6

Resources invested in education

This chapter examines the resources invested in education in PISA-participating countries and economies, how these resources have evolved over time, and how they are allocated across schools. The relationship between educational resources, including financial, material, human and time resources, and student performance is also analysed.

A 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.

Despite the widely accepted idea that more resources improve student performance, previous research on education has generally shown that, once an adequate level of resources is reached, additional resources may not necessarily contribute to better learning outcomes (Burtless, 1996; Nannyonjo, 2007; Nicoletti and Rabe, 2012; OECD, 2013, 2016a; Suryadarma, 2012; Wei, Clifton and Roberts, 2011). This implies that governments, schools and families should also focus on how educational resources are distributed and used, and which resources actually improve student learning, as well as on how much is spent on education.

Each additional dollar can only be spent once, so countries need to decide whether to invest in salary increases, more instruction time for students, more professional development for teachers, improved educational resources or school infrastructure. Equally important, countries need to decide how to distribute resources across schools, and how to align additional resources with socio-economic circumstances and other needs. Some research, for instance, suggests that increasing the educational resources available to disadvantaged students and schools offers good returns, both for student achievement (Bressoux, Kramarz and Prost, 2009; Lavy, 2012; Henry, Fortner and Thompson, 2010; Schanzenbach, 2007) and in redressing inequalities in education (Henry, Fortner and Thompson, 2010). PISA also shows that in high-performing education systems, resources tend to be allocated more equitably between socio-economically advantaged and disadvantaged schools (OECD, 2016a). PISA shows that countries differ widely in where they choose to invest their spending on education, so it is worth comparing policies and practices in this area.

This chapter analyses in detail how the resources invested in education are distributed across schools, and how they are related to student outcomes (Figure II.6.1). It starts by describing expenditure on education across education systems, how it has changed since previous PISA cycles, and its relationship with student performance. It then describes how this expenditure trickles down to the school system by focusing on the availability and quality of the material resources (educational material, computers and school size); human resources (teachers' salaries, initial training, qualifications and professional development; shortage of human resources; student-teacher ratios and class size); and time resources (actual teaching time, student learning time, homework assistance, extracurricular activities and attendance at pre-primary school). Given the correlational, not causal, nature of the analyses, the chapter only suggests avenues that policy makers may explore to allocate resources more fairly and efficiently.

What the data tell us

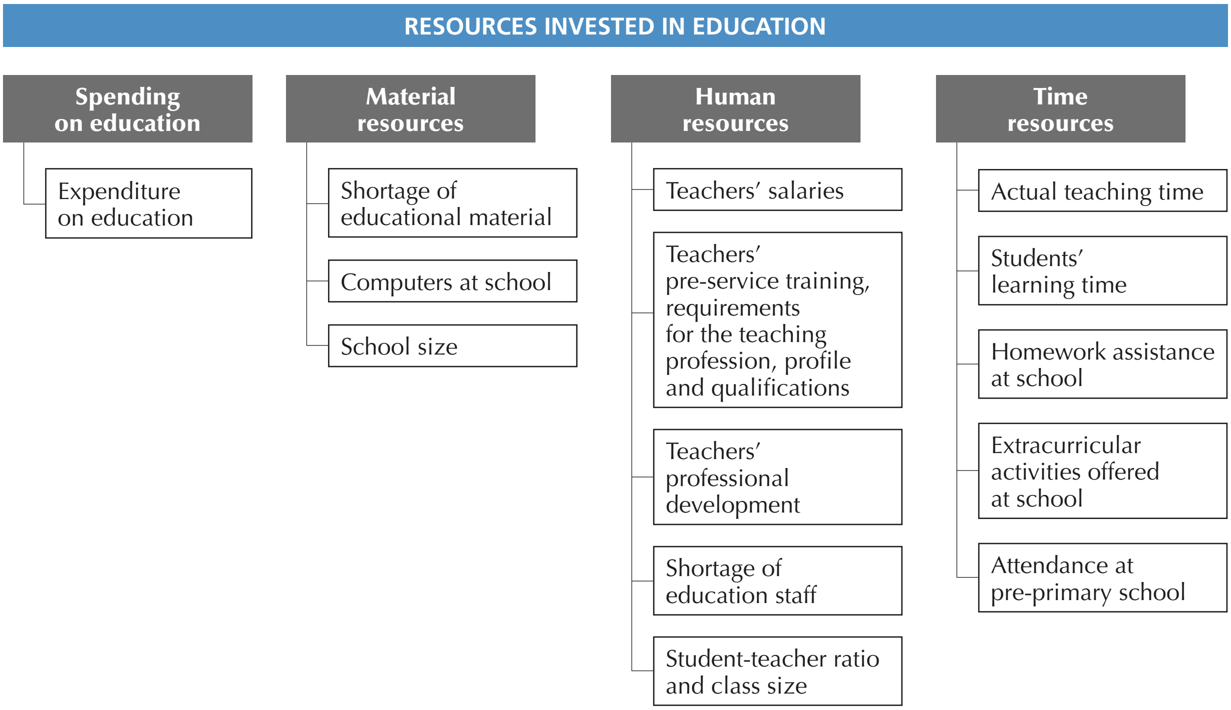
- Almost all school systems where schools principals in socio-economically disadvantaged schools are considerably more concerned than principals in advantaged schools about the material resources at their school score below the OECD average in science.
- Students in larger schools score higher in science and are more likely to expect to work in a science-related career in the future than students in smaller schools. But students in smaller schools reported a better disciplinary climate in their science lessons and they are less likely than students in larger schools to skip days of school and arrive late for school.
- On average across OECD countries, students in smaller classes reported more frequently than students in larger classes that their teachers adapt their instruction to their needs, knowledge and level of understanding.
- Students score five points higher in science for every additional hour spent per week in regular science lessons, after accounting for socio-economic status.
- School systems where students spend more time learning after school, by doing homework, receiving additional instruction or in private study, tend to perform less well in science.

FINANCIAL RESOURCES

Policy makers must constantly balance expenditure on education with expenditure for many other public services, particularly in the face of fiscal constraints. Yet despite the competing demands for resources and the recent economic crisis, expenditure on education has increased over the past few years. Between 2005 and 2013, expenditure per primary, secondary and post-secondary non-tertiary student[1] increased by 6%, on average across OECD countries with data available for both 2005 and 2013 (OECD, 2016b).

Financial resources in education can be allocated to salaries paid to teachers, administrators and support staff; maintenance or construction costs of buildings and infrastructure; and operational costs, such as transportation and meals for students.

Figure II.6.1 ■ **Resources invested in education as covered in PISA 2015**



In 2013, the average cumulative expenditure by educational institutions per student between the ages of 6 and 15[2] exceeded USD 100 000 (PPP-corrected dollars) in Austria, Belgium, Denmark, Finland, Iceland, Luxembourg, Malta, Norway, Singapore, Sweden, Switzerland, the United Kingdom and the United States.[3] In Luxembourg, cumulative expenditure per student exceeded USD 180 000. By contrast, in Colombia, the Dominican Republic, Georgia, Kazakhstan and Peru, cumulative expenditure per student over this age period totalled less than USD 25 000 (Table II.6.58).

As would be expected, spending on education and per capita GDP are highly correlated (r = 0.91 across OECD countries; the correlation is the same across all participating countries and economies in PISA 2015). School systems with greater total expenditure on education tend to be those with higher per capita GDP.

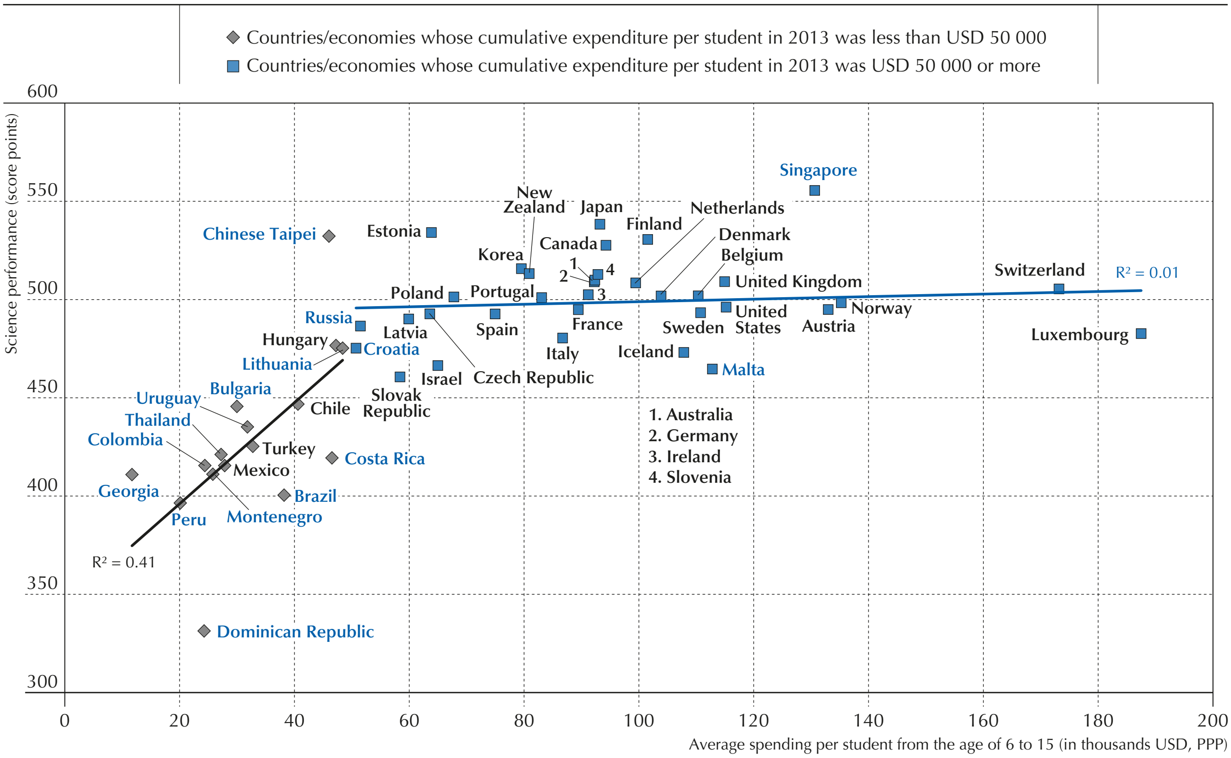
A first glance at PISA results gives the impression that students in high-income countries and economies – and countries/economies that can and do spend more on education – perform better. High-income countries and economies (defined here as those with a per capita GDP above USD 20 000) have more resources to spend on education. These countries and economies cumulatively spend USD 87 261 on each student from age 6 to 15, on average, while countries that are not considered to be in that group spend USD 28 071, on average (Tables II.6.58 and II.6.59). Students in high-income countries and economies score 81 points higher in science, on average, than students in countries whose per capita GDP is below the USD 20 000 benchmark.

Yet the relationship among a country's/economy's income per capita, its level of expenditure on education per student, and its PISA score is far more complex (Baker, Goesling and LeTendre, 2002; OECD, 2012). Among the countries and economies whose cumulative expenditure per student is under USD 50 000 (the level of spending in 18 countries), higher expenditure on education is significantly associated with higher PISA science scores. But this is not the case among countries and economies whose cumulative expenditure is greater than USD 50 000, which include most OECD countries (Figure II.6.2). It seems that for this latter group of countries and economies, factors other than the level of investment in education are better predictors of student performance.

Among the former group of countries and economies, systems whose cumulative expenditure per student is USD 10 000 higher than other systems score an average of 26 points higher in the PISA science assessment. For example, Turkey, with a cumulative expenditure of USD 32 752, has an average PISA science score of 425 points – 22 points lower than that of Chile, whose cumulative expenditure per student is nearly USD 8 000 higher than that of Turkey.

However, among those countries and economies whose cumulative expenditure per student is more than USD 50 000, the relationship between spending per student and performance is no longer observed. Among these countries and economies, it is common to find some with substantially different levels of spending per student yet similar science scores. For example, Poland and Denmark score 501 and 502 points in science, respectively, but the cumulative expenditure per student in Denmark is more than 50% greater than that in Poland. Similarly, although countries and economies might have similar levels of expenditure on education, they can perform very differently. For example, while Iceland and Finland both spend roughly USD 100 000 per student from the age of 6 to 15, Iceland's science score in PISA 2015 is 473 points and Finland's score is 531 points (Figure II.6.2).

Figure II.6.2 ■ **Spending per student from the age of 6 to 15 and science performance**



Notes: Only countries and economies with available data are shown.
A significant relationship ($p < 0.10$) is shown by the black line.
A non-significant relationship ($p > 0.10$) is shown by the blue line.
Source: OECD, PISA 2015 Database, Tables I.2.3 and II.6.58.
StatLink http://dx.doi.org/10.1787/888933436215

Whatever the reason for the lack of a relationship between spending per student and learning outcomes, at least in the countries and economies with larger education budgets, excellence in education requires more than money. How resources are allocated is just as important as the amount of resources available to be allocated.

MATERIAL RESOURCES

While poor physical infrastructure and an inadequate supply of educational resources could have adverse effects on learning (Schneider, 2002; Uline and Tschannen-Moran, 2008), there is little evidence that these material resources – such as the quality of buildings, heating, lighting or IT equipment – has a strong impact on student outcomes (Cervini, 2009; Hanushek, 2003; OECD, 2015; Wei, Clifton and Roberts, 2011). What matters for student achievement and other education outcomes is not necessarily the amount of resources – at least once a minimum level has been reached – but the quality of those resources, how effectively they are used, and how equitably they are distributed across schools (Gamoran, Secada and Marrett, 2000; OECD, 2016a).

PISA 2015 asked school principals to report the extent to which their school's capacity to provide instruction was hindered ("not at all", "very little", "to some extent" or "a lot") by a shortage or inadequacy of physical infrastructure, such as school buildings, heating and cooling systems and instructional space; and educational material, such as textbooks, laboratory equipment, instructional materials and computers. The responses were combined to create an index of shortage of educational material. The average on the index is zero and the standard deviation is one across OECD countries. Positive values reflect principals' perceptions that the shortage of educational material hinders the capacity to provide instruction to a greater extent than the OECD average; negative values indicate that school principals believe the shortage hinders the capacity to provide instruction to a lesser extent.

On average across OECD countries, about one in three students attends a school whose principal reported that the lack or inadequacy of physical infrastructure does not hinder the capacity to provide instruction at all (Table II.6.1). A similar proportion attends a school whose principal reported that a shortage of educational material does not hinder instruction at all. In some countries and economies, physical infrastructure is a great concern for school principals. For example, in Albania, Colombia, Costa Rica, Croatia, Indonesia, Italy, Jordan, Trinidad and Tobago, and Tunisia, more than one in four students attend a school whose principal reported that a lack of physical infrastructure hinders the capacity to provide instruction a lot; in five of these countries, a similar proportion attends a school whose principal reported that inadequate or poor-quality physical infrastructure hinders the capacity to provide instruction a lot.

In other education systems, school principals are more concerned about the quality of the educational material at school. For instance, in Colombia, Costa Rica, Indonesia, Jordan, Kosovo, Peru and Tunisia, more than one in four students attend schools whose principal reported that a lack of educational material hinders the capacity to provide instruction a lot; in three of these seven countries, the same proportion attends schools whose principal reported that the inadequacy of educational material hinders the capacity to provide instruction a lot. These results should be interpreted with caution, however, since the benchmarks of what constitutes "lack" or "inadequacy" are likely to differ across and within countries.

In 29 PISA-participating education systems, the capacity to provide instruction in socio-economically disadvantaged schools is hindered by a lack or inadequacy of educational material and physical infrastructure to a greater extent than in advantaged schools, according to school principals, while the opposite is reported only in the Former Yugoslav Republic of Macedonia (hereafter "FYROM"), Iceland and Latvia (Figure II.6.3).[4] On average across OECD countries, student learning in rural schools is also hindered to a greater extent than in urban schools by a lack or inadequacy of the material resources. In as many as 35 out of 57 education systems, the capacity of public schools to provide instruction is more likely to be hindered by a shortage of educational material than private schools. Only in Malta and Singapore do public schools enjoy more and better educational materials than private schools, according to principals' reports.

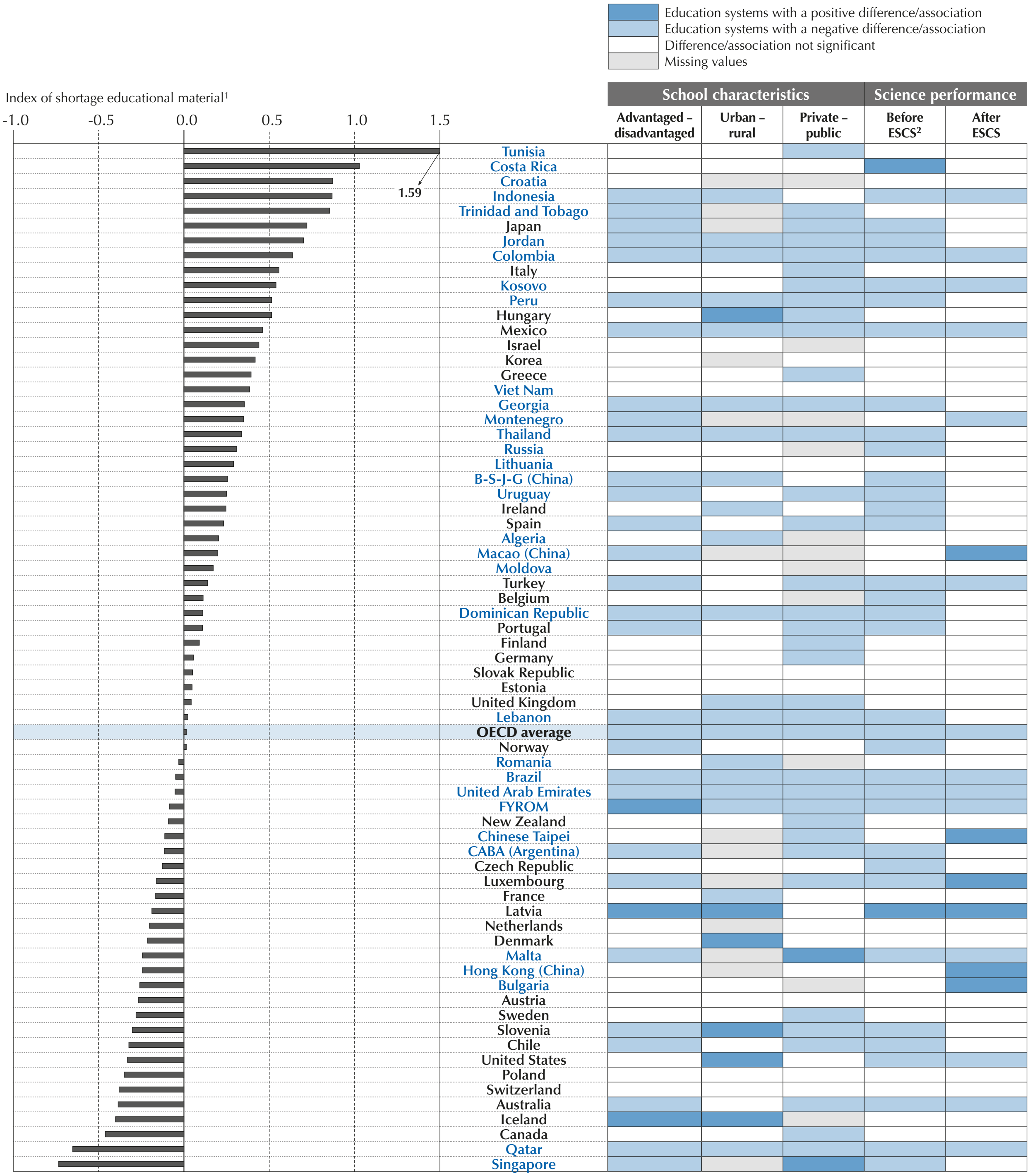
Not surprisingly, in about half of the education systems that participated in PISA 2015, students score lower in schools whose principals reported that the capacity to provide construction is hindered to a greater extent by a shortage of infrastructure and educational material (Figure II.6.3). However, after accounting for the socio-economic profile of students and schools, a shortage of educational material is negatively associated with performance in only 13 education systems.

Equity in resource allocation

How equitably resources are allocated across schools determines whether or not all students are given equal opportunities to learn (Roemer, 1998). In this context, an equitable resource allocation would mean that the schools attended by socio-economically disadvantaged students are at least as well-equipped as the schools attended by advantaged students, to compensate for inequalities in the home environment. This is measured by the index of equity in resource allocation (material), which assesses the extent to which the socio-economic profile of a school is positively or negatively associated with the principal's concern about the lack or inadequacy of educational material at school.[5] Positive values indicate that principals of disadvantaged schools reported less concern about the material resources at their schools than principals of advantaged schools.

Based on school principals' reports, only in Iceland, Latvia and Montenegro are principals of advantaged schools more likely to believe that learning is hindered by a lack of resources (Table II.6.3). Conversely, and as would be expected, in 26 countries and economies advantaged schools are better equipped than disadvantaged schools. In Brazil, Ciudad Autónoma de Buenos Aires (Argentina) (hereafter "CABA [Argentina]"), Lebanon, Macao (China), Mexico and Peru at least 15% of the difference in principals' concern about the lack or inadequacy of educational material is explained by the schools' socio-economic profile.

Figure II.6.3 ▪ Index of shortage of educational material, school characteristics and science performance



	Advantaged – disadvantaged	Urban – rural	Private – public	Before ESCS2	After ESCS
Education systems with a positive difference/association	3	6	2	2	6
Education systems with no difference/association	36	30	20	33	49
Education systems with a negative difference/association	29	19	35	33	13

1. Higher values on the index indicate a greater shortage of educational material.
2. ESCS refers to the PISA index of economic, social and cultural status.

Note: See Annex A7 for instructions on how to interpret this figure.

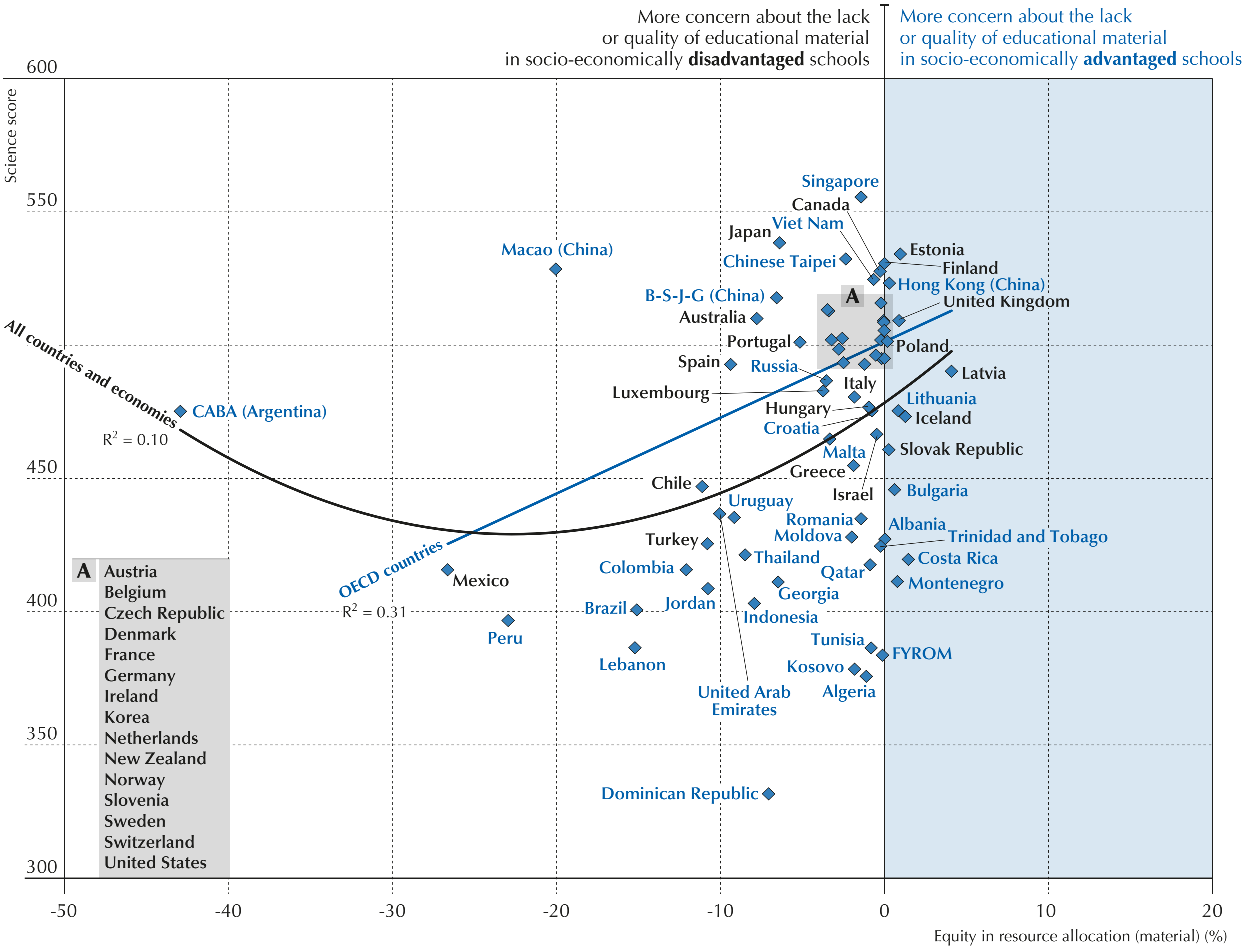
Countries and economies are ranked in descending order of the index of shortage of educational material.

Source: OECD, PISA 2015 Database, Table II.6.2.

StatLink http://dx.doi.org/10.1787/888933436227

In countries and economies where more resources are allocated to disadvantaged schools than advantaged schools, overall student performance in science is somewhat higher (Figure II.6.4). With the exception of CABA (Argentina) and Macao (China), all school systems where schools principals in disadvantaged schools are considerably more concerned about the material resources at their school than principals in advantaged schools – values below -10% in equity in resource allocation – score below 450 score points in science. Across OECD countries, 31% of the variation in science performance is explained by the degree of equity in the allocation of educational resources between advantaged and disadvantaged schools. Evidence from a previous PISA report suggests that low-performing students appear to benefit the most when more resources are allocated to disadvantaged schools than advantaged schools, but not at the expense of the highest-performing students in the education system (OECD, 2016a).

Figure II.6.4 ■ **Equity in resource allocation and science performance**



Note: Equity in resource allocation is the percentage of variance of the principal's concern about the educational material at the school explained by the school's socio-economic profile. A negative sign indicates that principals of socio-economically disadvantaged schools are more concerned about the educational material at the school than principals of advantaged schools.

Source: OECD, PISA 2015 Database, Tables I.2.3 and II.6.3.

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Computers at school

Introducing computers into the classroom can be justified on several grounds, including preparing students to become full participants in today's digital public space, equipping them with the digital skills needed for the labour market, and allowing teachers to explore new teaching tools (OECD, 2015). It is therefore hardly surprising that governments have invested substantial resources on computers, Internet connections, software, and information and communications technology (ICT) more generally. But this investment has not always produced obvious gains in student learning. As the PISA report, *Students, Computers and Learning: Making the Connection* (OECD, 2015) concludes: in general, schools and education systems have not been effective in leveraging the potential of technology.

PISA 2015 asked school principals to report the number of computers available to students in the school for educational purposes, and how many of these are connected to the Internet. Across OECD countries, there is 0.77 computer per student in school, 96% of which are connected to the Internet (Table II.6.4). There are large differences in the computer-student ratio across education systems. In Australia, Austria, Canada, the Czech Republic, Iceland, Macao (China), New Zealand, the United Kingdom and the United States, there is at least one computer available per student, and at least 95% of the computers are connected to the Internet. By contrast, in Albania, Algeria, Indonesia, Kosovo and Tunisia, there is less than one computer per every five students, and less than 70% of the computers are connected to the Internet.

On average across OECD countries, there are more computers per student available for educational purposes in socio-economically disadvantaged schools than in advantaged schools, and more in rural than in urban schools (Table II.6.5). Education systems may be compensating for the fact that disadvantaged students and students living in rural areas often have limited access to computers and the Internet at home (OECD, 2015). However, the percentage of computers connected to the Internet in socio-economically disadvantaged schools is lower than in advantaged schools, and is also lower in rural than in urban schools (Table II.6.6). There are considerably more education systems (26) where school computers in private schools are more frequently connected to the Internet than those in public schools, than there are education systems (3) where computers in public schools are more frequently connected to the Internet.

Across OECD countries, the more computers available for educational purposes per student, the lower students score in science, but only before accounting for the socio-economic profile of students and schools (Table II.6.5). There is a similar number of PISA-participating countries and economies where the relationship is positive (7) as education systems where it is negative (11), after accounting for the socio-economic profile of students and schools.

School size

Smaller schools may allow for greater interactions among school staff, parents and students, and also among students of different ages. Smaller learning communities may also foster a greater sense of belonging. However, through economies of scale, larger schools may be in a better position to offer more optional courses and a broader range of activities. Also, the greater diversity of students often found in larger schools means that students may find it easier to meet other students with similar interests and preferences. But evidence on the effects of school size on student outcomes is mixed (see Box II.6.1).

Box II.6.1. **School size, efficiency and effectiveness**

The relationship between school size, educational effectiveness and economic efficiency has been a subject of long-standing debate among policy makers and researchers. Populations of school-age children have shrunk in many OECD countries, while in others, enrolments in urban schools have swelled alongside internal migration to cities. Both situations have raised concerns about the quality and cost of small schools, particularly in rural areas. Rather than identifying an "optimal size", empirical studies indicate that the effect of school size varies across student groups and levels of education.

Student achievement

The relationship between school size and student achievement remains empirically contested, with studies finding both positive and negative relationships and varying effects, depending on students' socio-economic status and grade level (Slate and Jones, 2005). In general, secondary school students tend to benefit more from larger schools than primary school pupils, and low-income and minority students appear to perform better in smaller schools (Howley and Howley, 2004). Some studies also find evidence of diminishing returns to scale, suggesting that student performance improves up to a certain school size (which tends to be smaller in primary education than in secondary education) and declines thereafter.

Efficiency

Larger schools benefit from economies of scale, which allow them to reduce their capital, operating and administrative expenses, although schools above a certain size may be confronted with diminishing or even negative returns to expansion (Andrews et al., 2002). Many countries offset the higher cost of maintaining small schools by providing them with additional funding or promoting consolidation programmes to reduce the fiscal burden of a fragmented school network.

…

Educational offerings and teachers' working conditions

Small schools may struggle to provide a broad curriculum, organise students into learning groups, offer single-grade teaching and use ability streaming. Early studies on school size found that larger schools attract more qualified teachers, provide better facilities and offer more diverse extracurricular activities. However, recent studies have also found that students and teachers in smaller schools form closer ties, which can lead to improved attendance and retention rates, fewer disciplinary problems and a stronger sense of belonging. Advantages may also include more interaction with parents and higher rates of participation in extracurricular activities, particularly among disadvantaged students (Leithwood and Jantzi, 2009).

The size of a school also affects the work of teachers. Instructing multiple grade levels at once poses a challenge to staff members who are often not adequately trained for the task and lack appropriate teaching material. Teachers in larger schools also tend to benefit from a lighter administrative burden and more opportunities for professional development and peer learning.

Policy considerations

OECD countries have adopted different policy strategies related to small schools. Canada, Korea and Portugal underwent periods of extensive consolidation over the past decades, and Estonia provides municipalities with incentives to reorganise their school networks to make them more efficient (Santiago et al., 2016). Although school consolidation can increase efficiency and education quality in some contexts, its feasibility depends on a range of factors, including geographic context. In remote and sparsely populated areas, school closures are likely to impose additional transportation costs on parents, schools and school districts, which may outweigh the benefits of economies of scale (Andrews et al., 2002). Any improvements in quality and financial savings from closures need to be considered alongside equity concerns, broader regional development objectives and the social significance of schools for local communities.

Where consolidation is not feasible, creating school clusters or multifunctional centres, such as those piloted in Lithuania (Shewbridge et al., 2016), can enable small schools to pool resources, offer more specialised classes, and create a wider professional community for teachers and principals. The use of information and communications technology can also be a useful tool to overcome some of the disadvantages students and teachers face in small or isolated schools (Hobbs, 2004). In cases where consolidation was not an option, many countries responded to the higher cost of delivering quality education in small and rural schools by providing them with targeted investment and support.

For further reading, see Ares Abalde, M. (2014), "School Size Policies: A Literature Review", *OECD Education Working Papers*, No. 106, OECD Publishing, Paris, http://dx.doi.org/10.1787/5jxt472ddkjl-en.

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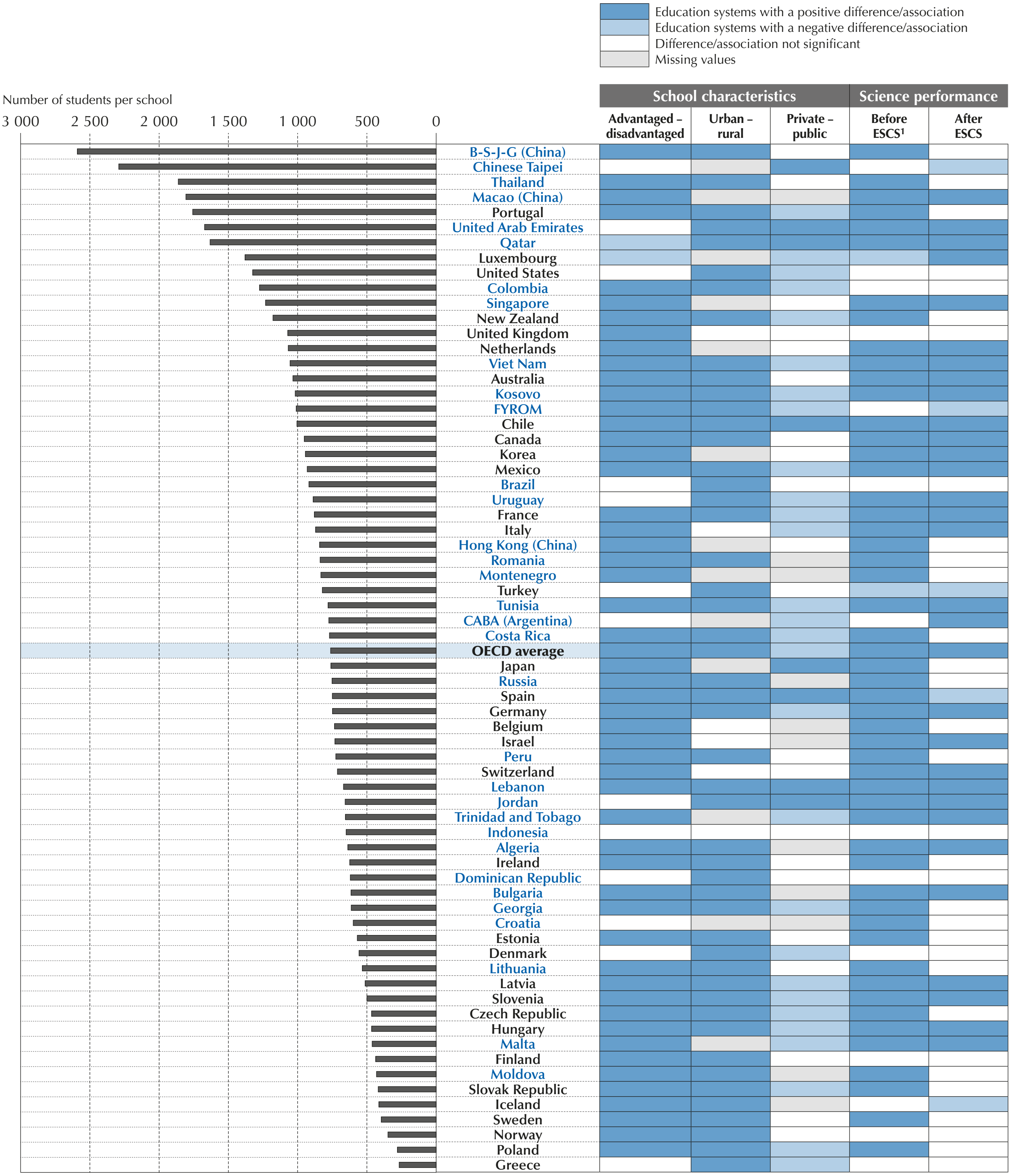
Figure II.6.5 ▪ Number of students per school, school characteristics and science performance



	Advantaged – disadvantaged	Urban – rural	Private – public	Before ESCS¹	After ESCS
Education systems with a positive difference/association	52	48	8	51	30
Education systems with no difference/association	13	6	21	14	32
Education systems with a negative difference/association	2	0	27	2	5

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

Countries and economies are ranked in descending order of the average number of students per school.

Source: OECD, PISA 2015 Database, Table II.6.7.

StatLink http://dx.doi.org/10.1787/888933436244

Across OECD countries, the average 15-year-old student attends a school with 762 students (Figure II.6.5). The size of schools ranges from more than 2 000 students in Beijing-Shanghai-Jiangsu-Guangdong (China) (hereafter "B-S-J-G [China]") and Chinese Taipei, to fewer than 400 in Albania, Greece, Norway, Poland and Sweden. In about three out of four education systems, significantly fewer students attend socio-economically disadvantaged schools than advantaged schools. In Thailand, for example, there are 737 students per disadvantaged school compared with 2 956 students per advantaged school, on average. Not surprisingly, the largest differences in school size are observed between rural and urban schools. In almost all education systems, fewer students attend rural schools than urban schools. For example, on average across OECD countries, there is a difference of 501 students between the two types of schools, and in B-S-J-G (China), Thailand and the United Arab Emirates, there is a difference of at least 1 500 students between rural and urban schools. On average across OECD countries and in 27 out of 56 education systems, public schools are larger than private schools. As expected, upper secondary schools are larger than lower secondary schools (Table II.6.7). On average across OECD countries, lower secondary students attend school with 667 other students, while upper secondary students attend school with 920 other students.

In almost all education systems, students in larger schools score higher in science (Figure II.6.5). Even after accounting for the socio-economic profile of students and schools, there are still more education systems (30) where the relationship is positive than education systems (5) where it is negative.

On average across OECD countries, larger schools are better equipped (although the difference disappears once the socio-economic profile of students and schools, the level of education and science performance are accounted for), but smaller schools are better staffed, according to school principals (Table II.6.8). Students in larger schools are more likely to expect to work in a science-related career in the future, even after accounting for socio-economic status, level of education and science performance. Conversely, in smaller schools, students reported a better disciplinary climate in their science lessons, and they are less likely to skip days of school and arrive late for school than students in larger schools, after accounting for socio-economic status, level of education and science performance. Based on these correlational data, there are advantages and disadvantages associated with both small and large schools.

HUMAN RESOURCES

Teachers are an essential resource for learning; but not every teacher attribute is related to student outcomes in the same way. Previous studies have shown, for instance, that teachers' knowledge of the subject they teach and the quality of their instruction have a measureable impact on student performance – stronger than their level of education, experience, qualifications, work status or salaries (Allison-Jones and Hirt, 2004; Hanushek and Rivkin, 2006; Hanushek, Piopiunik and Wiederhold, 2014; Lockheed and Komenan, 1988; Metzler and Woessmann, 2012; Palardy and Rumberger, 2008). The type and quality of the training teachers receive, and the requirements to enter and progress through the teaching profession, shape the quality of the teaching force. Attracting, developing and retaining effective teachers are priorities for public policy (Mourshed and Barber, 2007).

Teachers' salaries

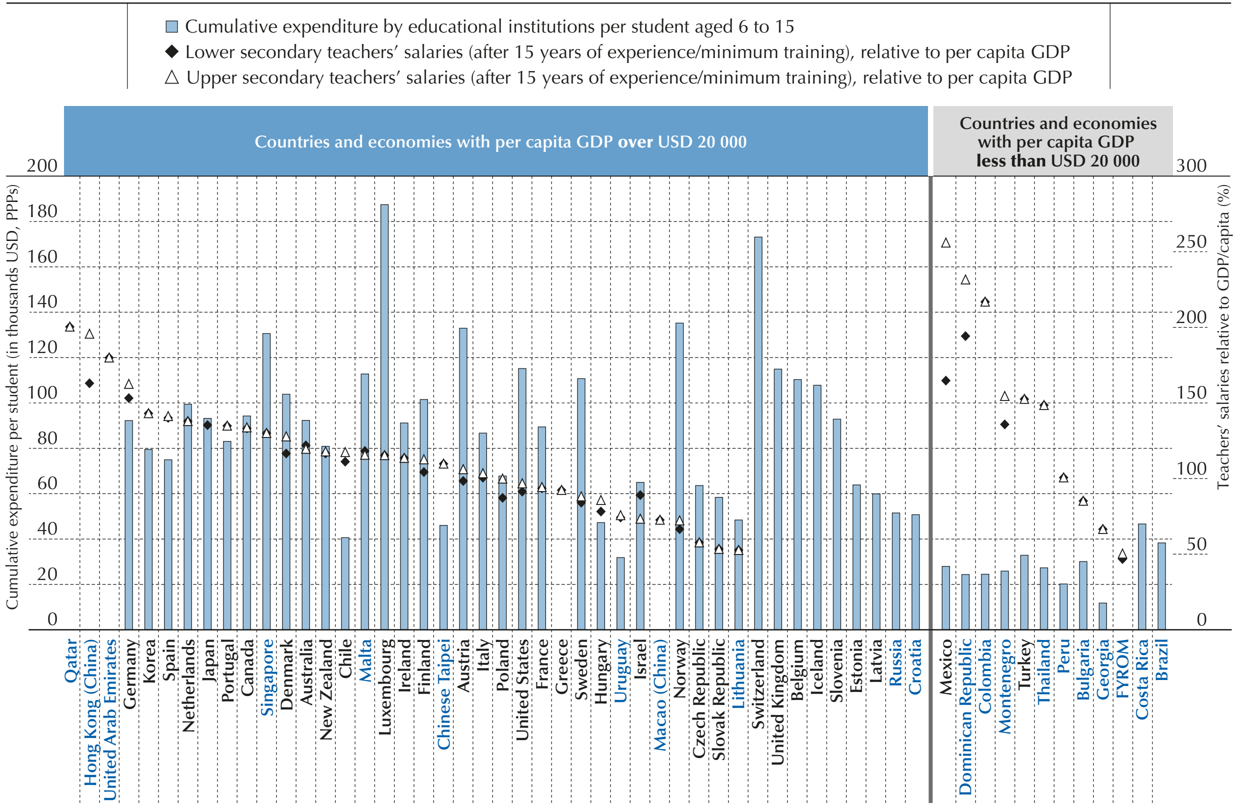
Teachers' salaries represent the largest single share of expenditure on education (OECD, 2016b). School systems differ not only in how much they pay teachers, but in the structure of their pay scales. On average, the salaries of teachers[6] with minimum training and 15 years of experience in OECD countries exceed the per capita GDP in their country by 10% for lower secondary teachers and by 16% for upper secondary teachers.

Relative to their country's national income, lower and upper secondary teachers in Colombia, the Dominican Republic, Germany, Hong Kong (China), Mexico, Qatar, Turkey and the United Arab Emirates earn the most. In these countries/economies, annual earnings of lower secondary teachers with minimum training and 15 years of experience range between 152% and 217% of per capita GDP, while annual earnings of upper secondary teachers with the same qualifications range between 152% and 256% of per capita GDP. By contrast, in the Czech Republic, FYROM, Kazakhstan, Lithuania and the Slovak Republic, annual earnings for lower and upper secondary teachers are less than 60% of per capita GDP (Table II.6.54).

In all school systems, teachers' salaries rise during the course of a career, although the rate of change differs greatly (the initial salaries of teachers also vary widely between countries). In Korea, Peru, Qatar and Singapore, salaries of teachers with minimum training[7] at the top of the pay scale are at least 2.5 times higher than starting salaries of teachers with similar training, and it takes between 20 and 37 years to reach the top salary. The ratio of teachers' salaries at the top of the scale to starting salaries is particularly high (at least 2.8 times) in two countries, Korea and Singapore, for both

lower and upper secondary teachers. By contrast, in the Czech Republic, Denmark, the Dominican Republic, Georgia, Kazakhstan, Lithuania, Montenegro, Norway and Turkey, the salaries of teachers with minimum training at the top of the scale are 1.3 times higher, at most, than starting salaries of teachers with the same training (Table II.6.54).

Figure II.6.6 ■ **Expenditure on education and teachers' salaries**



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

The reference year for the per capita GDP is 2013, except for the following countries: Bulgaria (2012), Canada (2012), Croatia (2015), Macao (China) (2014), Peru (2014) and Uruguay (2014).

Countries and economies are ranked in descending order of upper secondary teachers' salaries.

Source: OECD, PISA 2015 Database, Tables II.6.54, II.6.58 and II.6.59.

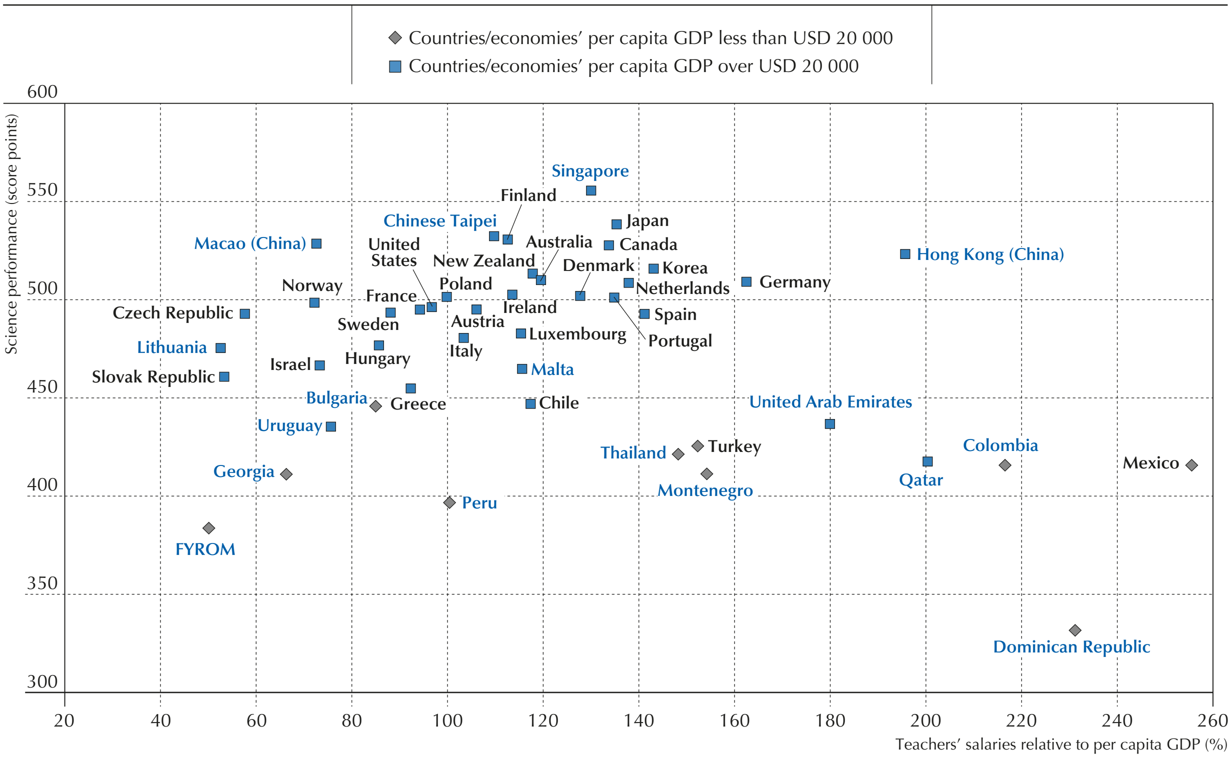
StatLink http://dx.doi.org/10.1787/888933436255

Higher salaries can help school systems attract the best candidates to the teaching profession, and signal that teachers are regarded and treated as professionals. But paying teachers well is only part of the equation. The relationship between science performance and teachers' salaries relative to per capita national income was found not to be statistically significant across PISA participating countries and economies (Figure II.6.7). This finding suggests that other factors, such as the quality of teaching, may be more closely associated with students' performance at the system level. Intervening factors, such as the different criteria used by school systems for identifying and compensating their best teachers and the level of teachers' pay in relation to the system's resources, may also be at play here. For example, if countries do not have enough resources to invest in education, paying relatively high salaries might attract good teachers, but it also might limit the number of teachers the system can afford, thus contributing to shortages of teaching staff.

Pre-service teacher training

System-level data show that competitive examinations are required to enter pre-service teacher training in 20 out of 41 education systems for primary education and in 19 out of 39 systems for secondary education (Table II.6.56). In some countries, even though competitive examinations are not required for pre-service teacher training, a leaving certificate or the results of exams taken by all students at the end of secondary education are used for admission into teacher education programmes. Pre-service teacher training is longest in Germany and Luxembourg, where such training for lower and upper secondary teachers lasts 6 to 7 years.

Figure II.6.7 ▪ Teachers' salaries and science performance



Notes: Teachers' salaries refer to the salaries of upper secondary teachers with typical qualifications in the respective countries and economies after 15 years of experience.

Only countries and economies with available data are shown.

The reference year for the per capita GDP is 2013, except for the following countries: Bulgaria (2012), Canada (2012), Croatia (2015), Macao (China) (2014), Peru (2014) and Uruguay (2014).

Source: OECD, PISA 2015 Database, Tables I.2.3, II.6.54 and II.6.59.

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Figure II.6.8 ▪ Selected pre-service training requirements for lower secondary teachers in public institutions

	No examination to enter pre-service training	Competitive examination to enter pre-service training
Relatively short duration of pre-service training programme (less than 4.5 years)	Argentina	Brazil
	Australia	Bulgaria
	Denmark	Georgia
	Dominican Republic	Greece
	England (UK)	Israel
	FYROM	Kazakhstan
	Malta	Korea
	Montenegro	Lithuania
	Norway	Macao (China)
	Singapore	Russia
	Uruguay	Chinese Taipei
		Turkey
Relatively long duration of pre-service training programme (more than 4.5 years)	Estonia	Croatia
	Hungary	Czech Republic
	Ireland	Finland
	Slovak Republic	Hong Kong (China)
	Slovenia	Portugal
	Spain	Peru
	Sweden	

Source: OECD, PISA 2015 Database, Table II.6.56.

Pre-service training for primary school teachers is the shortest (three years) in Austria, Belgium (Flemish and French Communities), Bulgaria, Portugal and Switzerland (Table II.6.56). For lower secondary teachers, pre-service training is shortest (three years) in Belgium (Flemish and French Communities) and Bulgaria. For upper secondary teachers, pre-service training lasts between 4 and 5 years in most education systems. In a few countries/economies, candidates whose bachelor's degree is not specific to education can complete a postgraduate diploma in education in one year. This is the case in Hong Kong (China) and Singapore, for example, for teachers at primary, lower and upper secondary levels.

Countries and economies with available data can be categorised into four groups, according to whether their pre-service training system for teachers in public schools requires a competitive examination and by the duration of the training programme for teaching at the lower secondary level, as shown in Figure II.6.8 (only countries with available data for both categories are presented). Competitive examinations may be required for a variety of reasons in any given country. For example, they may be required only for certain fields of education or when the number of candidates exceeds the capacity of a programme. Alternatively, some countries may provide career counselling to students rather than use examinations.

A teaching practicum is required as part of pre-service training for primary teachers in all 54 countries and economies with available data except Chile, Croatia, France, Georgia, Macao (China) and the United States. In these countries, the requirement for teaching practicum is at the discretion of the teacher-education institutions. In Macao (China), even though these institutions have discretion over the offer of such practicums, they do so in response to teachers' certification requirements in the country. A teaching practicum is also required as part of pre-service training for lower and upper secondary teachers in all 54 countries with available data except Chile, Croatia, the Czech Republic, France, Georgia, Macao (China), Mexico and the United States. In these countries, with the exception of Mexico, decisions regarding such requirements are made by the teacher-education institutions. In the United States, decisions regarding requirements for pre-service training and for entrance into the profession (e.g. competitive examinations, teaching practicums, credentials/licenses) are made at the state level. In Mexico, while a teaching practicum is mandatory at the lower secondary level, it is left to the discretion of the students enrolled in pre-service training programmes at the upper secondary level.

Requirements to enter the teaching profession

System-level data show that a competitive examination is required to enter the teaching profession for both primary and secondary teachers in 15 countries (Table II.6.57). In Luxembourg and Uruguay, a competitive examination to enter the profession is required exclusively for primary school teachers.

A credential or license, in addition to the education diploma, is required to start teaching or to become a fully qualified lower or upper secondary teacher in Australia, Austria, Croatia, England, FYROM, Georgia, Greece, Ireland, Israel, Japan, Malta, Montenegro, Scotland, Slovenia, Sweden, Chinese Taipei and Thailand.

Professional development is compulsory for remaining employed as a lower or upper secondary teacher in the teaching profession in 25 of the 53 countries for which information was available (although in Iceland, it is only a requirement at the lower secondary level). Professional development is a compulsory requirement for promotion or salary increases in 16 of 53 countries (although in Mexico, it is only a requirement at the lower secondary level).

Teacher profile and qualifications

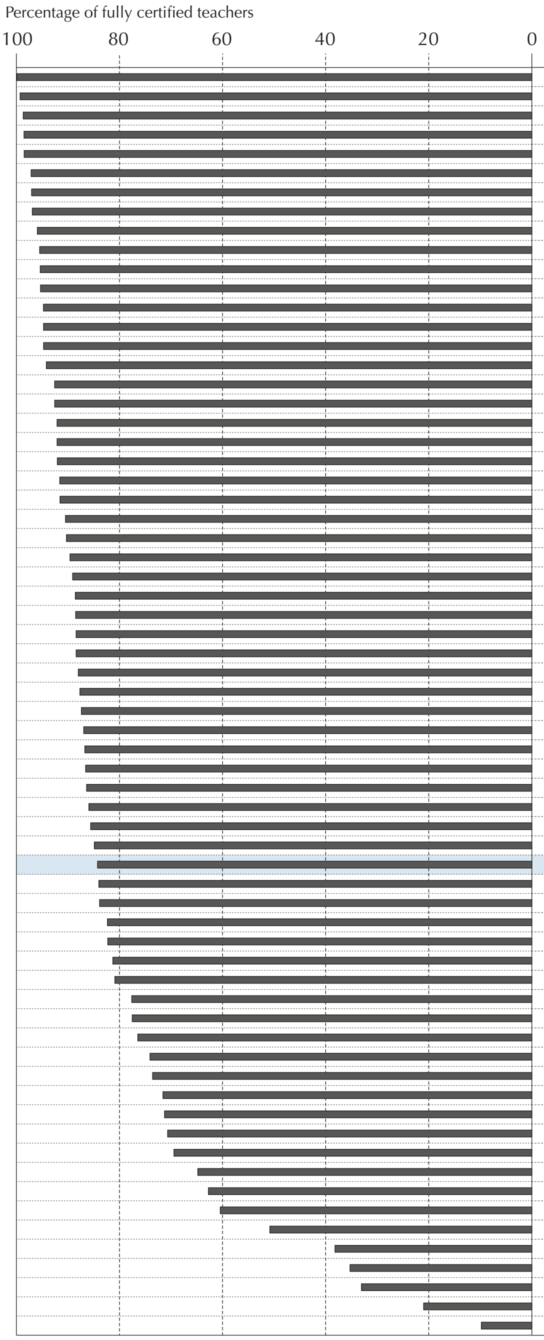
PISA 2015 asked school principals to report on the composition and qualifications of the teachers in their schools; more specifically, they were asked how many teachers work full time or part time and how many are fully certified by an appropriate authority. In most OECD countries, teachers are required to have been certified by an authority; however, many teachers who have earned a university degree do not always need a specific or additional licence to teach.

According to school principals, most of the teachers in their schools are full-time teachers and have some form of certification. Across OECD countries, the average student attends a school where 79% of teachers work full time and 84% have been fully certified (Table II.6.9).

Practices differ across education systems in how much schools rely on part-time teachers. On average across OECD countries, a student attends a school where 21% of teachers work part time. However, students in CABA (Argentina), Mexico, the Netherlands, Switzerland and Uruguay attend schools where more than half of the teachers work part time, while in B-S-J-G (China), Bulgaria, Colombia, Hong Kong (China), Macao (China), Qatar, Trinidad and Tobago, the United Arab Emirates and the United States, less than 4% of teachers work part time (Table II.6.9).

Figure II.6.9 ▪ Percentage of fully certified teachers, school characteristics and science performance

■ Education systems with a positive difference/association
▨ Education systems with a negative difference/association
□ Difference/association not significant
░ Missing values



	School characteristics			Science performance	
	Advantaged – disadvantaged	Urban – rural	Private – public	Before ESCS[1]	After ESCS
Macao (China)	▨	░	░	□	■
Lithuania	□	□	□	□	□
Montenegro	■	░	░	□	▨
B-S-J-G (China)	□	▨	□	□	■
Ireland	▨	□	□	▨	□
Slovenia	■	▨	▨	■	□
Japan	□	░	□	▨	▨
Bulgaria	□	□	░	□	□
Romania	□	□	░	□	□
Korea	□	░	■	□	□
Australia	□	□	□	□	□
Poland	□	□	■	□	■
Croatia	□	░	░	■	□
Thailand	□	□	▨	■	■
Canada	□	▨	□	□	□
Hong Kong (China)	□	░	▨	□	▨
Czech Republic	■	□	□	■	■
Finland	□	□	■	□	□
Slovak Republic	■	■	□	■	■
United Kingdom	□	□	▨	□	□
Turkey	□	□	▨	□	□
United States	□	□	▨	□	□
Portugal	□	□	□	□	□
Chinese Taipei	■	░	▨	□	□
New Zealand	▨	□	□	□	□
Singapore	□	░	□	□	□
Estonia	□	■	□	■	□
Russia	□	■	░	□	□
Spain	□	▨	□	□	□
Germany	□	□	□	□	□
Costa Rica	□	□	▨	■	□
Italy	■	□	▨	■	□
Malta	▨	░	▨	▨	■
Brazil	▨	□	□	▨	▨
Greece	□	▨	■	□	□
Peru	▨	□	▨	▨	□
CABA (Argentina)	□	░	□	□	□
Iceland	■	■	░	□	□
Sweden	□	□	□	□	□
Viet Nam	□	□	■	□	□
Belgium	□	▨	░	■	■
OECD average	■	□	▨	■	■
Austria	□	□	□	□	□
Norway	□	□	□	□	□
Algeria	▨	□	░	▨	▨
Tunisia	□	□	■	□	□
Netherlands	□	░	□	□	□
Switzerland	□	□	□	□	□
France	■	□	□	■	■
FYROM	■	■	▨	■	□
Qatar	▨	▨	▨	▨	▨
Jordan	□	□	▨	□	□
Israel	□	□	░	□	□
Luxembourg	■	░	■	■	□
Moldova	■	■	░	■	□
Kosovo	□	■	▨	□	□
Lebanon	□	□	□	□	□
Latvia	□	□	▨	□	□
Indonesia	■	■	▨	■	□
Uruguay	■	□	□	■	□
Trinidad and Tobago	■	░	■	■	▨
United Arab Emirates	▨	▨	▨	▨	▨
Mexico	▨	▨	□	▨	□
Georgia	■	■	□	■	□
Chile	□	■	□	□	□
Colombia	□	□	■	□	□

Education systems with a positive difference/association	15	10	9	17	9
Education systems with no difference/association	40	33	27	39	48
Education systems with a negative difference/association	10	9	18	9	8

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

Note: In Chile the question about the certification of teachers was adapted as "authorised or enabled by the Ministry of Education".

Countries and economies are ranked in descending order of the percentage of fully certified teachers.

Source: OECD, PISA 2015 Database, Table II.6.12.

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School systems also differ in whether or not they require teachers to be certified by an appropriate authority. For example, in Chile, Colombia, Georgia, Mexico and the United Arab Emirates, fewer than one in two teachers is fully certified by an appropriate authority, while in 26 out of 67 countries/economies, more than 90% of teachers at an average school are fully certified (Table II.6.9).[8]

In most PISA-participating countries and economies, the percentage of fully certified teachers is similar across advantaged and disadvantaged schools, rural and urban schools, and public and private schools (Table II.6.12 and Figure II.6.9). On average across OECD countries and in 15 countries/economies, particularly France, Georgia, Indonesia, and Trinidad and Tobago, advantaged schools have larger proportions of fully certified teachers than disadvantaged schools, while the reverse is true in 10 education systems, particularly in Algeria and Mexico. In 18 out of 54 countries/economies and on average across OECD countries, public schools have larger proportions of fully certified teachers than private schools. This difference is particularly striking in FYROM and Turkey, where the proportion of fully certified teachers in public schools is more than 50 percentage points larger than that in private schools.

The percentage of full-time teachers is notably higher in disadvantaged schools than in advantaged schools in 22 countries/economies and on average across OECD countries (Table II.6.13). In Luxembourg, Mexico, the Netherlands and Uruguay, the proportion of full-time teachers is at least 15 percentage points larger in disadvantaged schools. In 18 out of 57 countries/economies, full-time teachers are more frequently found in urban schools than in rural schools, while the opposite is observed in 7 countries/economies; there is no significant difference on average across OECD countries. In 32 out of 59 countries/economies and on average across OECD countries, there are more full-time teachers in public schools than in private schools. The most striking case is Tunisia, where virtually all teachers in public schools work full time but only 19% of teachers in the private schools attended by 15-year-old students work full time. In Italy and Poland, the difference in the proportion of full-time teachers between public and private schools is also larger than 30 percentage points.

On average across OECD countries, the proportion of teachers who have been certified to teach is positively, even if modestly, associated with student performance, before and after accounting for the socio-economic profile of students and schools (Figure II.6.9). Across OECD countries, for every ten percentage-point increase in the proportion of fully certified teachers, students score about one point higher in science after accounting for students' and schools' socio-economic profile (Table II.6.12). After accounting for the socio-economic profile of students and schools, there is almost the same number of countries where the proportion of fully certified teachers and science performance are positively associated as where they are negatively associated.

On average across OECD countries, the percentage of teachers working part-time or full-time is not associated with science performance, after accounting for socio-economic status. The proportion of full-time teachers is positively associated with students' science performance only in Bulgaria, Colombia, Japan, Malta, Peru, Chinese Taipei, and Trinidad and Tobago; in Luxembourg, Qatar and Switzerland, the association is negative.

Teachers' professional development

Supporting teachers' participation in professional development activities is one way that schools can strengthen teachers' knowledge base for teaching, one of the three pillars of teacher professionalism, together with teachers' professional autonomy and teachers' participation in peer networks (OECD, 2016c). Just as practitioners in any other profession, teachers need to keep up-to-date with advances in their field. They are often expected to learn about new ways of teaching, discoveries in their field of expertise, new theories about how children learn, curricular changes or innovative tools for the classroom. Professional development for teachers has been shown to be successful in changing the way teachers learn, work and feel about their job, including their self-efficacy and job satisfaction (Desimone et al., 2002; OECD, 2016c), but less so in improving student learning (Hattie, 2009). There is also evidence that the type and quality of professional development activities are critical. Some (Wade, 1985; Timperley, 2008), for instance, report that professional development activities for teachers have a greater impact when teachers are encouraged by their school principal to participate, when the programmes are initiated or funded by education authorities and involve external experts, and when the training is practical rather than theoretical.

PISA asked school principals to report the percentage of all teaching staff and science teaching staff in their school who had attended a programme of professional development in the three months prior to the PISA test.[9] A programme of professional development is defined by PISA as a formal programme of at least one day that is designed to enhance teachers' teaching skills or pedagogical practices. Across OECD countries, the average 15-year-old student attends a school whose principal

reported that half of the teaching staff – of all subjects combined – had attended a programme of professional development in the previous three months (Table II.6.17). The proportion is particularly large in English-speaking countries, such as Australia, New Zealand, Singapore, the United Kingdom and the United States, where at least three out of four teachers had attended such a programme in the three months prior to the PISA assessment. By contrast, in FYROM, Georgia, Norway and Turkey, less than one in four teachers had attended a professional development programme in the previous three months. Across OECD countries, the proportion of science teachers who had attended a professional development programme in the previous three months was almost identical to that of all teachers.

Only in a few education systems are there differences across different types of schools in teachers' and science teachers' participation in professional development activities (Figure II.6.10 and Table II.6.18). In 15 education systems, science teachers in advantaged schools participate more than science teachers in disadvantaged schools; in 4 other school systems, the opposite is true. And there are somewhat more education systems where teachers in urban schools participate more in professional development activities than school systems where teachers in rural schools participate more in these activities. Across OECD countries, there are no significant differences between these categories of schools.

The association between teachers' participation in professional development activities and students' performance in science is weak across most PISA-participating countries and economies, regardless of whether the participation of all teachers or only of science teachers is considered (Figure II.6.10 and Table II.6.18). After accounting for the socio-economic profile of students and schools, in eight education systems, students score higher in science when more of their science teachers had participated in professional development activities; in seven other systems, students score lower in science when their science teachers had participated in such activities.

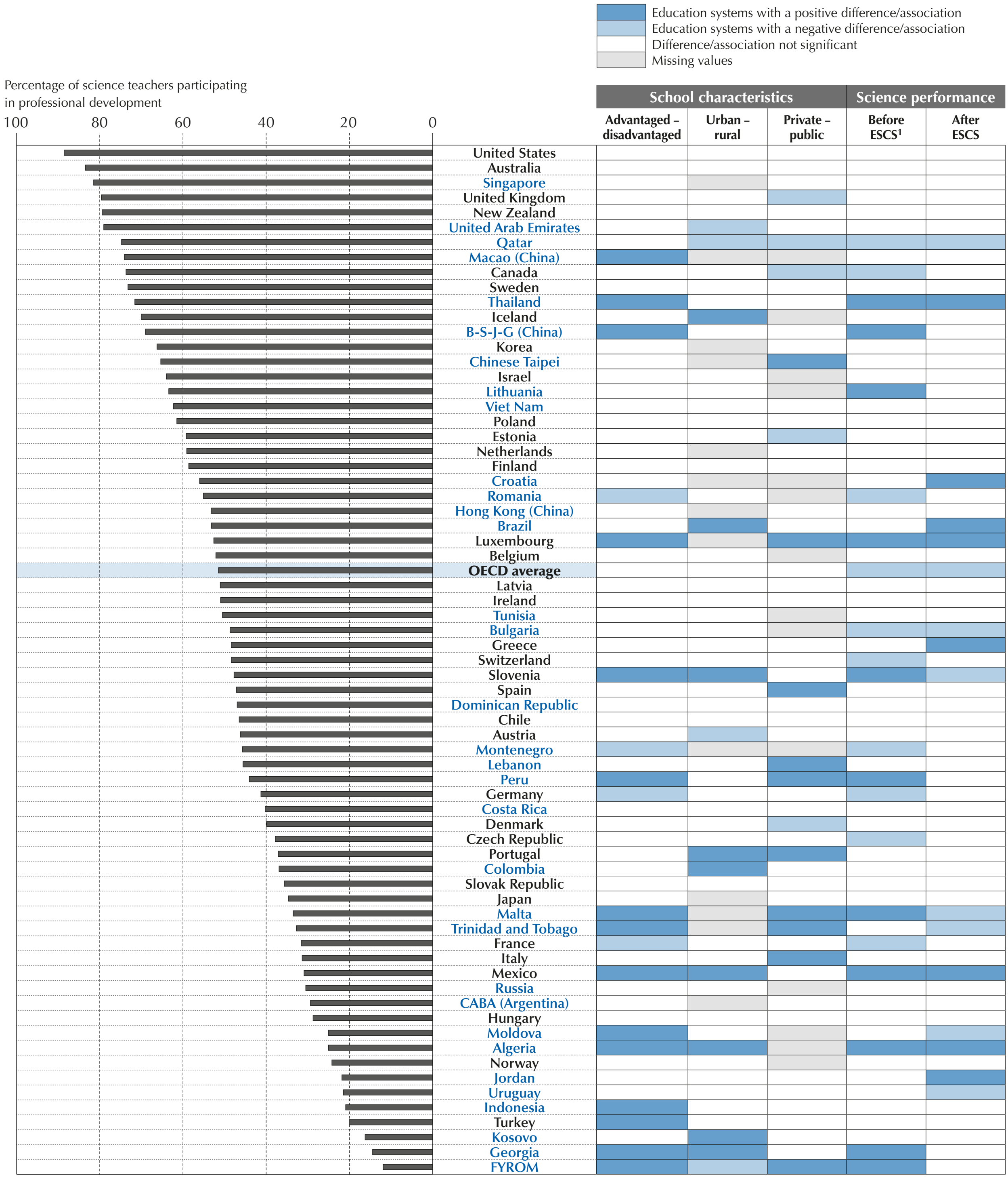
PISA also asked school principals whether their school offers a series of in-house professional development activities. Across OECD countries, almost all 15-year-old students are enrolled in schools where teachers co-operate by exchanging ideas or material when teaching specific units or series of lessons (96% of students), and a great majority attends schools that invite specialists to conduct in-service training for teachers (80%), organise in-service workshops that address specific issues facing the school (80%) or organise in-service workshops for specific groups of teachers (69%) (Figure II.6.11). According to school principals, professional co-operation among teachers occurs less frequently in Japan and Tunisia, where only around 70% of students attend schools where this occurs compared to at least 89% in every other country/economy. By contrast, activities involving external experts are less common in Algeria, Georgia, Kosovo, Moldova, Tunisia and Viet Nam: less than 50% of students attend schools where these activities are offered.

Across OECD countries, inviting specialists to conduct in-service training and organising in-service workshops (whether for specific groups of teachers or for specific issues faced by the school) are more frequently offered in advantaged than in disadvantaged schools, in urban than in rural schools, and in private than in public schools (Tables II.6.22, II.6.23 and II.6.24). There is no significant OECD-wide difference between different types of schools in how often co-operation among teachers takes place, except between private and public schools: co-operation among teachers is somewhat more common in private schools (Table II.6.21). For instance, in 24 out of 60 education systems, private schools engage external specialists more frequently than public schools do, while in 4 systems, the opposite is true. In 19 education systems, teachers in private schools collaborate more frequently by exchanging ideas or material than teachers in public schools do, while only in the Netherlands do public school teachers collaborate more than private school teachers.

On average across OECD countries, three out of the four in-house professional development activities are positively related to student performance in science, before accounting for the socio-economic profile of students and schools; only professional collaboration among teachers in the school is positively associated with student performance in science, after accounting for the socio-economic profile of students and schools. When school principals reported that teachers co-operate by exchanging ideas or material, the average 15-year-old student in OECD countries scores 9 points higher in science; in Slovenia, the average student scores 36 points higher. According to the report, *Supporting Teacher Professionalism* (OECD 2016c), a collaborative culture also shows one of the strongest associations with teachers' self-efficacy and job satisfaction.

On average across OECD countries, the percentage of teachers participating in professional development activities is higher when the school organises these kinds of activities directly, including inviting specialists or organising in-service workshops dealing with specific issues or for specific groups of teachers (Table II.6.25).

Figure II.6.10 ▪ Science teachers' participation in professional development activities, school characteristics and science performance



	Advantaged – disadvantaged	Urban – rural	Private – public	Before ESCS¹	After ESCS
Education systems with a positive difference/association	15	9	10	11	8
Education systems with no difference/association	49	42	39	48	53
Education systems with a negative difference/association	4	4	5	9	7

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

Countries and economies are ranked in descending order of the percentage of science teachers participating in professional development.

Source: OECD, PISA 2015 Database, Table II.6.19.

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Figure II.6.11 ▪ In-house professional development activities

Results based on school principals' reports

░ Less than half of students
▒ From 50% to 75% of students
▓ More than 75% of students

	Percentage of students in schools where the following types of in-house professional development activities exist			
	The teachers in our school co-operate by exchanging ideas or material when teaching specific units or series of lessons	**Our school invites specialists to conduct in-service training for teachers**	**Our school organises in-service workshops that deal with specific issues that our school faces**	**Our school organises in-service workshops for specific groups of teachers**
United Kingdom	100	94	100	98
New Zealand	100	93	99	98
United States	99	92	98	97
Australia	99	92	98	97
United Arab Emirates	100	91	98	97
Singapore	100	90	98	96
Qatar	100	88	97	97
B-S-J-G (China)	100	90	98	94
Netherlands	94	94	93	95
Macao (China)	100	95	84	93
Canada	100	89	95	88
Iceland	98	89	95	87
Korea	95	90	96	88
Chinese Taipei	94	92	91	91
Ireland	100	93	94	77
Germany	98	92	96	78
Israel	96	88	93	80
Estonia	97	97	92	70
Hong Kong (China)	99	87	89	78
Russia	99	68	98	89
Poland	100	95	97	62
Austria	99	93	84	75
Portugal	98	90	90	71
Switzerland	98	82	85	83
Albania	100	69	88	90
CABA (Argentina)	96	79	92	71
Montenegro	99	77	80	83
Trinidad and Tobago	94	87	91	66
Dominican Republic	95	83	91	68
Malta	100	93	90	51
Romania	99	72	83	78
Jordan	94	75	83	80
Thailand	90	88	88	64
Moldova	99	43	99	90
Luxembourg	96	84	76	72
OECD average	96	80	80	69
Latvia	97	87	74	65
Belgium	97	76	75	72
Japan	71	80	84	85
Lithuania	96	94	83	45
Bulgaria	99	79	79	60
Slovenia	99	78	83	52
Croatia	97	73	77	62
Viet Nam	100	27	92	89
Costa Rica	94	79	82	48
FYROM	95	53	78	75
Chile	89	73	79	57
Sweden	99	66	79	55
Uruguay	94	78	80	43
Denmark	99	77	61	56
Spain	92	70	72	58
Lebanon	95	68	62	63
Finland	100	72	63	51
Georgia	100	49	72	62
Italy	93	71	68	52
Peru	90	70	78	44
Greece	97	59	90	37
Norway	98	51	71	62
France	93	58	64	59
Czech Republic	98	81	57	38
Colombia	89	57	73	54
Slovak Republic	98	74	51	45
Mexico	94	56	68	50
Indonesia	96	74	55	38
Hungary	99	59	40	47
Brazil	97	60	49	32
Kosovo	99	44	52	42
Turkey	94	53	30	45
Algeria	93	14	34	53
Tunisia	72	21	25	38

Countries and economies are ranked in descending order of the percentage of students in schools offering in-house professional development (average of four activities).
Source: OECD, PISA 2015 Database, Table II.6.20.
StatLink http://dx.doi.org/10.1787/888933436298

Shortage of education staff

The lack or quality of the human resources in schools can also be measured by asking principals if the lack or quality of teaching and assisting staff hinders the capacity to provide instruction in the school. Principals' responses were combined to create an index of shortage of education staff. The average on the index is zero and the standard deviation is one across OECD countries. Positive values reflect principals' perceptions that a shortage of education staff hinders the capacity to provide instruction to a greater extent than the OECD average; negative values indicate that school principals believe a shortage hinders the capacity to provide instruction to a lesser extent.

On average across OECD countries, 39% of students attend schools whose principal reported that a lack of teaching staff does not hinder the capacity to provide instruction at all; only 4% of students are in schools whose principal reported that a lack of teaching staff hinders the capacity to provide instruction a lot (Table II.6.14). A similar proportion of principals reported that the capacity to provide instruction is hindered by an inadequate or poor teaching staff. However, in a number of countries, including Germany, Greece, Ireland, Korea, Luxembourg, Spain and Thailand, school principals appear to be more concerned about the lack of teaching staff than about the quality of the staff. Across OECD countries, one in ten students attends a school whose principal reported that the capacity to provide instruction is hindered a lot by the lack of assisting staff. In Colombia, Greece, Hungary, Korea and Spain, principals were considerably more concerned about the lack of assisting staff than about the quality of the assisting staff. Some of these countries have faced severe budgetary constraints in recent years.

In 34 out of 68 education systems, advantaged schools are better staffed than disadvantaged schools, according to school principals, while the opposite was reported only in FYROM (Figure II.6.12 and Table II.6.15). On average across OECD countries, public schools are more hindered by a lack of and a lower quality of education staff than private schools. In 35 countries and economies, student learning is more likely to be hindered by a shortage of or the inadequacy and poor quality of education staff in public schools. Only in France is the capacity to provide instruction in public schools less hindered by an inadequacy or poor quality of education staff than in private schools, according to school principals.

In about half of the education systems that participated in PISA 2015, students score lower in schools whose principal reported that the capacity to provide instruction is hindered to a great extent by a shortage of education staff (Figure II.6.12). After accounting for the socio-economic profile of students and schools, in only eight education systems is a shortage of education staff still negatively associated with science performance, presumably because of the strong association between a lack or inadequacy of teaching staff and schools' socio-economic disadvantage mentioned above.

Equity in resource allocation can also be measured by how concerned principals are about the human resources at their schools. An equitable allocation of human resources would imply that the schools attended by socio-economically disadvantaged students are at least as well-staffed as the schools attended by advantaged students, to compensate for the inequalities in the home environment. This is measured by the index of equity in resource allocation (staff), which measures the extent to which the socio-economic profile of schools is positively or negatively associated with principals' concern about the lack or inadequacy of human resources at school.[10] Positive values indicate that principals in disadvantaged schools reported less concern about the human resources at their schools than principals in advantaged schools. In FYROM, school principals in disadvantaged schools are less concerned than principals in advantaged schools about the human resources at their schools – the only country where this is observed. In Australia, CABA (Argentina), Peru, Spain and 18 other education systems, principals in disadvantaged schools are more concerned (Table II.6.16).

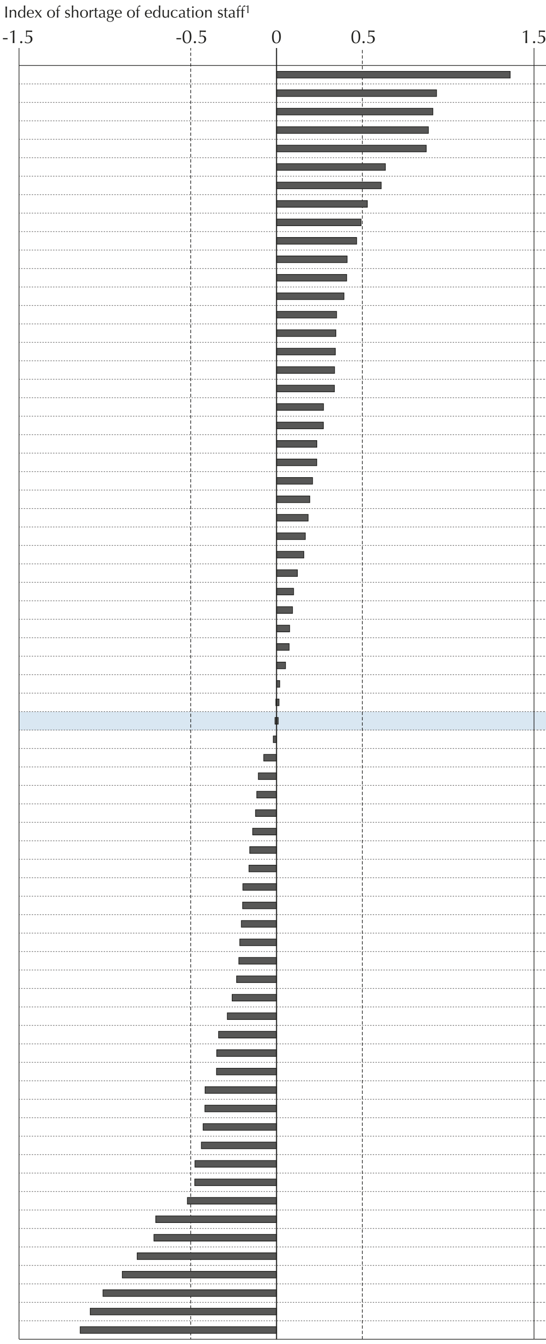
In some education systems, human resources are better distributed between advantaged and disadvantaged schools than material resources, according to school principals. In CABA (Argentina), Lebanon, Macao (China), Mexico and Thailand, for instance, principals of disadvantaged schools are more concerned than principals of advantaged schools about the material than about the human resources in their schools. Conversely, in Australia, B-S-J-G (China), New Zealand and Spain, they are relatively more concerned about the human than about the material resources (Figure II.6.13).

Class size and student-teacher ratio

Class size can affect learning in various ways. Large classes may limit the time and attention teachers can devote to individual students, rather than to the whole class; they may also be more prone to disturbances from noisy and disruptive students. As a result, teachers might have to adopt different pedagogical styles to compensate, and these, in turn, might affect learning.

Figure II.6.12 ▪ Index of shortage of education staff, school characteristics and science performance

■ Education systems with a positive difference/association
▨ Education systems with a negative difference/association
□ Difference/association not significant
░ Missing values



	School characteristics			Science performance	
	Advantaged – disadvantaged	Urban – rural	Private – public	Before ESCS²	After ESCS
Tunisia	□	□	▨	□	□
Portugal	▨	□	▨	▨	□
Costa Rica	□	□	□	□	□
Jordan	▨	□	□	□	□
B-S-J-G (China)	▨	▨	□	▨	□
Trinidad and Tobago	▨	░	▨	□	□
Greece	□	□	▨	□	□
Turkey	▨	□	▨	▨	□
Japan	□	░	□	□	□
Colombia	▨	□	▨	▨	▨
Germany	□	□	▨	▨	□
Algeria	□	□	░	■	■
Luxembourg	▨	░	▨	▨	■
Italy	□	□	▨	□	□
Sweden	▨	□	□	▨	□
Uruguay	▨	□	▨	▨	□
Israel	□	□	░	□	□
Peru	▨	▨	▨	▨	□
Thailand	□	□	▨	□	□
Spain	▨	□	▨	▨	□
Belgium	□	■	░	▨	□
Macao (China)	▨	░	░	▨	▨
Chinese Taipei	□	░	□	▨	□
Korea	□	░	□	□	□
Austria	□	□	□	□	□
France	□	□	■	□	□
United Arab Emirates	▨	▨	▨	▨	▨
Ireland	□	□	□	□	□
Mexico	▨	□	▨	▨	□
Hungary	▨	□	▨	▨	□
Russia	□	□	░	□	□
Estonia	□	□	□	□	□
Viet Nam	□	□	□	□	□
Netherlands	□	░	□	□	□
Finland	□	□	▨	▨	▨
OECD average	▨	□	▨	▨	▨
Croatia	□	░	░	□	□
Brazil	▨	□	▨	▨	□
Norway	▨	□	□	▨	▨
United Kingdom	▨	□	▨	□	□
Indonesia	▨	▨	□	▨	□
Lebanon	▨	□	▨	▨	□
Kosovo	□	□	▨	▨	□
CABA (Argentina)	▨	░	▨	▨	□
Malta	▨	░	□	▨	□
Canada	▨	▨	▨	▨	□
Hong Kong (China)	□	░	▨	□	□
Latvia	□	□	□	□	□
Dominican Republic	▨	▨	▨	▨	□
Chile	▨	□	▨	▨	□
Iceland	□	■	░	□	□
United States	▨	□	▨	▨	▨
Georgia	□	□	▨	□	□
Australia	▨	□	▨	▨	□
Moldova	□	□	░	□	□
Romania	□	□	░	□	□
New Zealand	▨	□	▨	▨	□
Switzerland	□	□	□	□	□
Czech Republic	▨	□	▨	▨	□
Singapore	□	░	□	□	□
Lithuania	□	□	□	□	□
Slovenia	▨	■	▨	▨	□
Denmark	▨	□	▨	▨	□
Qatar	▨	▨	▨	▨	□
Slovak Republic	▨	▨	□	▨	▨
FYROM	■	▨	▨	▨	▨
Montenegro	▨	░	░	□	□
Poland	□	□	□	□	□
Bulgaria	□	□	░	□	□
Education systems with a positive difference/association	1	3	1	1	2
Education systems with no difference/association	33	43	21	31	58
Education systems with a negative difference/association	34	9	35	36	8

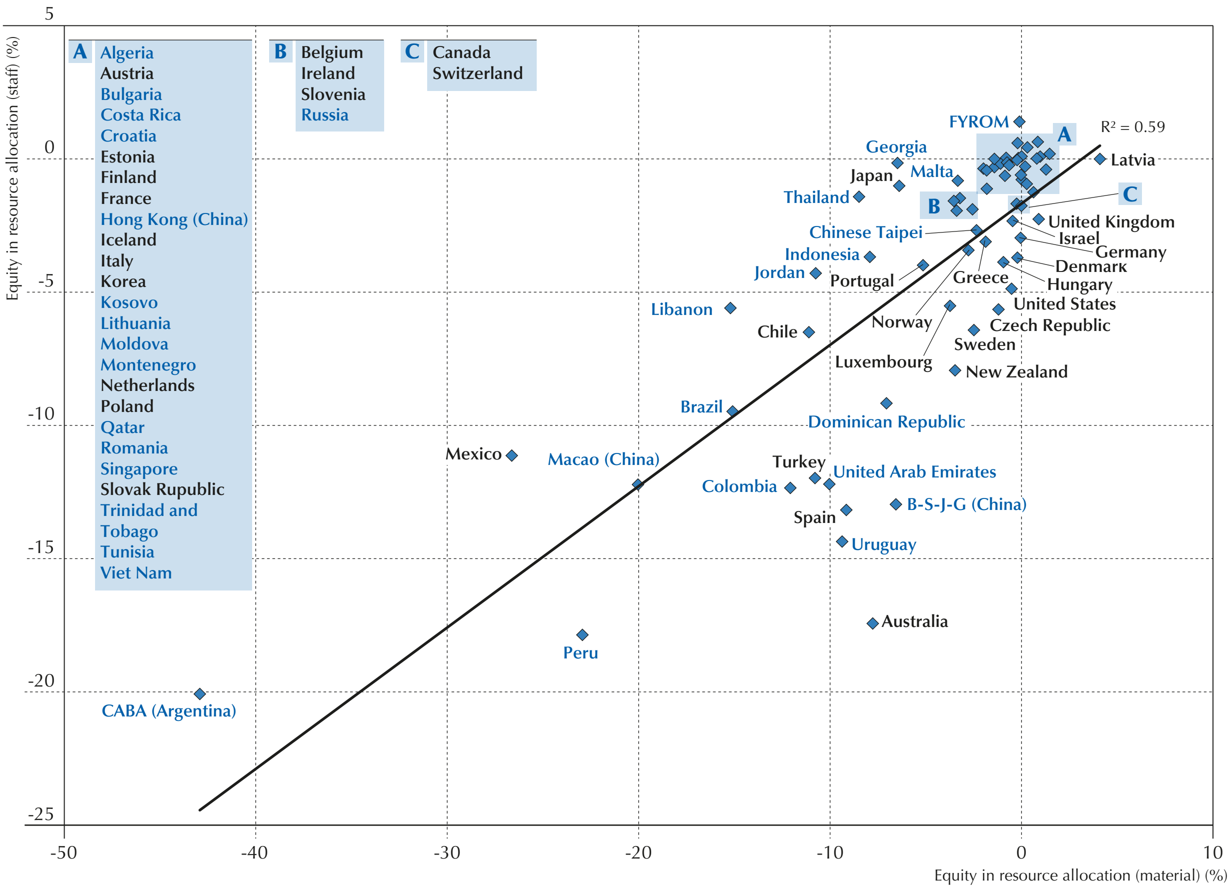
1. Higher values in the index indicate a greater shortage of educational staff.
2. ESCS refers to the PISA index of economic, social and cultural status.

Countries and economies are ranked in descending order of the index of shortage of education staff.

Source: OECD, PISA 2015 Database, Table II.6.15.

StatLink http://dx.doi.org/10.1787/888933436301

Figure II.6.13 ■ **Equity in allocation of material and human resources**



Source: OECD, PISA 2015 Database, Tables II.6.3 and II.6.16.

StatLink http://dx.doi.org/10.1787/888933436319

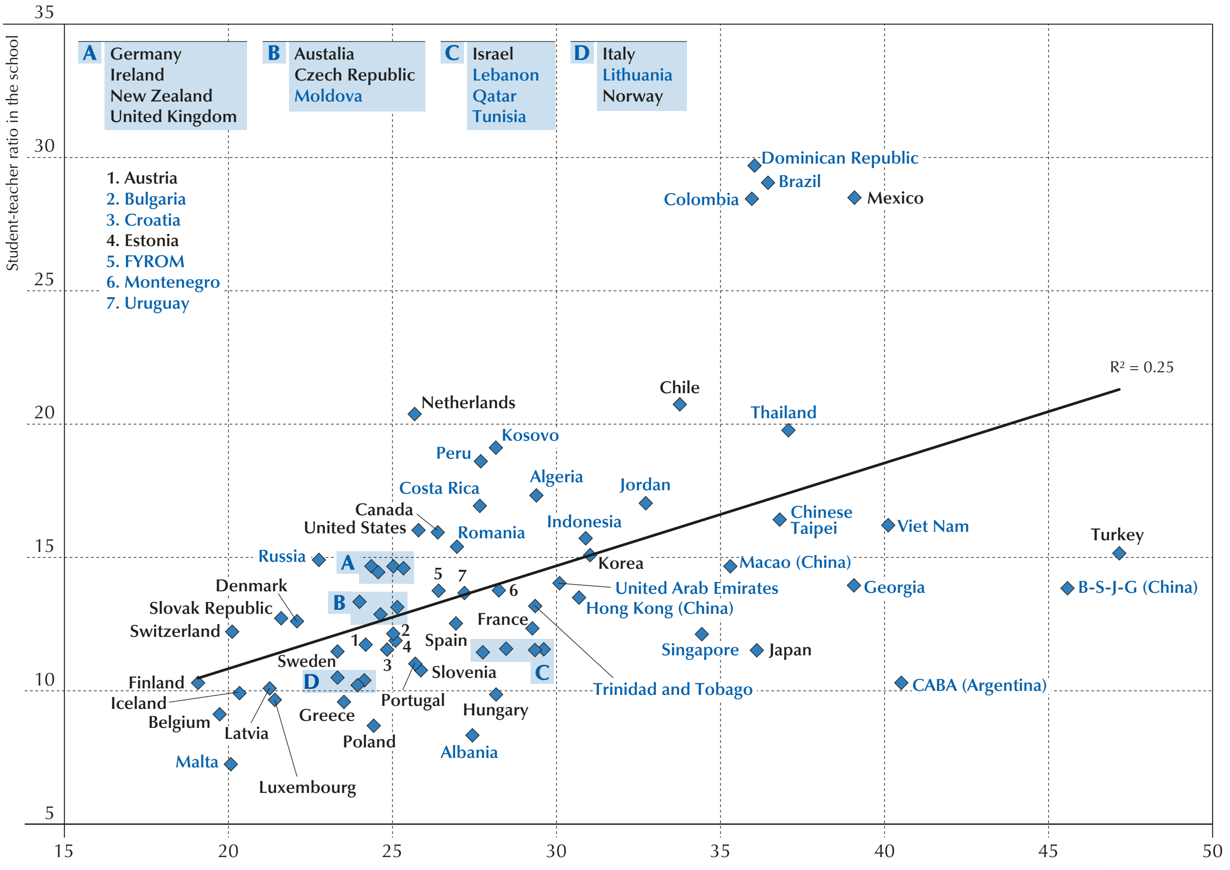
Some studies, particularly those based on the Tennessee STAR experiment, which assigned students randomly to larger or smaller classes, show that smaller classes can improve student outcomes and might be more beneficial for disadvantaged and minority students (Dynarski, Hyman and Schanzenbach, 2013). Chetty et al. (2011) even find long-term effects on college attendance, home ownership and savings. However, other research shows no impact of class size on student performance (Woessmann and West, 2006). For instance, no long-term gains in earnings were observed among students in the Tennessee STAR experiment who attended smaller classes (Chetty et al., 2011); and large classes are found in many Asian countries where average student performance in PISA is high (Figure II.6.16). But given the relatively high cost of reducing class size, the decision to do so or not should ultimately depend on how much it improves student outcomes compared to other, less expensive, policy interventions (Fredriksson, Ockert and Oosterbeek, 2013).

PISA 2015 asked school principals to report the average size of language-of-instruction[11] classes in the national modal grade for 15-year-olds. It also asked the total number of teachers and students in their schools, from which the student-teacher ratio was computed (Table II.6.26).[12] According to schools principals, on average across OECD countries, there are 26 students per language-of-instruction class. In B-S-J-G (China), CABA (Argentina), Turkey and Viet Nam, there are 40 or more students per class, while in Belgium, Finland, Iceland, Malta and Switzerland, there are 20 or fewer students.

Across OECD countries, the average student attends a school where there are 13 students for every teacher (Table II.6.26). Student-teacher ratios range from almost 30 students per teacher in Brazil, Colombia, the Dominican Republic and Mexico, to fewer than 10 students per teacher in Albania, Belgium, Greece, Hungary, Iceland, Luxembourg, Malta and Poland.

The comparison of student-teacher ratios and class size can provide a measure of the spare teacher resource capacity within schools. Across education systems, there is a positive association between class size and student-teacher ratios; but there are several education systems, such as those in B-S-J-G (China), CABA (Argentina), Georgia, Japan and Singapore, that have both large classes and low or average student-teacher ratios. Teachers in these systems may, as a result, have more time to prepare for their classes and for other school responsibilities besides teaching. By contrast, there are also some education systems with small or average classes and high student-teacher ratios, such as those in Germany, Ireland, the Netherlands, New Zealand, the Russian Federation (hereafter "Russia"), the United Kingdom and the United States (Figure II.6.14).

Figure II.6.14 ■ **Relationship between class size and student-teacher ratio**



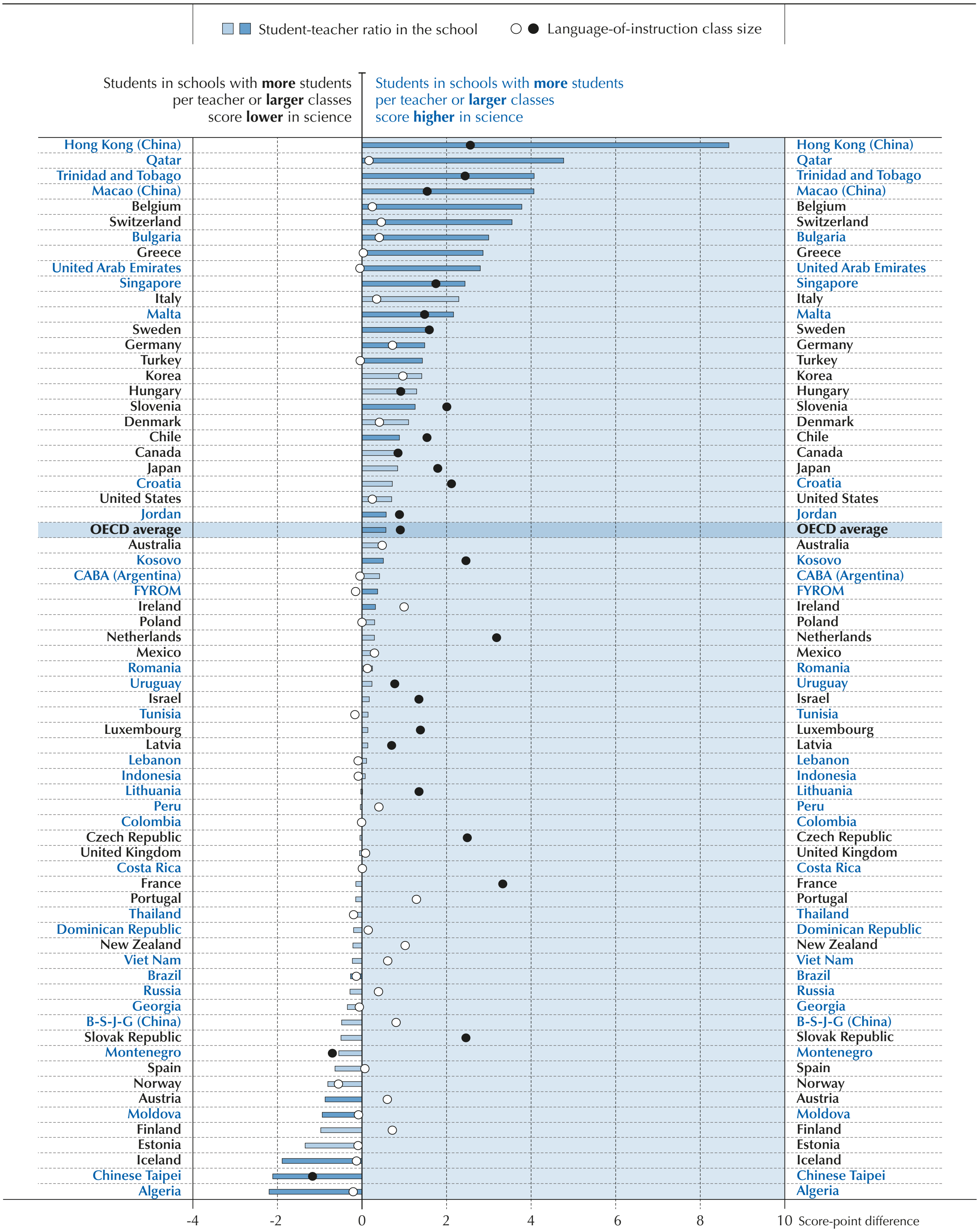
Source: OECD, PISA 2015 Database, Table II.6.26.

StatLink `http://dx.doi.org/10.1787/888933436320`

Between 2006 and 2015, both of the above measures decreased across OECD countries – by about one student, when measuring class size, and by 0.7 student per teacher, when measuring the student-teacher ratio (Table II.6.28). Across PISA-participating education systems, class size increased in Denmark, Ireland, the Netherlands, Portugal and especially in Turkey, where it increased from 34 to 47 students. Class size decreased in 27 education systems, particularly in Greece (where it fell from 35 to 24 students per class), Hong Kong (China), Indonesia, Latvia, Macao (China) and Uruguay. The student-teacher ratio increased in 9 education systems during the period, especially in Colombia and the Netherlands, and decreased in 30 others, particularly in Chile, Hong Kong (China), Macao (China) and Tunisia. In Turkey, class size increased at the same time that the student-teacher ratio decreased, while in Colombia, Greece, Italy, Luxembourg and Qatar, class size decreased and the student-teacher ratio increased.

On average across OECD countries, large classes and higher student-teacher ratios are more frequently observed in socio-economically advantaged schools than in disadvantaged schools, in urban than in rural schools, in public than in private schools, and in upper secondary than in lower secondary schools (Tables II.6.29 and II.6.30). For instance, in Italy there are 8 students per teacher in disadvantaged schools while there are 13 students per teacher in advantaged schools.

Figure II.6.15 ▪ Relationship between class size and student-teacher ratio, and science performance



Notes: Statistically significant values are marked in a darker tone (see Annex A3).

The regression analyses accounts for the socio-economic profile of students and schools.

Countries and economies are ranked in descending order of the change in science score associated with a one-unit increase in the student-teacher ratio.

Source: OECD, PISA 2015 Database, Tables II.6.29 and II.6.30.

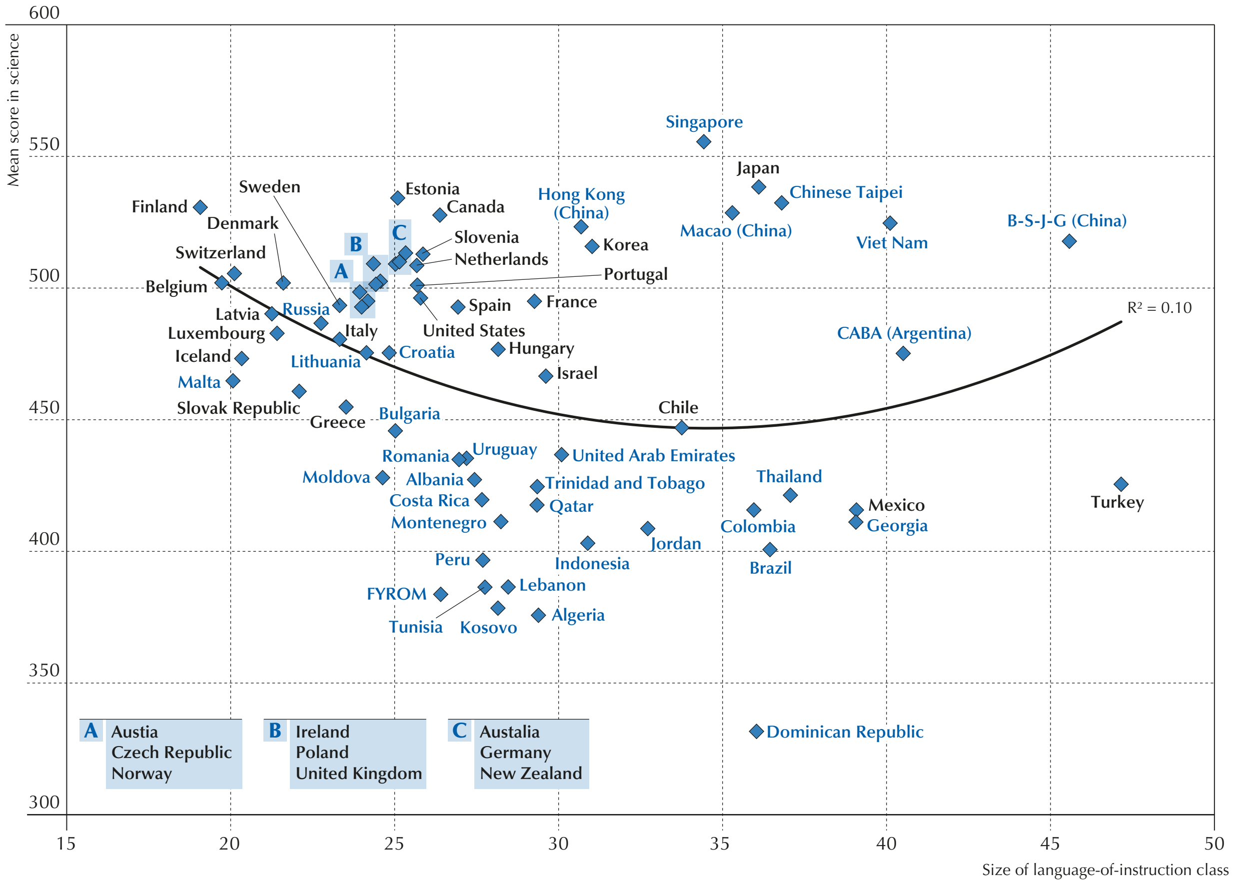
StatLink http://dx.doi.org/10.1787/888933436337

In Chile and FYROM, the difference in the student-teacher ratio between urban and rural schools is approximately ten students per teacher. But in a few countries, classes are larger or student-teacher ratios are higher in disadvantaged schools than in advantaged schools. For instance, in the Dominican Republic, there are 13 more students per teacher in disadvantaged than in advantaged schools. In this country, some students may be facing the double disadvantage of fewer resources both at home and at school.

Students in larger classes and in schools with higher student-teacher ratios score higher in science, on average across OECD countries (Figure II.6.15). The positive association between the student-teacher ratio and science performance is particularly strong in Belgium, Hong Kong (China), Macao (China), Qatar, and Trinidad and Tobago, and that between class size and science scores is particularly strong in France and the Netherlands. After accounting for the socio-economic profile of students and schools, students in Hong Kong (China), for instance, score nine points higher in science for every additional student per teacher in the school. At the system level, there is no linear association between the average size of the language-of-instruction class and average science performance. Students perform moderately lower in countries as the number of students per class increases from 20 to 35, but perform somewhat better after that point, mainly because of the high scores and large classes commonly observed in East Asian countries and economies, such as B-S-J-G (China), Japan, Macao (China), Singapore, Chinese Taipei and Viet Nam (Figure II.6.16).

The relationships between class size/student-teacher ratio and student achievement should be interpreted with caution, given that some education systems may be reducing the size of classes, or the student-teacher ratio, in an effort to tackle low performance. In addition, schools with lower achievement often have difficulty in retaining or attracting good students, which could affect their overall academic performance.

Figure II.6.16 ■ **Relationship between class size and science performance**

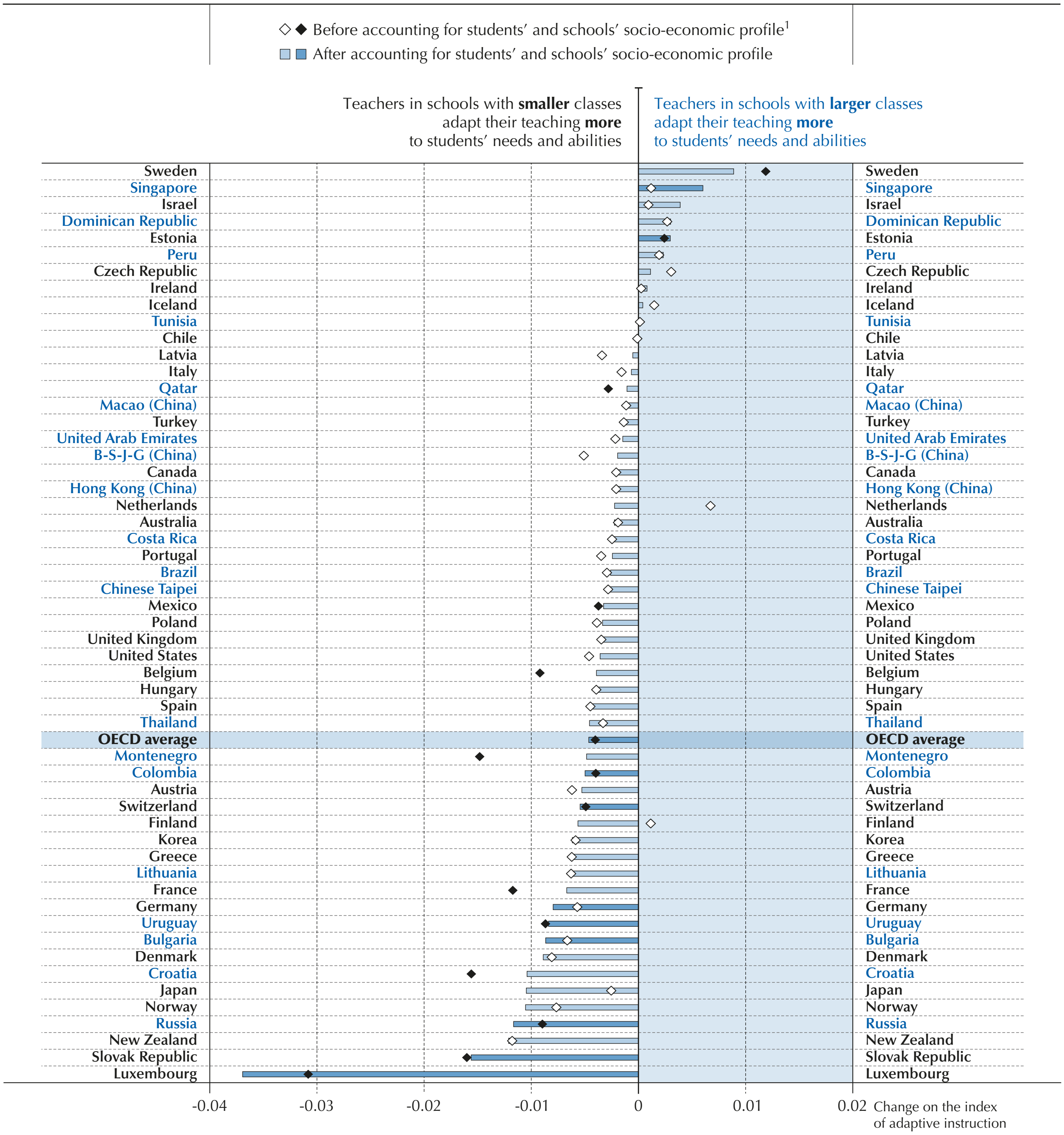


Source: OECD, PISA 2015 Database, Tables I.2.3 and II.6.26.

StatLink http://dx.doi.org/10.1787/888933436345

For instance, an often-mentioned benefit of smaller classes is that teachers can dedicate greater attention to individual students, especially to those who need academic support the most. PISA 2015 findings show that, on average across OECD countries, in schools with smaller classes, students were more likely to report that their teachers adapt their lessons to students' needs and knowledge,[13] provide individual help to struggling students, and change the structure of the lesson if students find it difficult to follow (Figure II.6.17). This is particularly the case in Luxembourg, Russia and the Slovak Republic, after accounting for students' and schools' socio-economic profile.

Figure II.6.17 ■ **Class size and the index of adaptive instruction**



1. The socio-economic profile is measured by the PISA index of economic, social and cultural status.
Note: Statistically significant correlation coefficients are marked in a darker tone (see Annex A3).
Countries and economies are ranked in descending order of the regression coefficient, after accounting for students' and schools' socio-economic profile.
Source: OECD, PISA 2015 Database, Table II.6.31.

StatLink `http://dx.doi.org/10.1787/888933436356`

TIME RESOURCES

Ever since the seminal study by John B. Carroll (1963) on the extent of learning as a function of the time a student receives instruction relative to the time the student needs (in addition to the quality of instruction and students' engagement and ability), educators and policy makers have attempted to understand how students' hours in school should be organised to maximise learning (Bloom, 1968). The literature suggests that increasing learning time can improve academic achievement, for instance by giving teachers and students more opportunities to cover the curriculum, repeat material, provide/receive feedback and engage in hands-on activities (Carroll, 1989; Marzano, 2003; Patall, Cooper and Allen, 2010). Increasing learning time can involve, for instance, making school days or years longer, or shortening lunch breaks. However, more learning time does not necessarily result in better student outcomes (Hattie, 2009), and it can actually lead to fatigue and boredom among students and burnout among teachers (Patall, Cooper and Allen, 2010). The key question is how the allocated instruction time translates into actual lesson time, engagement time and, ultimately, into productive or actual learning time (Gromada and Shewbridge, 2016).

Actual teaching time

Most education systems establish the total number of hours teachers are required to work per week or per year in order to earn a full-time salary. The required working time may include both teaching and non-teaching time, which is reserved for a variety of teachers' tasks, such as preparing lessons, correcting students' homework, grading assignments, or attending staff meetings or professional development sessions. Actual teaching time, which, in many countries, may differ from statutory teaching time, is the average number of hours per year that full-time teachers teach a group or a class of students, including overtime. It thus provides a full picture of teachers' actual teaching load (OECD 2016b, Indicator D4).

The allocation of time to each of these activities varies considerably across countries, as many factors may influence how much time teachers spend teaching, including collective and contractual agreements, teacher absenteeism, teacher shortage or variations in teaching load related to a teacher's progression through his or her career (i.e. reduced teaching load for beginning teachers). System-level data reveal that actual teaching time in PISA-participating countries and economies ranges from less than 500 hours per year in Malta, Qatar, Russia, Chinese Taipei and Uruguay to more than 800 hours in Australia and the Dominican Republic at both the lower and upper secondary levels (Table II.6.55). In the United States, actual teaching time also exceeds 800 hours annually at the lower secondary level.

There are also variations by level of education. Among OECD countries with available data for both levels of secondary education, average teaching time is 662 hours per year at the lower secondary level and 619 hours per year at the upper secondary level. The difference in total teaching time between these two levels of education is much smaller among partner countries, where teachers teach, on average, 595 hours per year at the lower secondary level and 589 hours per year at the upper secondary level.

Student learning time

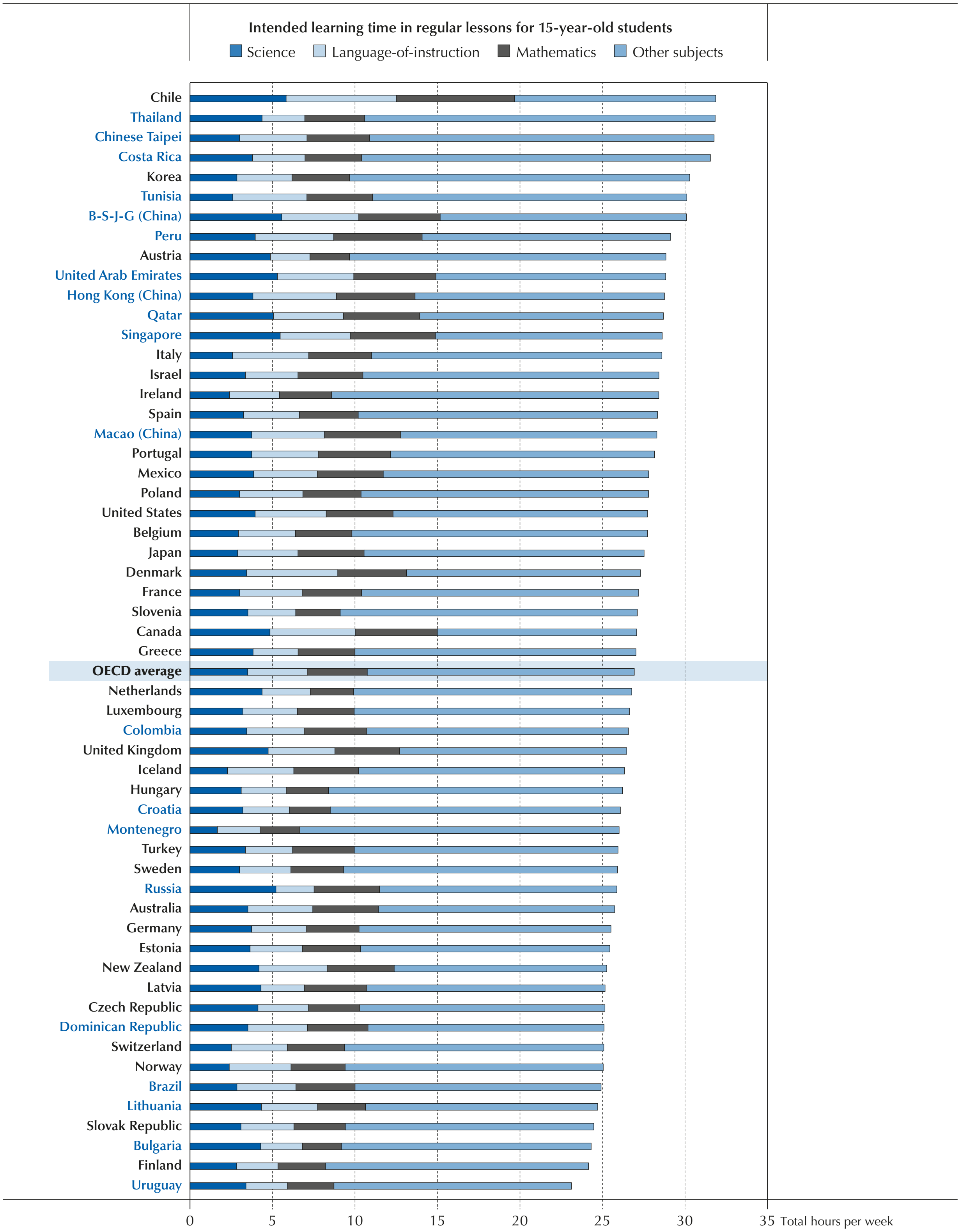
Intended learning time in school

School systems decide the overall amount of time devoted to instruction, and what material students should be taught and at what age. Total intended instruction time is an estimate of the number of hours during which students are taught both compulsory and non-compulsory parts of the curriculum, as per public regulations. On average across OECD countries, students are expected to receive an average of 7 677 hours of instruction in primary and secondary education by the time they are 14 years old. Most of this instruction time is compulsory (OECD, 2016b; Table II.6.53). Total intended instruction time for students up to 14 years ranges from over 9 500 hours in Chile and Denmark to less than 6 000 hours in Bulgaria, Croatia, Estonia, Finland, Georgia, Lithuania, Montenegro and Poland.

Most systems allocate more learning time for older students than younger students. The difference in the average intended instruction time per year for students between 12 and 14 years compared to the average time allocated to students up to the age of 9 varies among countries. It can represent an increase of less than 10% in Canada, Chile, Ireland, Italy, Israel, Macao (China) and Peru, to more than 40% in Bulgaria, Croatia, Georgia, Lithuania, Mexico and Chinese Taipei. By contrast, in Greece, Luxembourg, Malta, Portugal, Singapore and Uruguay, older students are provided with less intended instruction time than younger students. In Greece, Portugal and Uruguay, 12-14 year-old students are given 15% to 26% less instruction time, on average, than students aged 9 or younger (Table II.6.53).

Figure II.6.18 ■ **Time per week spent learning in regular lessons**

Results based on students' self-reports



Countries and economies are ranked in descending order of the total intended learning time in regular lessons.
Source: OECD, PISA 2015 Database, Table II.6.32.
StatLink http://dx.doi.org/10.1787/888933436364

Students' learning time in regular school lessons

PISA 2015 asked students to report the average number of minutes per class period, the total number of class periods per week, and the number of class periods for science, language-of-instruction and mathematics. Across OECD countries, students reported spending 26 hours and 56 minutes per week in lessons, of which 3 hours and 30 minutes per week are spent in science lessons, 3 hours and 36 minutes per week in language-of-instruction classes, and 3 hours and 39 minutes per week in mathematics lessons (Figure II.6.18 and Table II.6.32).

Student learning time in regular lessons varies across school systems. Students in B-S-J-G (China), Chile, Costa Rica, Korea, Chinese Taipei, Thailand and Tunisia spend at least 30 hours per week in regular lessons (all subjects combined), while students in Brazil, Bulgaria, Finland, Lithuania, the Slovak Republic and Uruguay spend less than 25 hours per week. In B-S-J-G (China), Chile, Qatar, Russia, Singapore and the United Arab Emirates, 15-year-old students spend more than five hours in regular science lessons per week, while in Iceland, Ireland, Montenegro and Norway, they spend less than half of that time in science class. In Chile, Peru and Singapore, students spend more than five hours in regular mathematics lessons, whereas in Austria, Bulgaria, Croatia and Montenegro students spend less than half of that time in mathematics class. In Canada, Chile, Denmark and Hong Kong (China), 15-year-olds spend five hours per week in language-of-instruction classes, while students in Austria, Finland and Russia spend less than 2 hours and 30 minutes per week in these classes.

Even within individual school systems, the amount of learning time in regular lessons vaires, especially across schools with different socio-economic profiles (Table II.6.36). Across OECD countries, students in advantaged schools spend 27 hours and 15 minutes in regular lessons per week, while students in disadvantaged schools spend 26 hours and 33 minutes per week. This difference is observed in 31 out of 56 countries for which data are available and exceeds 3 hours per week of extra instruction in advantaged schools in B-S-J-G (China), Chinese Taipei, the United States and Uruguay. Part of the reason for this difference could be that advantaged 15-year-old students are more likely to attend upper secondary schools, where there are more hours of intended learning time than in lower secondary schools.

On average across OECD countries, and in a majority of education systems, students in socio-economically advantaged schools spend more time in science lessons than students in disadvantaged schools (Figure II.6.19 and Table II.6.33). The difference is 41 minutes per week on average across OECD countries but exceeds 2 hours per week in Croatia and Germany. Across OECD countries, students in advantaged schools also spend more time in mathematics lessons than students in disadvantaged schools (8 minutes more per week), but no differences are observed for language-of-instruction lessons (Tables II.6.34 and II.6.35).

On average across OECD countries, and in 14 out of 48 countries and economies, students in private schools spend more time in regular science lessons than students in public schools (Figure II.6.19). In Brazil, Croatia and New Zealand, for instance, there is a difference, in favour of private schools, of more than 80 minutes per week (Table II.6.33).

PISA examined the relationship between the intended time in science, language-of-instruction and mathematics classes with student performance in the corresponding PISA assessment – science, reading and mathematics. On average across OECD countries, and in three out of four education systems, students who spend more time in science lessons score higher in science, even after accounting for the socio-economic profile of students and schools (Figure II.6.19). For every additional hour spent in science lessons, students in OECD countries score five points higher in science – and eight points higher before accounting for the socio-economic profile of students and schools (Table II.6.33).

In most education systems, the association between the time spent in mathematics lessons and mathematics performance is positive but considerably weaker than that concerning science lessons and performance, while the association between intended time in language-of-instruction class and reading scores is negative in almost half of the PISA-participating countries and economies (Tables II.6.34 and II.6.35). The positive and stronger association between time spent in science class and performance in science could reflect the fact that 15-year-old students taking more science classes attend more selective education tracks, schools or classes. Another reason might be that science competencies – particularly in the life sciences – are acquired in a more linear fashion than the skills needed for the PISA reading and mathematics assessments. The recent OECD report, *Equations and Inequalities* (OECD, 2016d), proposes and examines a similar argument for mathematics learning. More frequent exposure to mathematics concepts and formulas is related to better performance on routine problems, i.e. when students are asked to use a simple formula, but seems insufficient when students are asked to solve non-routine problems.

Figure II.6.19 ▪ Intended learning time in science lessons, school characteristics and science performance

■ Education systems with a positive difference/association
▨ Education systems with a negative difference/association
□ Difference/association not significant
▒ Missing values

	School characteristics			Science performance	
	Advantaged – disadvantaged	Urban – rural	Private – public	Before ESCS[1]	After ESCS
Chile	■	□	■	■	■
B-S-J-G (China)	■	□	■	■	■
Singapore	■	▒	□	■	■
United Arab Emirates	■	■	■	■	■
Russia	□	□	▒	■	■
Qatar	□	■	■	■	■
Austria	□	□	□	■	■
Canada	■	■	□	■	■
United Kingdom	■	□	□	■	■
Netherlands	■	▒	□	■	■
Thailand	■	■	▨	■	■
Lithuania	■	□	□	□	□
Latvia	□	□	□	■	■
Bulgaria	▨	▨	▒	▨	▨
New Zealand	■	□	■	■	■
Czech Republic	■	□	□	■	■
Peru	■	□	■	■	□
United States	■	□	□	■	■
Mexico	□	□	□	□	□
Greece	■	□	■	■	■
Hong Kong (China)	■	▒	□	■	■
Costa Rica	■	□	▨	■	■
Macao (China)	■	▒	▒	■	■
Portugal	■	□	□	■	■
Germany	■	□	□	■	■
Estonia	□	▨	□	■	■
Slovenia	■	□	□	■	■
Dominican Republic	□	□	□	□	□
Australia	■	□	□	■	■
OECD average	■	□	■	■	■
Colombia	□	□	□	■	■
Denmark	■	□	□	□	□
Uruguay	■	□	■	■	■
Israel	□	□	▒	■	■
Turkey	■	■	■	■	■
Spain	■	□	■	■	■
Croatia	■	▒	■	■	■
Luxembourg	■	▒	■	■	■
Hungary	□	▨	□	□	□
Slovak Republic	■	□	□	■	■
France	■	□	□	■	■
Chinese Taipei	■	▒	▨	■	■
Poland	□	□	□	■	■
Sweden	□	□	▨	□	□
Belgium	■	▨	▒	■	■
Japan	■	▒	■	■	□
Brazil	■	■	■	■	■
Korea	■	▒	□	■	■
Finland	■	□	□	■	■
Tunisia	■	□	□	■	■
Italy	□	▨	□	■	■
Switzerland	■	■	□	■	□
Ireland	■	▨	□	■	■
Norway	□	□	□	▨	▨
Iceland	▨	□	▒	□	□
Montenegro	□	▒	▒	▨	▨
Education systems with a positive difference/association	38	7	14	45	42
Education systems with no difference/association	15	32	30	7	10
Education systems with a negative difference/association	2	6	4	3	3

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

Countries and economies are ranked in descending order of time spent in regular science lessons per week.

Source: OECD, PISA 2015 Database, Table II.6.33.

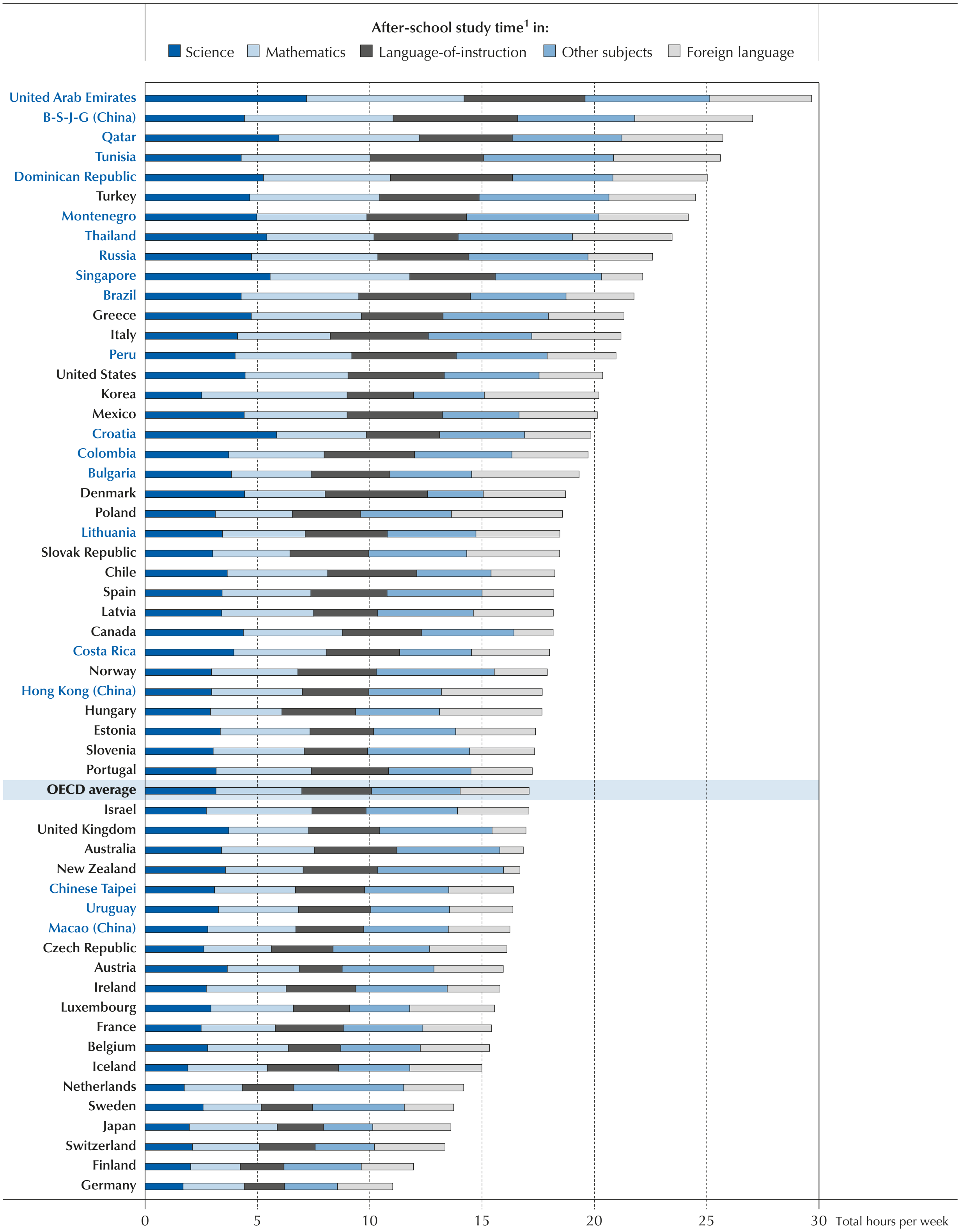
StatLink http://dx.doi.org/10.1787/888933436374

After-school learning time

Students were asked to report the number of hours they typically spend per week, in addition to the required school schedule, learning science, language-of-instruction, mathematics, foreign languages and other subjects, including the time dedicated to homework, additional instruction and private study. Across OECD countries, students spend 3.2 hours per week studying science after school, 3.8 hours studying mathematics, 3.1 hours studying the language of instruction, 3.1 hours studying a foreign language, and almost 4 hours studying other subjects (Figure II.6.20). All subjects combined, in B-S-J-G (China), the Dominican Republic, Qatar, Tunisia and the United Arab Emirates, students reported that they study at least 25 hours per week in addition to the required school schedule; in Finland, Germany, Iceland, Japan, the Netherlands, Sweden and Switzerland, they study less than 15 hours per week.

Figure II.6.20 ▪ **After-school study time**

Results based on students' self-reports



1. Hours spent learning in addition to the required school schedule, including homework, additional instruction and private study.

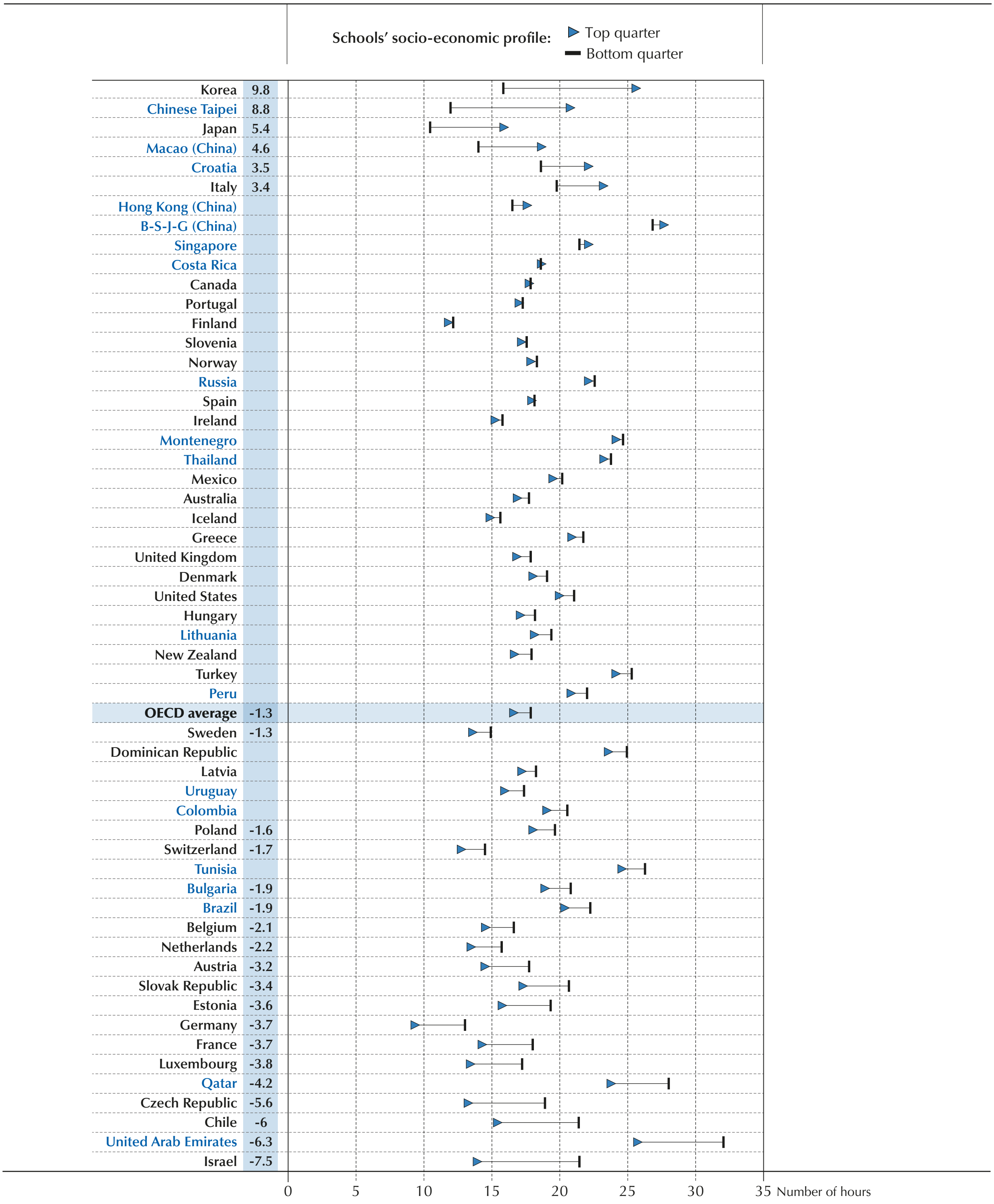
Countries and economies are ranked in descending order of the total time spent learning after school.

Source: OECD, PISA 2015 Database, Table II.6.37.

StatLink http://dx.doi.org/10.1787/888933436384

Figure II.6.21 ▪ **After-school study time, by schools' socio-economic status**

Results based on students' self-reports



Note: Statistically significant differences in the number of hours studying after school between schools in the top quarter of the PISA index of economic, social and cultural status and those in the bottom quarter are indicated next to the country/economy name.

Hours spent learning in addition to the required school schedule, including homework, additional instruction and private study.

Countries and economies are ranked in descending order of the difference between schools in the top quarter of socio-economic status and those in the bottom quarter.

Source: OECD, PISA 2015 Database, Table II.6.41.

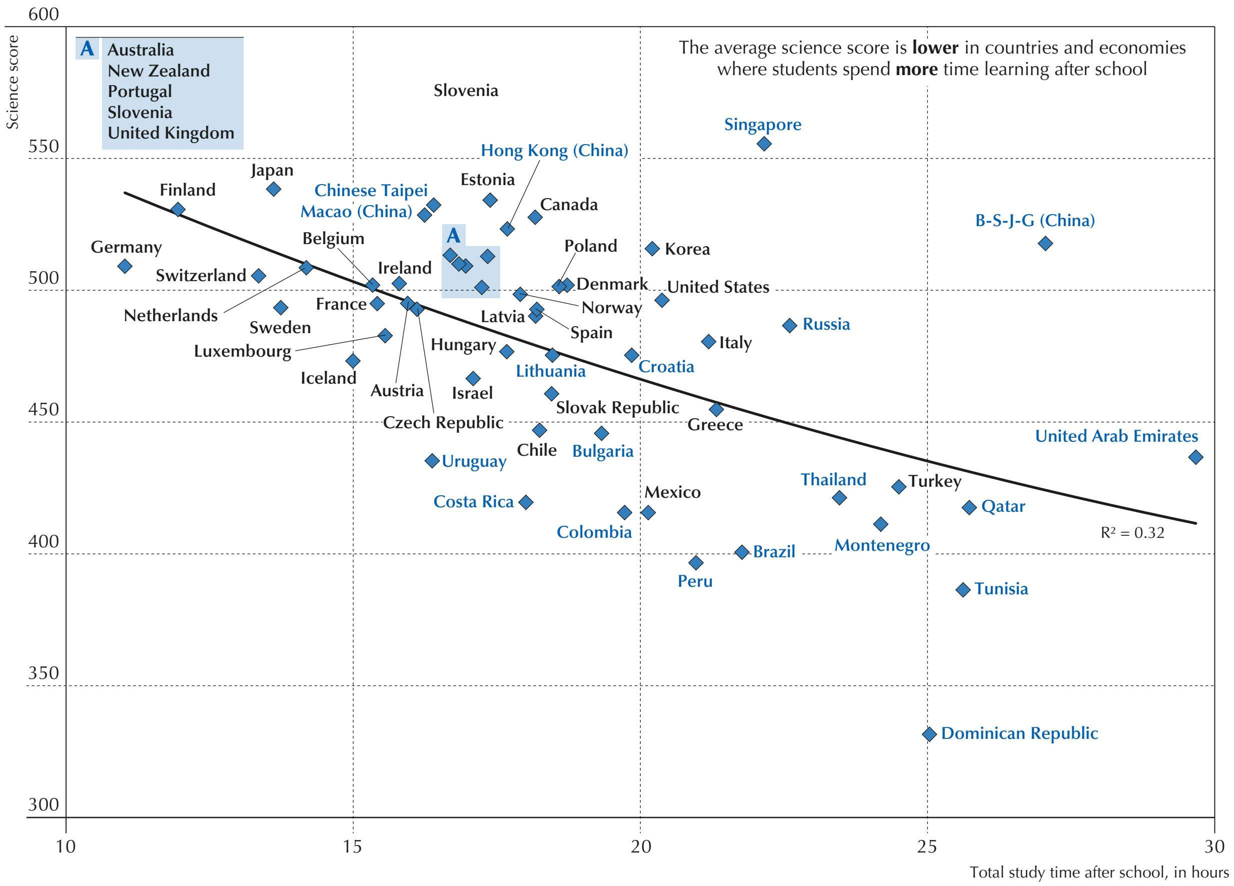
StatLink http://dx.doi.org/10.1787/888933436399

Across OECD countries, students in disadvantaged schools spend more time studying after school (18 hours per week) than students in advantaged schools (17 hours per week) (Figure II.6.21). Evidence from PISA 2012 on the time students spend in different after-school learning activities (OECD, 2013) suggests that, in most education systems, these differences should be interpreted as a compensatory measure, whereby struggling students, who are more likely to come from a disadvantaged background, are offered the possibility to narrow the performance gap between them and their better-performing peers. The important question is: are the schools organising and paying for this extra learning time, or are families shouldering the financial burden?

Probably more worrying is the situation in Croatia, Italy, Japan, Korea, Macao (China) and Chinese Taipei, where students in advantaged schools spend more time studying after school, probably widening the performance gap between advantaged and disadvantaged students. If these differences are the result of private tutoring and a pervasive shadow education system, as other studies suggest for East Asian school systems (Bray and Lykins, 2012), it could undermine the principle of quality (and free) education for all.

On average across OECD countries, students who reported spending more time studying after school score lower in the PISA assessment (Tables II.6.38, II.6.39, II.6.40 and II.6.41). After accounting for the socio-economic profile of students and schools, for every additional hour students spend studying science and the language-of-instruction after school, they score about two and three points lower, respectively, in the corresponding PISA assessment. In mathematics, they score five points lower for every additional hour spent studying mathematics beyond their regular lessons.

Figure II.6.22 ▪ **Relationship between after-school study time and science performance**



Note: Hours spent learning in addition to the required school schedule, including homework, additional instruction and private study.
Source: OECD, PISA 2015 Database, Tables I.2.3 and II.6.41.
StatLink `http://dx.doi.org/10.1787/888933436409`

Comparing learning time in and after school, it could be argued that learning time at school is more effective than studying after school. Another plausible interpretation is that students who are struggling at school are more likely to participate in after-school learning activities or put in more effort on their own at home in order to catch up with their better-performing peers. Similarly, at the country level, the more time students spend studying after school, the lower their achievement in science (Figure II.6.22).

By combining the total number of hours that students spend learning or studying in and outside of school, and their scores in science, reading and mathematics, it is possible to get a rough idea of students' efficiency in learning. Of course, the learning time measured in this way cannot adequately capture the accumulated learning time during a student's entire academic life, but it does say something about how much time students devote deliberately to learning and studying across different countries.

The ratio between PISA scores and learning time in and outside of school (how many score points for each hour spent learning) does not necessarily reflect the efficiency of the education system. Students learn mainly at school and in studying for school, but they also learn by interacting with knowledgeable others, such as family members and peers. For these reasons, the ratios can be interpreted in various ways. They can be an indication of the quality of a school system; they can also be indicative of the differences in learning time across education levels. For example, 15-year-olds in some education systems may be compensating for (or reaping the benefits of) the time spent learning in earlier stages of their education. The ratio between learning time and PISA scores can also indicate that, to succeed academically, students in some education systems need to spend more time in "planned" or "deliberate" learning because they have fewer opportunities to learn informally outside of school. The low ratios between PISA scores and learning time observed in some countries and economies with high PISA scores can also signal decreasing returns to learning time, or the increasing difficulty of attaining higher PISA scores.

According to this analysis, students in Finland, Germany, Japan and Switzerland devote less time to learning in relation to their PISA scores in science, compared with students in other countries, while those in the Dominican Republic, Peru, Qatar, Thailand, Tunisia and the United Arab Emirates spend more time learning relative to their academic performance (Figure II.6.23). In the Dominican Republic, for instance, the ratio between the science score and total learning time – in and outside of school – is 6.6 score points per hour, while in Finland it is 14.7 score points per hour.

Assistance with homework at school

Doing homework can help students identify and apply material they have learned, provide additional stimulation for high-performing students, and guarantee that struggling students are learning the basics (OECD, 2014). Previous PISA reports have shown that spending more hours doing homework – up to seven hours per week – is associated with higher academic achievement (OECD, 2016a). However, these benefits can only materialise if students have enough time, a quiet place to study and access to knowledgeable others who can motivate and guide them, should the need arise. Homework-assistance programmes organised by schools can create the right conditions for students to complete their school assignments and gain self-confidence, particularly for those students who would otherwise not be take part in after-school programmes (Beck, 1999; Cosden et al., 2001).

For the first time, PISA 2015 asked school principals if the school provides a room where students can do their homework and staff who can help them with homework. Across OECD countries, about three out of four students are enrolled in schools that provide a room where students can do their homework, and three out of five students attend schools where staff is available to help students with their homework (Table II.6.42). In Japan, Luxembourg, Chinese Taipei and the United Kingdom, at least 95% of 15-year-old students have access to a room to do their homework at school, while in Jordan, Kosovo and Lebanon, less than 30% of students do. In Denmark, Luxembourg, Sweden, the United Kingdom and the United States, more than 90% of students attend schools where staff is available to help with homework; but in Brazil, Colombia, Croatia and Montenegro, less than 20% of students attend such schools.

Across OECD countries, socio-economically advantaged schools are more likely to offer a room for homework than disadvantaged schools, and private schools are more likely than public schools to do so (Table II.6.43). However, disadvantaged schools are more likely than advantaged schools to provide staff that can help students with homework, and rural schools are more likely than urban schools to do so (Table II.6.44). In most education systems, students score similarly whether or not their schools offer study help in the form of either study rooms or staff, at least after accounting for the socio-economic profile of students and schools.

Figure II.6.23 ▪ **Ratio between learning time and PISA scores**

Results based on students' self-reports, OECD average

	Learning time (15-year-old students)				Ratio between learning time and PISA scores		
	Intended learning time at school (hours)	Study time after school (hours)[1]	Total learning time (hours)	Total learning time as a percentage of available time[2]	Score points in science per hour of total learning time	Score points in reading per hour of total learning time	Score points in mathematics per hour of total learning time
Finland	24.2	11.9	36.1	45.1	14.7	14.6	14.2
Germany	25.5	11.0	36.5	45.7	13.9	13.9	13.8
Switzerland	25.1	13.4	38.4	48.0	13.2	12.8	13.6
Japan	27.5	13.6	41.1	51.4	13.1	12.5	12.9
Estonia	25.4	17.4	42.8	53.5	12.5	12.1	12.1
Sweden	25.9	13.7	39.6	49.6	12.4	12.6	12.5
Netherlands	26.8	14.2	41.0	51.2	12.4	12.3	12.5
New Zealand	25.3	16.7	41.9	52.4	12.2	12.1	11.8
Australia	25.7	16.8	42.6	53.2	12.0	11.8	11.6
Czech Republic	25.1	16.1	41.3	51.6	11.9	11.8	11.9
Macao (China)	28.3	16.2	44.5	55.7	11.9	11.4	12.2
United Kingdom	26.5	17.0	43.4	54.3	11.7	11.5	11.3
Canada	27.1	18.2	45.2	56.5	11.7	11.6	11.4
Belgium	27.7	15.3	43.1	53.8	11.7	11.6	11.8
France	27.2	15.4	42.6	53.3	11.6	11.7	11.6
Norway	25.0	17.9	43.0	53.7	11.6	11.9	11.7
Slovenia	27.1	17.3	44.5	55.6	11.5	11.4	11.5
Iceland	26.3	15.0	41.3	51.7	11.5	11.7	11.8
Luxembourg	26.6	15.6	42.2	52.7	11.4	11.4	11.5
Ireland	28.4	15.8	44.2	55.3	11.4	11.8	11.4
Latvia	25.2	18.2	43.3	54.2	11.3	11.3	11.1
Hong Kong (China)	28.8	17.7	46.4	58.0	11.3	11.3	11.8
OECD average	26.9	17.1	44.0	55.0	11.2	11.2	11.1
Chinese Taipei	31.8	16.4	48.2	60.2	11.1	10.3	11.3
Austria	28.8	15.9	44.8	56.0	11.1	10.8	11.1
Portugal	28.2	17.2	45.4	56.7	11.0	11.0	10.8
Uruguay	23.1	16.4	39.5	49.4	11.0	11.1	10.6
Lithuania	24.7	18.5	43.2	54.0	11.0	10.9	11.1
Singapore	28.6	22.2	50.8	63.5	10.9	10.5	11.1
Denmark	27.3	18.7	46.0	57.5	10.9	10.9	11.1
Hungary	26.2	17.7	43.9	54.9	10.9	10.7	10.9
Poland	27.8	18.6	46.4	58.0	10.8	10.9	10.9
Slovak Republic	24.5	18.5	42.9	53.7	10.7	10.5	11.1
Spain	28.3	18.2	46.5	58.2	10.6	10.6	10.4
Croatia	26.1	19.8	45.9	57.4	10.3	10.6	10.1
United States	27.7	20.4	48.1	60.1	10.3	10.3	9.8
Israel	28.4	17.1	45.5	56.9	10.3	10.5	10.3
Bulgaria	24.3	19.3	43.6	54.5	10.2	9.9	10.1
Korea	30.3	20.2	50.5	63.1	10.2	10.2	10.4
Russia	25.9	22.6	48.5	60.6	10.0	10.2	10.2
Italy	28.6	21.2	49.8	62.2	9.7	9.7	9.8
Greece	27.0	21.3	48.4	60.4	9.4	9.7	9.4
B-S-J-G (China)	30.1	27.0	57.1	71.4	9.1	8.6	9.3
Colombia	26.6	19.7	46.3	57.9	9.0	9.2	8.4
Chile	31.9	18.2	50.1	62.6	8.9	9.2	8.4
Mexico	27.8	20.1	47.9	59.9	8.7	8.8	8.5
Brazil	24.9	21.8	46.7	58.4	8.6	8.7	8.1
Costa Rica	31.5	18.0	49.5	61.9	8.5	8.6	8.1
Turkey	25.9	24.5	50.4	63.0	8.4	8.5	8.3
Montenegro	26.0	24.2	50.2	62.7	8.2	8.5	8.3
Peru	29.1	21.0	50.1	62.6	7.9	7.9	7.7
Qatar	28.7	25.7	54.4	68.0	7.7	7.4	7.4
Thailand	31.8	23.5	55.3	69.1	7.6	7.4	7.5
United Arab Emirates	28.8	29.7	58.5	73.1	7.5	7.4	7.3
Tunisia	30.1	25.6	55.7	69.7	6.9	6.5	6.6
Dominican Republic	25.1	25.0	50.1	62.7	6.6	7.1	6.5

1. Hours spent learning in addition to the required school schedule, including homework, additional instruction and private study.
2. Excluding sleeping time (8 hours) and weekends.

Countries and economies are ranked in descending order of the score points in science per hour of total learning time.

Source: OECD, PISA 2015 Database, Tables I.2.3, I.4.3, I.5.3, II.6.32 and II.6.41.

StatLink `http://dx.doi.org/10.1787/888933436411`

Across OECD countries, students who attend schools that provide a room for homework do not spend more time studying after school (Table II.6.45). However, they spend considerably more time studying after school – roughly 13 minutes more per week, after accounting for the socio-economic profile of students and schools – if school staff members are available to help them with homework. The association is particularly strong in Austria and Canada, where students in schools where staff members are available to help them with homework spend at least two hours more studying after school than students in schools where no such staff member is available.

Extracurricular activities

Students'school life does not always end when the final school bell rings. Extracurricular activities, such as sports activities and teams, debate clubs, academic clubs, bands, orchestras or choirs, can improve students' cognitive and non-cognitive skills. Skills such as persistence, independence, following instructions, working well within groups, dealing with authority figures and fitting in with peers are needed for students to succeed in school – and beyond (Carneiro and Heckman, 2005; Covay and Carbonaro, 2010; Farb and Matjasko, 2012; Farkas, 2003; Howie et al., 2010). Some research finds that, since extracurricular activities are more frequently offered in advantaged schools, they can play a role in perpetuating socio-economic inequalities in education (Covay and Carbonaro, 2010; Lareau, 2003).

School principals were asked to report whether their school offers various extracurricular activities to students in the modal grade for 15-year-olds. Across OECD countries, 90% of students attend schools that support a sports team or sporting activities; 73% attend schools that offer volunteering or service activities; 66% attend schools that offer science competitions; 63% attend schools that offer an art club or art activities; 61% attend schools that support a band, orchestra or choir; 58% attend schools that produce a school play or musical; 54% attend schools that support a school yearbook, newspaper or magazine; 39% attend schools that support a science club; 39% attend schools that support a club with a focus on computers and information and communications technologies; and 31% attend schools that support a chess club (Figure II.6.24).

Some of the principals' responses to these questions were combined to create an index of creative extracurricular activities at school, which is the sum of principals' responses to questions about whether their school offers: a band, orchestra or choir; a school play or school musical; and an art club or art activities. The index ranges from 0 to 3, with each response weighed equally. Countries and economies where these activities are more frequently offered include Canada, Hong Kong (China), Macao (China), the United Kingdom and the United States, where nearly all of these activities are offered, on average. By contrast, in Austria, Belgium, Denmark and Spain, schools offer, on average, only around one of these activities, and in Norway less than one (Figure II.6.25).

In 53 out of 68 education systems, these creative activities are more frequently offered in advantaged schools than in disadvantaged schools (Figure II.6.25). On average across OECD countries and in many education systems, these activities are more frequently offered in urban than in rural schools, and in private than in public schools. In as many as 54 out of 68 education systems, students score higher in science when their schools offer more creative extracurricular activities. Even after accounting for the socio-economic profile of students and schools, there are still 19 education systems where students perform better in science if these activities are offered at school, and only one country – Tunisia – where they score lower in science.

ATTENDANCE AT PRE-PRIMARY SCHOOL

Whether and for how long students are enrolled in pre-primary education is another important aspect of time resources invested in education. Many of the inequalities observed in school systems are already present when students first enter formal schooling and persist as students progress through education (Berlinski, Galiani and Gertler, 2009; Entwisle, Alexander and Olson, 1997; Mistry et al., 2010). Because research shows that inequalities tend to grow when students are not attending school, such as during long school breaks (Downey, Von Hippel and Broh, 2004), earlier entry into the school system may reduce inequalities in education – as long as participation in pre-primary schooling is universal and the learning opportunities across pre-primary schools are of high quality and relatively homogeneous. Earlier entry into pre-primary school prepares students for entry into – and success in – formal schooling (Chetty et al., 2011).

Across OECD countries, the average time spent in pre-primary education is three years, but around 5% of 15-year-old students reported that they had not attended pre-primary school at all (Tables II.6.50 and II.6.51). Even if a majority of students in all education systems reported that they had attended pre-primary education, in B-S-J-G (China), Croatia, Lithuania, Montenegro, Poland and the United States, more than 17% of students – and in Turkey, almost half of students – reported that they had never attended pre-primary school.

Across OECD countries, students in socio-economically advantaged schools had attended about four months more of pre-primary school than students in disadvantaged schools; in B-S-J-G (China), Croatia, the Dominican Republic, Lithuania, Poland and Russia, the difference is at least one year. There is no country/economy where students in disadvantaged schools had spent significantly more time in pre-primary education, even if students in disadvantaged and advantaged schools in Belgium, the Czech Republic, Germany, Hong Kong (China), Iceland, Italy, Japan, Korea, Macao (China), New Zealand, Switzerland and Chinese Taipei show similar levels of attendance. Across OECD countries, students in urban schools had spent two months more in pre-primary school than students in rural schools, and students in private schools had also spent two months more in pre-primary education than students in public schools.

Figure II.6.24 ▪ **Extracurricular activities offered at school**

Results based on school principals' reports

▢ Less than half of students
▨ From 50% to 75% of students
■ More than 75% of students

	Percentage of students in schools where the following extracurricular activities are offered									
	Band, orchestra or choir	School play or school musical	School yearbook, newspaper or magazine	Volunteering or service activities	Science club	Science competitions	Chess club	Club with a focus on computers and ICT	Art club/ activities	Sporting team/ activities
Hong Kong (China)	94	81	91	100	95	87	75	95	98	100
Korea	86	55	85	100	93	86	95	84	97	99
Macao (China)	94	95	95	100	74	96	42	79	97	100
Chinese Taipei	92	60	97	99	80	81	71	76	95	99
United States	93	84	95	98	75	72	48	67	92	98
United Kingdom	96	88	78	91	79	72	56	69	94	100
Thailand	82	79	86	89	90	72	38	94	89	99
New Zealand	96	82	88	99	49	83	76	64	77	100
B-S-J-G (China)	66	54	79	93	91	90	68	72	95	100
Singapore	99	70	95	100	42	89	25	89	92	100
Canada	88	88	88	97	57	76	52	63	91	100
Poland	65	81	61	99	79	95	24	72	88	100
Qatar	30	74	87	94	86	91	26	74	80	99
Malta	73	81	56	92	66	75	35	61	91	98
Australia	92	74	69	85	38	91	62	44	71	98
United Arab Emirates	34	68	75	90	82	88	40	74	74	95
Montenegro	43	79	88	81	76	83	28	62	78	95
Slovenia	69	70	86	86	52	87	29	49	71	98
Russia	68	41	67	92	77	99	33	38	71	98
Slovak Republic	35	47	73	86	60	81	27	84	71	99
Luxembourg	85	77	53	93	32	81	51	21	67	100
Romania	43	69	93	25	73	37	43	84	94	94
Latvia	78	74	55	80	45	85	16	39	86	96
Lithuania	89	56	69	74	34	92	18	36	85	98
Germany	78	62	55	94	48	59	26	58	75	93
Japan	91	51	48	91	60	24	33	53	97	100
Estonia	81	50	57	76	42	94	21	46	75	96
FYROM	71	70	60	84	39	71	23	54	62	100
Indonesia	64	37	68	76	59	80	29	42	80	96
Albania	56	64	37	88	48	85	36	35	78	98
Hungary	50	45	49	82	52	93	21	57	57	98
Croatia	43	57	62	98	52	82	14	36	56	99
Portugal	26	57	69	89	57	89	33	23	58	97
Bulgaria	39	42	57	89	61	83	26	47	59	94
Georgia	32	58	69	82	39	79	35	14	81	98
Turkey	39	50	42	75	42	58	75	51	55	97
Moldova	31	44	42	88	17	98	40	34	90	99
Chile	73	58	30	60	35	63	30	47	87	97
OECD average	61	58	54	73	39	66	31	39	63	90
Ireland	81	43	45	66	35	65	38	37	63	100
Kosovo	63	50	50	77	52	58	21	36	59	97
CABA (Argentina)	62	53	26	74	49	54	15	66	79	86
Israel	54	48	55	98	58	57	7	42	55	85
Dominican Republic	49	54	20	79	50	81	46	17	75	86
Trinidad and Tobago	64	45	30	81	39	69	39	18	74	97
Colombia	40	43	41	92	35	68	20	32	68	95
Czech Republic	42	25	54	63	47	85	21	46	54	89
Viet Nam	18	89	45	82	44	47	15	18	67	99
Jordan	23	54	47	86	52	25	32	36	57	95
Costa Rica	79	59	12	31	24	91	24	23	70	93
Lebanon	23	49	50	78	44	58	14	35	58	89
Italy	21	68	49	66	46	66	8	33	44	92
Mexico	42	50	33	56	29	69	39	24	63	86
France	45	70	39	37	24	67	20	19	72	97
Netherlands	52	60	49	94	18	51	11	7	63	82
Tunisia	27	44	39	65	59	42	20	47	56	82
Algeria	32	57	45	65	64	33	7	35	44	90
Iceland	48	75	70	31	10	26	47	39	58	69
Peru	49	55	22	44	28	70	27	25	62	85
Greece	50	60	26	62	19	71	7	19	46	85
Finland	81	40	41	36	13	86	8	13	37	85
Switzerland	71	57	31	36	37	24	9	22	63	90
Spain	29	46	48	62	16	66	19	22	36	80
Belgium	28	53	37	72	6	69	18	10	36	86
Austria	47	34	42	87	5	31	16	21	28	76
Uruguay	70	43	12	27	35	45	13	27	27	88
Brazil	31	51	26	49	13	27	33	16	43	87
Sweden	62	47	22	41	7	61	11	8	29	76
Denmark	43	40	28	18	9	33	16	12	29	71
Norway	24	33	26	52	2	12	11	11	8	35

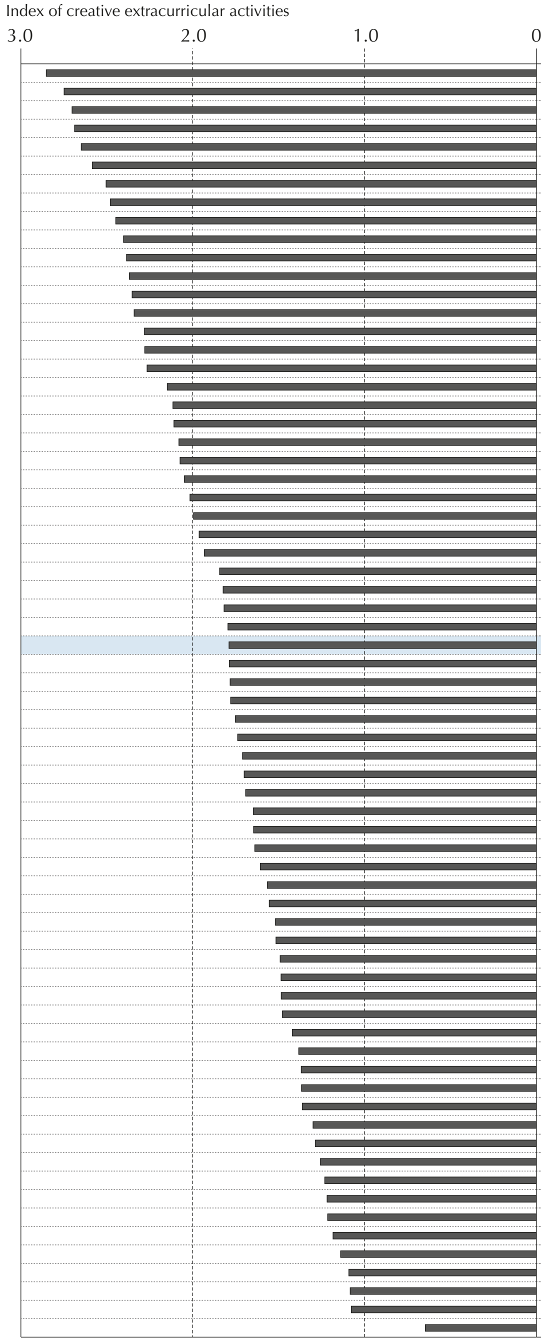
Countries and economies are ranked in descending order of the percentage of students in schools offering extracurricular activities (average 12 activities).

Source: OECD, PISA 2015 Database, Table II.6.46.

StatLink http://dx.doi.org/10.1787/888933436425

Figure II.6.25 ▪ Index of creative extracurricular activities, school characteristics and science performance

■ Education systems with a positive difference/association
▨ Education systems with a negative difference/association
□ Difference/association not significant
▒ Missing values



	School characteristics			Science performance	
	Advantaged – disadvantaged	Urban – rural	Private – public	Before ESCS[1]	After ESCS
Macao (China)	■	▒	▒	■	■
United Kingdom	□	□	□	□	□
Hong Kong (China)	■	▒	□	■	□
United States	■	□	□	■	□
Canada	■	■	□	□	□
Singapore	■	▒	□	■	■
New Zealand	■	■	□	■	□
Thailand	■	■	□	■	■
Chinese Taipei	■	▒	□	■	□
Malta	▨	▒	■	■	■
Japan	■	▒	□	■	□
Korea	□	▒	□	■	□
Latvia	■	■	□	■	□
Australia	■	■	■	■	□
Lithuania	■	■	□	■	□
Poland	■	□	□	■	□
Luxembourg	■	▒	■	■	□
B-S-J-G (China)	■	■	□	■	□
Chile	□	■	□	■	■
Germany	■	□	□	■	□
Slovenia	■	▨	■	■	□
Costa Rica	□	□	□	□	□
Romania	■	■	▒	■	■
Estonia	□	□	□	□	□
Montenegro	■	▒	▒	■	■
FYROM	■	■	▨	■	■
CABA (Argentina)	□	▒	□	■	□
Switzerland	■	□	□	■	□
Qatar	■	■	■	■	■
France	□	□	□	□	□
Ireland	□	□	□	□	□
OECD average	■	■	■	■	■
Russia	■	□	▒	■	□
Iceland	■	▨	▒	□	□
Trinidad and Tobago	■	▒	■	■	□
Dominican Republic	■	■	□	■	■
Indonesia	■	■	□	■	□
United Arab Emirates	■	■	■	■	■
Netherlands	■	▒	□	■	□
Viet Nam	■	■	□	■	□
Georgia	■	■	□	□	□
Kosovo	■	▨	□	■	■
Peru	■	■	□	■	□
Moldova	■	■	▒	■	□
Finland	□	□	■	□	□
Israel	■	□	▒	■	■
Mexico	■	■	■	■	■
Croatia	■	▒	■	■	■
Greece	■	■	■	■	□
Hungary	■	□	■	■	□
Colombia	■	■	■	■	□
Slovak Republic	■	□	■	□	□
Turkey	■	■	■	■	□
Bulgaria	■	■	▒	■	■
Portugal	□	■	□	□	□
Uruguay	■	■	□	■	□
Sweden	■	□	□	■	□
Italy	■	■	□	■	□
Jordan	■	■	■	■	■
Algeria	□	□	▒	■	□
Brazil	□	□	□	□	□
Lebanon	■	□	■	■	□
Tunisia	□	■	□	□	▨
Czech Republic	■	□	□	■	■
Belgium	■	□	▒	■	□
Denmark	■	□	■	■	□
Spain	■	■	■	■	□
Austria	■	□	■	■	■
Norway	□	□	□	□	□
Education systems with a positive difference/association	53	29	20	54	19
Education systems with no difference/association	14	23	37	14	48
Education systems with a negative difference/association	1	3	1	0	1

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

Countries and economies are ranked in descending order of the index of creative extracurricular activities.

Source: OECD, PISA 2015 Database, Table II.6.49.

StatLink http://dx.doi.org/10.1787/888933436439

Students score four points higher in science for every additional year they had spent in pre-primary education, but the association disappears once the socio-economic status of students and schools is accounted for. One reason why the association is weak, even before accounting for the socio-economic profile of students and schools, is that the relation is curvilinear: students who had spent too little time (less than one year) in pre-primary education score lower in science than students who had not attended or who had spent more than one year (Table II.6.52).

Notes

1. This only covers expenditure on educational institutions.

2. These resources are allocated throughout a student's educational, and countries spend different amounts per student. Caution is required in interpreting this indicator, as school systems are organised in many different ways across countries. For example, some school systems include special education in school budgets while others do not. Some school systems sponsor extensive recreational, athletic and extracurricular activities that are not related to academic instruction. In addition, some countries require schools to pay the pensions and health insurance of school staff, while others include these costs in the national budget for all citizens.

3. System-level data that are not derived from the PISA 2015 student or school questionnaire are extracted from the OECD's annual publication, *Education at a Glance*, for those countries and economies that participate in that periodic data collection. For other countries and economies, a special system-level data collection was conducted in collaboration with PISA Governing Board members and National Project Managers.

4. See Boxes II.2.1, II.2.2 and II.2.3 in Chapter 2 for a description of how PISA defines socio-economically disadvantaged and advantaged schools, public and private schools, and urban and rural schools.

5. The index of equity in resource allocation (material) is the percentage of the variation on the index of shortage of educational material explained by the PISA index of economic, social and cultural status of the school multiplied by a negative or positive sign, depending on the sign of the relationship. A value of zero indicates that there is no difference between socio-economically advantaged and disadvantaged schools in how concerned principals are about the educational material at school, and positive values (higher equity) indicate that principals of socio-economically advantaged schools are more concerned than principals of disadvantaged schools.

6. Annual statutory salaries of teachers refer to the average scheduled gross salary per year of full-time classroom teachers according to official pay scales (OECD, 2016b).

7. Minimum qualifications required to enter the teaching profession may not be the most commonly held qualifications in the teaching force. In several education systems, the "typical" teacher is certified and qualified beyond the minimum requirements and has reached a given position on the salary scale. This is referred to as "typical training" of teachers in Table II.6.54 and it varies depending on the country and the school system (OECD, 2016b, Indicator D3).

8. In Chile the question about the certification of teachers was adapted as "authorised or enabled by the Ministry of Education".

9. The timing of the PISA data collection can have an impact on principals' responses to this question. For example, if most teachers in a country or economy had participated in professional development programmes during summer holidays and the PISA data collection was conducted before the summer break in this country/economy, the reported proportion would be an underestimate of the reality.

10. The index of equity in resource allocation (staff) is the percentage of the variation on the index of shortage of educational staff explained by the school PISA index of economic, social and cultural status of the school multiplied by a negative or positive sign, depending on the sign of the relationship. A value of zero indicates that there is no difference between socio-economically advantaged and disadvantaged schools in how concerned principals are about the educational staff at school, and positive values (higher equity) indicate that principals' in socio-economically advantaged schools are more concerned than principals in disadvantaged schools.

11. Language-of-instruction refers to the language in which students from the school took the PISA test.

12. The student-teacher ratio is not necessarily the same as class size. For example, schools with large special education programmes and more teaching assistants tend to have more teachers, but the schools' high student-teacher ratio has no impact on the size of regular classes. In addition, the amount of preparation time per day allotted to teachers may vary across schools and across school systems. More teachers are needed where more preparation time is given and class size remains constant.

13. See Chapter 2 for details on the index of adaptive teaching.

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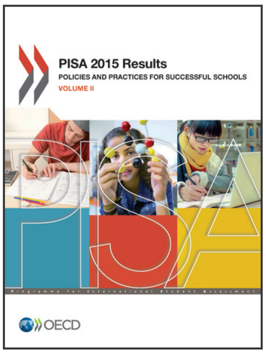

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