* is based on the prevalence of ability grouping within schools across the school system.
The *index of between-school horizontal stratification* is based on five indicators: the number of education tracks, the age at which students are selected into those tracks, the prevalence of vocational programmes, the academic selectivity of the school, and school transfer rates.
Only countries and economies with available data are included.
Source: OECD, PISA 2012 Database, Table 5.4.
StatLink *http://dx.doi.org/10.1787/888933315908*

■ Figure 5.12 ■

Sorting/selecting students and percentage of top performers in mathematics



Notes: None of the relationships are significant ($p < 0.10$).
The *index of vertical stratification* is based on the degree of variation in the grade levels in which 15-year-old students are enrolled.
The *index of ability grouping within schools* is based on the prevalence of ability grouping within schools across the school system.
The *index of between-school horizontal stratification* is based on five indicators: the number of education tracks, the age at which students are selected into those tracks, the prevalence of vocational programmes, the academic selectivity of the school and school transfer rates.
Only countries and economies with available data are included.
Source: OECD, PISA 2012 Database, Table 5.4.
StatLink http://dx.doi.org/10.1787/888933315919

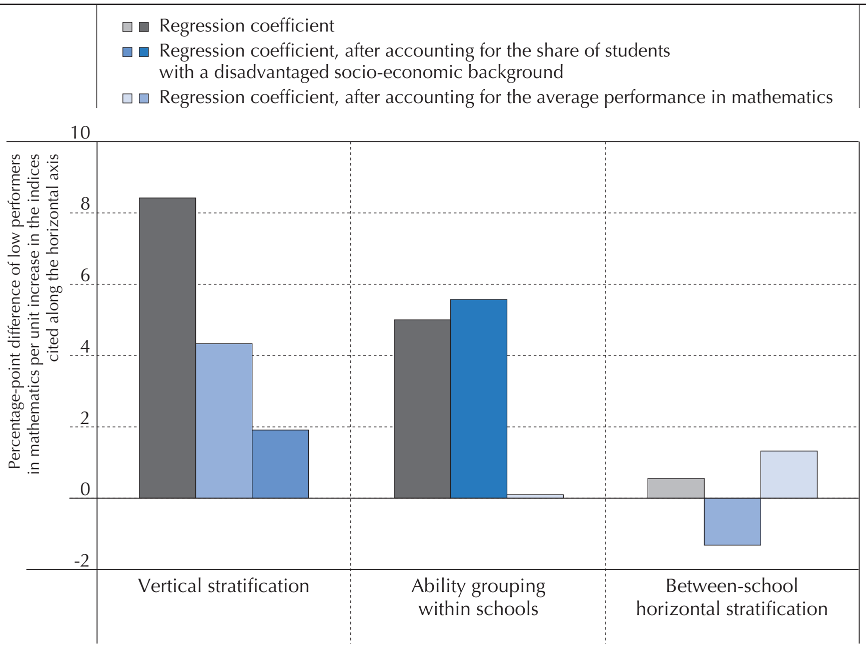
There is little evidence that grade repetition is beneficial for academic and non-academic outcomes (Allen et al., 2010; Ikeda and García, 2014; Manacorda, 2012; Monseur and Lafontaine, 2012); however, many countries, including Belgium, Portugal and Spain, use the practice extensively (OECD, 2013). A significant proportion of the variation in grade repetition is observed at the system level (Goos et al., 2013). System-level analysis shows that more vertical stratification, including grade repetition, is related to a greater incidence of low performance in mathematics, but barely affects the share of top performers in a country/economy (Figures 5.11 and 5.12). Although the association weakens considerably when countries perform similarly in mathematics, it does not disappear entirely (Figure 5.13).

Ability grouping within the same school, the "softest" version of student stratification, appears to be becoming popular again (Garelick, 2013). A recent field experiment conducted by Duflo, Dupas and Kremer (2011) in Kenya observed significant academic gains from separating students, including low-performing students, by achievement into different school classes. These gains persisted one year after the programme ended.

In a comparison of 27 strategies to improve student learning conducted for the Abdul Latif Jameel Poverty Action Lab (J-PAL),[3] the Kenyan experiment was ranked fourth in a cost-benefit analysis, and first among eight pedagogical interventions (other interventions included adding computers, diagnostic feedback or remedial education). Similar beneficial effects of sorting students by achievement were observed by Borman and Hewes (2002), Collins and Gan (2013) and Zimmer (2003) in the United States. However, correlational evidence at the system level suggests that only a weak relationship exists between ability grouping within schools and the share of low/top performers in an education system. If there is an association, it is the opposite suggested by these studies: more ability grouping within schools is related to a greater number of low performers in mathematics, and fewer top performers (Figures 5.11, 5.12 and 5.13).

■ Figure 5.13 ■

Sorting/selecting students and percentage of low performers in mathematics, before and after accounting for socio-economic status and average performance



Notes: Statistically significant percentage-point differences are marked in a darker tone.
The *index of vertical stratification* is based on the degree of variation in the grade levels in which 15-year-old students are enrolled.
The *index of ability grouping within schools* is based on the prevalence of ability grouping within schools across the school system.
The *index of between-school horizontal stratification* is based on five indicators: the number of education tracks, the age at which students are selected into those tracks, the prevalence of vocational programmes, the academic selectivity of the school and school transfer rates.
Only countries and economies with available data are included.
Source: OECD, PISA 2012 Database, Table 5.4.
StatLink http://dx.doi.org/10.1787/888933315925

Notes

1. In PISA, schools are categorised as public, private government-dependent and private government-independent. Public schools are managed directly or indirectly by a public education authority, government agency, or governing board appointed by government or elected by public franchise. Government-dependent private schools are schools that are directly or indirectly managed by a non-government organisation and receive 50% or more of their core funding (i.e. funding that supports the institution's basic educational services) from government agencies. Government-independent private schools are schools that are managed directly or indirectly by a non-government organisation and receive less than 50% of their core funding from government agencies.

2. The *index of vertical stratification* is based on the degree of variation in 15-year-old students' grade level across the education system, which reflects both the different starting ages for schooling and the prevalence of grade repetition. The *index of ability grouping within schools* is based on the extent to which ability grouping, with different content or difficulty, for all mathematics classes is used in the school, according to principals' reports. The *index of between-school horizontal stratification* is based on five inter-related indicators: the number of education tracks, the prevalence of vocational or pre-vocational programmes, early selection, academic selectivity, and school transfer rates. All the indices have been standardised.

3. Established in 2003 at the Massachusetts Institute of Technology, the Abdul Latif Jameel Poverty Action Lab (J-PAL) is a global network of researchers who use randomised evaluations to answer critical policy questions in the fight against poverty.

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6

A Policy Framework for Tackling Low Student Performance

Millions of 15-year-old students around the world are not acquiring basic skills in such essential domains as mathematics, reading and science. This chapter discusses a series of policy tools to tackle each of the risk factors of low performance identified throughout the report. Policy makers, teachers, parents and students themselves have an important role to play.

The statistical data for Israel are supplied by and under the responsibility of the relevant Israeli authorities. The use of such data by the OECD is without prejudice to the status of the Golan Heights, East Jerusalem and Israeli settlements in the West Bank under the terms of international law.

Results from PISA 2012 clearly show that no country or economy can yet claim that all of its 15-year-old students have achieved a baseline level of proficiency in mathematics, reading and science. In fact, the numbers of low performers in the 64 countries and economies that participated in PISA in 2012 are staggering: out of approximately 28 million 15-years-old students represented by PISA data, 11.5 million are low performers in mathematics, 8.5 million are low performers in reading, and 9 million are low performers in science. On average across OECD countries, more than one in four students perform below the baseline level of proficiency in one or more of the three subjects PISA assesses. Even in top-performing countries and economies, around one in ten students is a low performer in at least one subject.

Defining the problem, and its scale, is only the first – albeit essential – step. What needs to follow is creative thinking about what governments, schools, teachers, parents and students themselves can do to improve student performance so that every student acquires at least a baseline level of skills. Developing and implementing policy requires creativity, will and potentially extra resources. Figure 6.1 shows a selection of policies and actions that respond to the specific risk factors of low performance at each of the three levels studied in this report: students, schools and education systems.

When reading these policy recommendations, bear in mind that PISA results do not establish causality. Rather, PISA identifies empirical correlations between student achievement and the characteristics of schools and school systems, correlations that show consistent patterns across countries. Implications for policy are based on this correlational evidence and previous research.

PRIORITISE REDUCING THE NUMBER OF LOW-PERFORMING STUDENTS

The evidence presented in this report suggests that all countries and economies can reduce their share of low-performing students, and that a reduction can be accomplished in a relatively short time. The first step for policy makers is to prioritise tackling low performance in their education policy agendas, and translate this priority into additional resources.

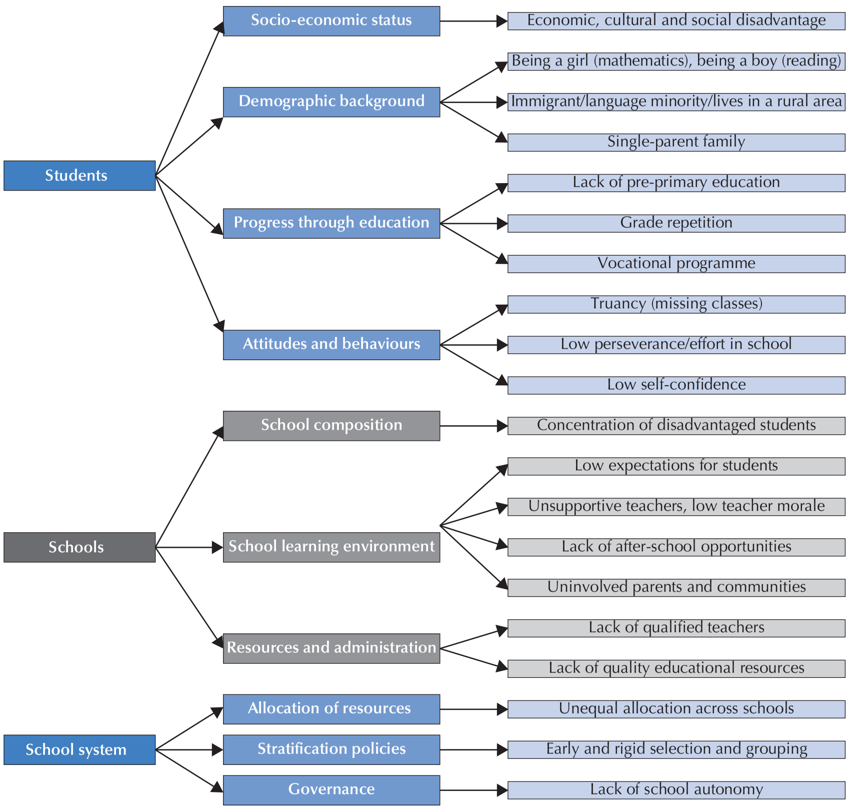
As discussed in Chapter 1, nine countries reduced their share of low-performing students in mathematics between 2003 and 2012; 11 countries reduced their share of low performers in reading between 2000 and 2012; and 20 countries and economies saw a significant reduction in their share of low performers in science between 2006 and 2012. These countries vary considerably in national wealth and in their initial share of low performers. For example, high-income countries Germany and Italy reduced their shares of low performers in mathematics between 2003 and 2012 from 22% to 18% (Germany) and from 32% to 25% (Italy), while Mexico and Tunisia, whose per capita income is comparatively lower, reduced their shares of low performers in mathematics from 78% to 68% (Tunisia) and from 66% to 55% (Mexico) (see Tables 1.9, 1.11 and 1.12).

What these countries and economies do have in common is recent education reform that specifically targeted some of the main risk factors of low performance. For example, in Germany, changes to the structure of the school system, such as delaying the age of student selection into different academic programmes and reducing the number of academic programmes, were introduced with the aim of reducing the influence of socio-economic status on education outcomes. In addition, federal programmes have improved the availability and quality of

■ Figure 6.1 ■

Risk factors of low performance and policy tools

Level	Potential areas of risk	Risk factors of low performance	Policy tools: What policy makers, educators, parents and students can do to tackle low performance



Policy makers

- Define student low performance as a priority in the education policy agenda
- Identify the low performers, the schools they attend and trends over time
- Design a policy strategy that addresses the multiple risk factors faced by low performers
- Implement a system of early diagnosis and remedial support for struggling students
- Target special resources to schools with a concentration of socio-economically disadvantaged or minority students
- Ensure that every child has access to pre-primary education
- Reduce the use of vertical (grade repetition) and horizontal (early vocational tracking, ability grouping) stratification in the school system
- Provide teachers with pedagogical tools, through professional development, to manage classroom heterogeneity
- Reduce inequities in the allocation of resources across schools
- Grant schools some autonomy to respond to their students' needs in exchange for accountability measures

School principals and teachers

- Set high expectations for all students, including low performers
- Provide special support and help to students who need it most
- Take pride in your school and be role models for your students
- Provide extracurricular opportunities, both school-related and recreational, after school hours
- Be receptive to the demands and encourage the participation of parents and community in school life

Parents and communities

- Encourage your child to make more of an effort in school
- Provide your child with a quiet space at home to study, help her/him with homework
- Connect with your child: take the time to talk to him/her about daily activities
- Participate in school life
- Encourage members of the community to volunteer or donate resources for schools and students

Students

- Attend school regularly and arrive on time
- Do your homework
- Make your best effort at school and persevere in the face of difficulties
- Participate in extracurricular activities, both school-related and recreational

pre-primary education programmes and language training for students who do not speak German fluently. School reforms in Germany have also sought to address the perceived lack of transparency and accountability that permeated the education system before the country suffered its "PISA shock" in 2000 (OECD, 2011).

In Mexico, a number of programmes and initiatives to promote access to and quality of education among disadvantaged students have been introduced during the past few years. These include cash-transfers to poor families to raise enrolment rates in secondary education, especially among girls, and targeted funds, educational resources and infrastructure for schools with large concentrations of either disadvantaged or low-performing students (OECD, 2013a).

DISMANTLE MULTIPLE BARRIERS TO LEARNING

Analyses in this report show that poor performance at age 15 is not the result of any single risk factor, but rather of a combination and accumulation of various barriers and disadvantages that affect students throughout their lives.

Socio-economic disadvantage is arguably the toughest barrier to success at school, but it is not impossible to overcome. For example, Chapter 2 shows that disadvantaged 15-year-old students who have never repeated a grade and who are enrolled in a general programme have a 48% chance of scoring above the baseline level of proficiency (Level 2) in mathematics, on average across OECD countries. Many disadvantaged students manage to defy the odds and perform among the top students internationally through their own efforts and positive attitudes. The analysis presented in Chapter 3 shows that students who have a positive attitude and disposition towards school in general, and mathematics in particular, tend to score higher, regardless of their socio-economic status. By contrast, low performers, regardless of their socio-economic status, show similarly poor attitudes and behaviours towards school, on average across OECD countries. This report also shows that even after accounting for students' socio-economic status, a variety of factors related to students' demographic and educational background (Chapter 2), students' attitudes and behaviours (Chapter 3), schools (Chapter 4) and education systems (Chapter 5) also affect the probability of low performance.

Students often have to overcome several potential barriers to success at school simultaneously. For example, disadvantaged students are more likely than advantaged students to have an immigrant background, live in rural areas and in single-parent households, to have repeated a grade and to be enrolled in a vocational track – all of which, in most countries, increase the likelihood of low performance. Furthermore, barriers associated with demographic background, including gender stereotypes, language difficulties, lack of parental time or help with school work, and geographic isolation, have a stronger impact on the performance of disadvantaged students than on the performance of more advantaged students, on average across OECD countries (see Chapter 2). Disadvantaged students are also more likely to attend schools where there are larger concentrations of other disadvantaged students, a greater incidence of teacher shortage, poorer-quality educational resources, and where teachers have low expectations for their students.

Thus, within any single country or region, tackling low performance requires a multi-pronged approach. Governments and schools need to dismantle barriers to learning that are related to socio-economic status and demographic background. Given the differences in the size of the populations of disadvantaged students, immigrant students, students from single-parent families and rural students – and the differences in the strength of the impact of these factors on student performance – across countries, policies and actions must be tailored to national and local circumstances. Countries also need to organise schools and education systems so that they: provide early education opportunities for all (universal pre-primary education); can identify struggling students early on (ideally in primary school); offer remedial support, either during regular school hours or after school; and provide psycho-social support, through school psychologists, peer mentors, guidance counsellors and/or assistance for families.

CREATE DEMANDING AND SUPPORTIVE LEARNING ENVIRONMENTS AT SCHOOL

Chapter 4 discusses how school leaders can tackle low performance by fostering expectations of high academic achievement for all students in their schools. Training and professional development programmes for school leaders could thus emphasise this aspect of leadership. Creating networks among school leaders could also help to disseminate best practice in how to improve student performance. The United Kingdom's Education Action Zone programme and Shanghai-China's urban-rural school networks are examples of initiatives that enable schools to exchange and discuss practices and resources (OECD, 2015a, 2011). In addition, school evaluations, whether internal or external, could focus on whether and how schools support students who are falling behind.

Low performers benefit from better-qualified and better-skilled teachers (see Chapter 4). Policy strategies aimed at improving teacher quality are complex and varied, and include all aspects of teacher education and practice. Some countries that have reduced their share of low performers have established new qualification and training requirements and new incentives to recruit and retain the most talented graduates, including higher salaries and rewards for better performance. Korea, for example, offers multiple incentives to teachers who work in disadvantaged schools, including higher salaries, smaller classes, less instructional time, additional credits towards promotion to administrative positions, and the ability to choose the next school in which to work. Teacher-education programmes need to prepare teachers on how to assess their students' performance and how to provide individualised instruction that caters to the needs of particular students (OECD, 2013b).

As Chapter 4 notes, struggling students benefit from teachers who show an interest in every student's learning, help students when they need it, work with students until they understand the course content, and give students an opportunity to express their opinions. This support is particularly important for low-performing students as they perceive that their investment in learning is relatively ineffective (see Chapter 3). Teachers who work with enthusiasm, take pride in their school and value academic achievement are more likely to make school activities and tasks more engaging for students. Countries may want to emphasise these kinds of skills, attitudes and behaviour in teacher training and professional development programmes for teachers. Germany, for example, whose share of low performers has shrunk significantly over the past decade, stresses both pedagogical and psychological skills in its teacher-education programmes.

Low performers often do not have a quiet place at home to do homework or study, and may not be able to pursue creative recreational activities. Governments can provide additional funds for schools to remain open after regular hours to offer instructional and creative extracurricular activities. Countries as diverse as Germany, Greece and Mexico have introduced all-day school programmes that provide supplementary education, including courses in information and communication technologies and language instruction (OECD, 2013a). Governments can also provide financial support for external organisations that provide extracurricular activities and/or summer camps for students from disadvantaged and/or immigrant families. Norway's Homework Assistance Programme and Germany's Education Alliance are two such initiatives (OECD, 2015a). In education systems where after-school tutoring is widespread, such as Hong Kong-China, Japan, Korea, Shanghai-China and Singapore, equity could be improved by increasing access to these activities and perhaps limiting their duration.

PROVIDE REMEDIAL SUPPORT AS EARLY AS POSSIBLE

It is important to disrupt the cycle of low performance that leads to early disengagement. Diagnostic assessments, typically done at the beginning of the school year or at the beginning of a study unit, are tools to identify students who are at risk of failure, to uncover the sources of their learning difficulties, and to plan for an appropriate supplemental intervention or remediation. Diagnostic assessments may include standardised tests, but are more effective when embedded in a broader set assessment that includes a range of formative assessments and tasks. Professional development can help teachers understand which assessment information is most appropriate for particular cases and purposes (OECD, 2013b). It is particularly important to identify and target students who are having difficulties in more than one or in many subjects (see Chapter 1).

Implementing a system of early diagnosis and remedial support for struggling students can be an effective policy tool to prevent students from getting trapped in a cycle of low academic performance and disengagement (see Chapter 3). In Finland, for example, a special teacher who is specifically trained to work with struggling students is assigned to each school and works closely with teachers to identify students who need extra help. Multi-professional care groups, consisting of the school principal, special education teacher, the school nurse, the school psychologist, a social worker, teachers and parents, meet periodically to discuss individual students in each comprehensive school (OECD, 2011).

Singapore provides support to students who do not have the basic numeracy skills and knowledge needed to follow the mathematics curriculum at school ("Learning Support for Maths" [LSM]). These students are identified through a screening test at the beginning of the first grade and receive support by a specialist teacher for 4-8 periods per week. LSM teachers are provided as additional teachers to each school, based on need, and receive additional training and teaching resources for LSM students, as required (see Box 1.2) (OECD, 2011).

ENCOURAGE THE INVOLVEMENT OF PARENTS AND LOCAL COMMUNITIES

Parents have an important role to play both directly and indirectly. Directly they can encourage their children to work hard in school, help them with homework, read to their younger children and take time to talk with their older children about their daily activities. Indirectly they can become involved in their children's school and be aware of and interested in additional education opportunities for their children, such as free after-school tutoring programmes. As discussed in Chapter 4, there is less incidence of low performance in schools whose principals reported that parents pressure the school to maintain higher academic standards.

Involving parents formally in school management, such as through school boards, is a way of introducing "horizontal" accountability (i.e. to parents and the community as opposed to higher education authorities) in schools (OECD, 2013b). For example, school reforms introduced in Japan encourage parents and community members to assume some responsibility for managing schools and providing individualised instruction to students during lessons when necessary (OECD, 2011). These initiatives seem to be having a positive impact as students in Japan reported a stronger sense of belonging, lower rates of tardiness and better attitudes towards school in 2012 than in 2003.

Schools can reach out to parents who appear to be disengaged from their child's education and provide them with clear guidelines on how they can support their children and participate in the school community. The Netherland's Platform for Ethnic Minority Parents focuses on involving immigrant parents in their children's schooling. Activities include language courses for immigrant parents and home visits by teachers, which give teachers a better idea of their students' living and learning environment (Akkerman et al., 2011; Schleicher, 2014). Ireland's Home School Community Liaison scheme targets children in disadvantaged areas who are at risk because of family-related issues. Through this scheme, liaison co-ordinators visit students' homes regularly to promote good relations between parents and schools, and to identify and provide for the basic needs of parents. The idea behind the scheme is that when parents are more self-confident, they have a more positive impact on their child's education (Irish Department of Education and Skills, 2014).

Many initiatives to assist low-performing students come from the communities and local actors willing to volunteer or donate resources. For example, in Japan's School Support Regional Headquarters Project, people in local communities provide after-school remedial support for students in need, in consultation with schools (OECD, 2011). Mentoring programmes that connect students with working adults as their mentors can also help to motivate students. The Manitoba province in Canada provides a range of school-based, developmental mentoring programmes, including the Big Brother, Big Sister programme, which engages older students or peers as mentors of struggling and low-performing students.

ENCOURAGE STUDENTS TO MAKE THE MOST OF AVAILABLE EDUCATION OPPORTUNITIES

Students who have better attitudes and behaviours towards learning and school – i.e. who attend school regularly and on time, spend more hours on homework, are more perseverant and interested in what they are learning, and participate in extracurricular activities – are less likely to be low performers. Although disadvantaged students can do little to change the material conditions of their families or their schools, they can make the most out of the opportunities they are offered.

Developing positive attitudes towards learning, including mathematics, is essential (Chapter 3). Many policies and practices can have a direct or indirect impact on the engagement, motivation and self-confidence of low-performing students. Research suggests that interventions that teach disadvantaged students "social-cognitive skills", including self-regulation, social information-processing and conflict resolution, in combination with tailored remedial lessons, can have a measurable impact on high school students (Cook et al., 2014). Low performers could also benefit from developing a "growth mindset", which assumes that intelligence, character and creativity are not given traits, but qualities that can be learned and trained (Dweck, 2006).

IDENTIFY LOW PERFORMERS AND DESIGN A TAILORED POLICY STRATEGY

In order to design an appropriate strategy to tackle low performance, a country/economy should first identify its low performers. Do they share particular socio-economic and/or demographic characteristics? Are they found in all schools or only in certain schools? Has the incidence of low performance across the country/economy increased over time? The answers to these questions will form the basis of any policy intervention.

Countries and economies where the majority of 15-year-old students performs below the baseline level of proficiency in one, two or all three subjects PISA assesses may want to consider comprehensive education reforms. In 15 countries,[1] more than one in two students are low performers in mathematics; in 10 countries,[2] more than one in two students are low performers in reading; and in 9 countries,[3] more than one in two students are low performers in science. These are mostly upper-middle income countries in Latin America (Brazil, Colombia, Costa Rica, Mexico and Peru), Europe (Albania and Montenegro), East Asia (Malaysia), Central Asia (Kazakhstan) and the Middle East and North Africa (Jordan and Tunisia); three high-income countries in Latin America (Argentina, Chile and Uruguay) and one in the Middle East (Qatar); and one lower-middle income country in East Asia (Indonesia).[4]

In all of these countries, the level of economic development – and of educational expenditure per student – is lower than the OECD average (OECD, 2013a). Previous PISA analysis estimates that cumulative expenditure per student, from age 6 to 15, of around USD 50 000 is the threshold after which additional investments are not necessarily associated with better student performance. Thus, a key policy strategy for these countries would be to increase the financial resources invested in education to the greatest extent possible, in order to attain a minimum level of qualified staff and material resources that schools need to give all students a chance to succeed.

As Chapters 4 and 5 of this report show, the quality of schools' educational resources, and the equity with which those resources are allocated across an education system, have an impact on the likelihood that an individual student will be a low achiever. Chapter 5 shows that low performers benefit most from investing more, and more equitably, in schools' educational resources. Thus, countries need to develop funding-allocation mechanisms that ensure that schools receive the resources they need. Revising funding to avoid shortages of educational materials, qualified teachers and professional staff in the schools attended by low-performing and socio-economically disadvantaged students are important components of an education reform that aims to support low performers. These types of comprehensive reforms do not obviate the need for targeted reforms, since there are also considerable performance differences observed across socio-economic and demographic groups in most countries.

Targeted policies and programmes, rather than comprehensive education reforms, may be more appropriate in countries/economies where low performers are a minority of the total student population. In 14 countries and economies,[5] 15% or less of students are low performers in mathematics; in 19 countries and economies,[6] 15% or less of students are low performers in reading; and in 22 countries and economies,[7] 15% or less of students are low performers in science. All of these countries and economies are high-income countries, except Viet Nam, which is a lower-middle income country where less than 15% of all students are low performers in one of the core PISA subjects.[8]

Although these percentages are relatively low – in top-performing countries/economies, only 8% of students or less are low performers in mathematics –, they represent large numbers of students. In Japan, for example, where the average mathematics score is significantly above the OECD average, 11% of students are low performers in mathematics. This translates into roughly 134 000 15-year-old students in Japan who have not yet acquired basic mathematics skills (see Table 1.7a).

All of these countries/economies may benefit more from policies that target the risk factors of low performance that have the strongest impact on their students. As this report has shown, the impact of each risk factor varies considerably from country to country. For example, the link between immigrant background and low performance, which is significant on average across OECD countries and is particularly strong in Belgium, Denmark, Estonia, Finland, France, Iceland, Mexico and Switzerland, whereas in Australia, Hong Kong-China, Macao-China, Montenegro, Qatar, Singapore and the United Arab Emirates, immigrant students perform better than students without an immigrant background, after students' socio-economic status has been taken into account (Table 2.7). Similarly, the relationship between low performance and no pre-primary education is particularly strong in France, Israel, the Slovak Republic and Shanghai-China. These findings identify the need for targeted interventions to tackle low performance.

Countries and economies that have reduced their shares of low performers may require different approaches than countries and economies where low performance has remained stable or has increased over time. In 14 countries, the share of low performers in mathematics increased between 2003 and 2012; in 4 countries, the share of low performers in reading increased between 2000 and 2012; and in 6 countries, the share of low performers in science increased between 2006 and 2012 (Tables 1.9, 1.11 and 1.12). Sweden has seen dramatic increases in the shares of low performers in each of the core subjects since 2000. In response, the country recently conducted a thorough analysis of its education system to determine the possible source(s) of the problem (OECD, 2015b). Countries – including Brazil, Mexico, Tunisia and Turkey – that have managed to reduce their shares of students who do not attain Level 1 proficiency in mathematics, still face the challenge of lifting sizeable proportions of students above the baseline level of proficiency. Achieving this may require a change in strategy.

PROVIDE TARGETED SUPPORT TO DISADVANTAGED SCHOOLS AND/OR FAMILIES

This report finds that students who attend schools with high concentrations of disadvantaged students are more likely to be low performers, even after accounting for the socio-economic status of individual students (Table 4.5). It is common to find such schools across OECD countries, particularly in Germany, Hungary, the Netherlands and Slovenia (Table 4.1). In these countries, and others, allocating additional resources to schools based on the number or proportion of disadvantaged students enrolled can be an effective and equitable way of supporting low performers (OECD, 2012).

Some countries grant the schools themselves, or local administrators, the autonomy to decide how to use additional resources. The Preferential Subsidy Programme (*Ley de Subvención Preferencial*) in Chile, for example, allocates extra funding for each disadvantaged student enrolled in a school. While schools can decide how to spend this extra money, they still must adhere to certain regulations and accountability requirements. They must, for example, design and implement an improvement plan that is evaluated within five years (OECD, 2015a; Brandt, 2010). In granting autonomy, while demanding accountability, the government takes decision making closer to the classroom, while allowing central education authorities to monitor how the additional resources are used.

Other programmes allocate specific goods and/or personnel to disadvantaged schools, such as teachers specialised in certain subjects or other professional and administrative staff, instructional materials (e.g. computers, laboratories, textbooks) or improvements in school infrastructure. For example, Ireland's Delivering Equality of Opportunity in Schools programme is a national plan that identifies levels of socio-economic disadvantage in schools based on the community in which they are located, and provides different kinds of resources and support, depending on levels of disadvantage. The plan provides early childhood education for disadvantaged students, access to teachers/co-ordinators in rural primary schools, and additional funding for books and school libraries (OECD, 2015a). Portugal's School Food Support Programme (*Programa Escolar de Reforço Alimentar*) provides a morning meal to students identified by their schools and raises awareness among students and their families about the importance of good nutrition (OECD, 2015a).

Instead of providing more resources to schools, some countries allocate resources directly to students' families. For example, countries that have reduced their shares of low performers, such as Brazil, Mexico and Peru, have introduced conditional transfer programmes that offer financial incentives to disadvantaged or marginalised families to encourage their children to enrol in and attend school. These programmes have helped to increase school enrolments and attendance (Anderson, 2005).

In addition to offering these programmes, countries could try to reduce the concentration of disadvantaged and low-performing students in particular schools. At the system level, more socio-economic inclusion in schools is related to smaller shares of low performers and larger shares of top performers (see Chapter 5). This suggests that policies leading to more social inclusion within schools may result in improvement among low-performing students, without adversely affecting high performers.

In education systems where students are assigned to schools on the basis of where they live, a concentration of disadvantage within a particular school is largely the result of residential segregation, rather than an outcome of education policy. Revising funding-allocation mechanisms so that resources are equitably distributed across schools can begin to address this problem (see Chapter 5). In education systems that allow parents and students to choose their schools, social and academic inclusion – meaning greater socio-economic and academic diversity – in schools can be promoted through regulatory frameworks, better dissemination of information about the available choices and financial incentives. Legislation could guarantee that public and private schools receiving government funding are open to all students, making it impossible to discriminate against potential students on the basis of socio-economic status, race, religion, sexual orientation, or other considerations. For example, Chile's 2009 General Education Law prohibited student selection based on academic performance or family income in any school receiving government funds (OECD, 2015a). Other systems set a quota for disadvantaged students. For example, the French Community of Belgium regulates enrolment in secondary schools through a scheme that offers parents a large degree of choice. In schools where the number of applications is larger than the number of places available, a percentage of seats (around 20%) is reserved for students from disadvantaged primary schools (OECD, 2013a).

OFFER SPECIAL PROGRAMMES FOR IMMIGRANT, MINORITY-LANGUAGE AND RURAL STUDENTS

Low performers are more often found among students with an immigrant background and who speak a different language at home from the language of assessment. This is partly because these students also tend to be socio-economically disadvantaged. However, immigrant students have the potential to perform as well as non-immigrant students. Strategies to prevent low performance among immigrant and minority-language students include language training, curricular programmes designed specifically for minority students and longer school days. Israel, where the share of low performers in reading decreased from 33% in 2000 to 24% in 2012, has instituted small-group teaching programmes for low-performing students. The country also lengthened the school day and improved the quality of the educational resources and teachers' working conditions in schools attended by Arabic-speaking minorities, especially students from Bedouin families (OECD, 2013a; Hemmings, 2010). Germany's National Action Plan for Integration recently introduced language training for children with an immigrant background (OECD, 2015a). Finland's National Core Curriculum for Instruction Preparing Immigrants for Basic Education provides a preparatory curriculum for students with an immigrant background based on their age, ability and mastery of the mainstream language. The programme helps these students integrate more quickly into the regular curriculum (OECD, 2015a). New Zealand's Māori Education Strategy (*Ka Hikita*) is designed to support minority students through language training (OECD, 2015a).

Policies to support rural students partly overlap with those for disadvantaged immigrant and minority-language students because low performance among rural students is often linked to the disadvantaged conditions of poor ethnic minorities. Geographic isolation and a lack of access to jobs and other resources that are concentrated in cities are additional challenges unique to rural low performers. Support to rural students could include investing in education infrastructure

and resources in rural schools to encourage universal enrolment in isolated areas, and offering financial incentives for qualified teachers to teach in rural schools. At the same time, policy needs to address the cost of maintaining small schools with small classes. Australia has introduced "place-based" education in rural areas, through which students in rural schools explore the science and history of their surroundings (Bartholomaeus, 2006). A number of school districts in the United States have shortened the school week to four days and lengthened the school day in order to reduce overhead and transportation costs. Research suggests that this initiative has had positive effects on student achievement (Anderson and Walker, 2015).

TACKLE GENDER STEREOTYPES AND ASSIST SINGLE-PARENT FAMILIES

Chapter 2 shows that boys are more likely than girls to be low performers in reading and science, while girls are more likely than boys to be low performers in mathematics. A recent PISA report focusing on gender differences in education suggests several policy tools to reduce gender gaps and help boys and girls fulfil their potential (OECD, 2015c). For example, training teachers to be aware of their own gender biases can help them to become more effective teachers. Sweden introduced a teacher training scheme where each college and university is required to provide a gender perspective, and teachers are expected to develop awareness and knowledge about the importance of gender equality (Rabo, 2007).

Giving students, particularly boys, a greater choice in what they read is a way to encourage reading for enjoyment. This is especially important for boys because they are less likely than girls to read in their free time; and when students don't read well, their performance in other subjects suffers too. The Australian State of Victoria funds a programme, specifically targeting boys, called "Boys, Blokes, Books & Bytes", which promotes learning styles that are appealing to boys, and involves adult men as positive role models and reading partners (OECD, 2015c). Policy makers and teachers can also do more to bolster girls' self-confidence and reduce their high levels of anxiety towards mathematics. In the United States, the "Race to the Top" programme promotes science, technology, engineering and mathematics (STEM) education among groups that are under-represented in these fields, particularly girls and women (OECD, 2015c).

Students in single-parent families tend to have a higher risk of low performance, compared with students who live with two parents (Chapter 2). One reason for this performance gap may be that single parents often have less time and resources to support their children's school work. Lengthening the school day and offering additional extracurricular activities after regular school hours, as Germany and Greece do (OECD, 2013a; Greek Ministry of Education, 2011), are two ways of offering more opportunities for students who do not get the help they need at home. Japan's Study Support Volunteering Programme recruits volunteers among university students who help children with their homework and home study (Education Board of Tokyo, 2015).

REDUCE INEQUALITIES IN ACCESS TO EARLY EDUCATION AND LIMIT THE USE OF STUDENT SORTING

A lack of pre-primary education is closely associated with low performance, as discussed in Chapter 2. In most countries, and particularly in high-performing education systems, having attended no or less than a year of pre-primary education increases the likelihood of low performance more among disadvantaged than advantaged students. Countries should move quickly towards providing access to quality pre-primary schooling for all children. This could be accomplished by passing legislation that gives every child the right to participate in pre-primary education (Mexico and Poland have done so), and by providing the resources needed to develop a network of free pre-primary education centres for disadvantaged children.

Of all variables analysed in this report, repeating a grade has the second strongest association with low performance, after socio-economic disadvantage. Although it remains unclear whether grade repetition is the cause or the result of low performance, as discussed in Chapter 2, research shows that grade repetition is a costly policy with unproven benefits for student performance and with a negative impact on students' engagement with school. Identifying low performers early and providing remedial support for struggling students is a more desirable and effective practice than keeping back low performers. Countries where grade repetition is pervasive, including Belgium, Luxembourg, Portugal and Spain (see Table 2.16), may want to revisit their policies on grade repetition. Where school systems presume that grade repetition is beneficial or necessary, it is important to raise awareness among stakeholders about its cost and negative impact on students (OECD, 2012).

The policy of sorting students into different curricular tracks often results in a two-tier system where socio-economically disadvantaged and low-performing students are more likely to be sorted into tracks of lower quality or status that will make it more difficult for them to enter higher levels of education. As discussed in Chapter 2, students in vocational programmes are more likely to be low performers than students enrolled in general academic programmes. One way to ensure that vocational students are not short-changed in their education is to delay tracking and extend the length of comprehensive education, as Poland has done, or create easier ways to move from vocational to comprehensive schools, as Austria has done. Another way is to improve the quality of vocational training and work with employers to ensure that students in these programmes are well-equipped to enter the labour market (OECD, 2010).

Notes

1. Listed in descending order of the percentage of students who are low performers in mathematics: Indonesia, Peru, Colombia, Qatar, Jordan, Brazil, Tunisia, Argentina, Albania, Costa Rica, Montenegro, Uruguay, Mexico, Malaysia and Chile.

2. Listed in descending order of the percentage of students who are low performers in reading: Peru, Qatar, Kazakhstan, Indonesia, Argentina, Malaysia, Albania, Colombia, Brazil and Jordan.

3. Listed in descending order of the percentage of students who are low performers in science: Peru, Indonesia, Qatar, Colombia, Tunisia, Brazil, Albania, Argentina and Montenegro.

4. According to the World Bank Country Classification, http://data.worldbank.org/about/country-and-lending-groups (consulted on 7 January 2016).

5. Listed in descending order of the percentage of students who are low-performers in mathematics: the Netherlands, Poland, Viet Nam, Canada, Liechtenstein, Chinese Taipei, Switzerland, Finland, Japan, Macao-China, Estonia, Korea, Hong Kong-China, Singapore and Shanghai-China.

6. Listed in descending order of the percentage of students who are low performers in reading: Denmark, Germany, Australia, the Netherlands, Switzerland, Liechtenstein, Chinese Taipei, Macao-China, Finland, Canada, Poland, Singapore, Japan, Ireland, Viet Nam, Estonia, Korea, Hong Kong-China and Shanghai-China.

7. Listed in descending order of the percentage of students who are low performers in science: the United Kingdom, the Czech Republic, Australia, the Netherlands, Slovenia, Switzerland, Latvia, Germany, Ireland, Canada, Liechtenstein, Chinese Taipei, Singapore, Poland, Macao-China, Japan, Finland, Viet Nam, Korea, Hong Kong-China, Estonia and Shanghai-China.

8. The population of Vietnamese students who took the PISA 2012 test represents only 56% of all 15-year-olds in Viet Nam. This is a smaller proportion than in most other participating countries (OECD, 2013a).

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Annex A

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Chapter 4 How school characteristics are related to low performance

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Chapter 5 Policies governing school systems and low student performance

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More than one in four 15-year-old students in OECD countries have not attained a baseline level of proficiency in at least one of the three core subjects PISA assesses: reading, mathematics and science. Students who perform poorly at age 15 face a high risk of dropping out of school altogether; and when a large share of the population lacks basic skills, a country's long-term economic growth is severely compromised.

Low-Performing Students: Why they Fall Behind and How to Help them Succeed both describes the factors that may contribute to students' disengagement with school and offers suggestions on how education policy can reduce the incidence of low performance. Solving this complex problem requires a multi-pronged approach, tailored to national and local circumstances, and involving school leaders, teachers, parents and students themselves. Clearly, the gains from tackling low performance dwarf any conceivable cost of improvement.

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