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How Resources, Policies and Practices are Related to Student Performance

By focusing on selected organisational features of schools and school systems, this chapter details how resources, policies and practices relate to student performance, and how far positive relationships at the school level translate into positive relationships at the level of the education system. The chapter also discusses how the environment within schools affects learning outcomes.

Chapter 1 shows to what extent the performance variation among students stems from performance differences among countries, between schools within countries, or among students within schools. This chapter takes these analyses further by examining in greater detail how resources, policies and practices relate to student performance, and to what extent positive relationships observed at the school level translate into positive relationships at the level of the education system. Since reading was the focus of the PISA 2009 assessment, the analyses focus on reading. However, the patterns observed for mathematics and science are similar. Chapter 3 discusses how PISA describes and measures education resources, policies and practices, and shows where countries stand on these issues. Chapter 4 describes the learning environment in schools.

HOW PISA EXAMINES RESOURCES, POLICIES, PRACTICES AND LEARNING OUTCOMES

When examining the relationship between student performance and resources, policies and practices, this volume takes into account the socio-economic differences among students and schools. The advantage of doing this lies in comparing similar entities, namely education systems and schools with similar socio-economic backgrounds. At the same time, there is a risk that such adjusted comparisons underestimate the strength of the relationship between student performance and resources, policies and practices, since most of the differences in performance are often attributable both to policies and to socio-economic background. For example, it may be that in better-performing schools, parents have high expectations for the school and exert pressure on the school to fulfil those expectations. After accounting for socio-economic factors, an existing relationship between parents' expectations of the school and student performance may no longer be apparent as an independent relationship because these schools often have an advantaged socio-economic intake. Even though the relationship between parental expectations and student performance may exist, it is no longer observed, simply because it has been accounted for along with the socio-economic differences.

Conversely, analyses that do not take socio-economic background into account can overstate the relationship between student performance and resources, policies and practices, as the level of resources and the kinds of policies adopted may also relate to the socio-economic background of students, schools and countries. At the same time, analyses without adjustments may paint a more realistic picture of the schools that parents choose for their children. They may also provide more information for other stakeholders who are interested in the overall performance of students, schools and systems, including any effects that may be related to the socio-economic intake of schools and systems. For example, parents may be primarily interested in a school's absolute performance standards, even if a school's higher achievement record stems partially from the fact that the school has a larger proportion of socio-economically advantaged students.

The analyses in this volume present relationships both before and after accounting for socio-economic differences, and focus on differences among countries and among schools within countries.

Relationships between the organisational characteristics of a school system and the school system's performance in PISA, as well as the impact of socio-economic background on performance, are established through correlational analysis.¹ The analyses are undertaken first on the basis of the OECD countries and then extended to all countries and economies that participated in PISA (Table IV.2.1).

Within school systems, these relationships are established through multilevel regression analysis. In each of the following sections, a set of interrelated resources, policies and practices are considered jointly to establish their relationship with student performance.² For the reasons explained above, two approaches are used: an unadjusted one that examines the relationships as they present themselves to students, families and teachers in the schools irrespective of the socio-economic context, and a "like-with-like" approach that examines the relationships after accounting for the socio-economic and demographic background of students and schools. The methodology of both approaches is presented in Annex A5.

How selecting and grouping students are related to student performance

Volume II, *Overcoming Social Background*, highlights the challenges school systems face in addressing the needs of diverse student populations. To meet these challenges, some countries have adopted non-selective and comprehensive school systems that seek to provide all students with similar opportunities, leaving it to each teacher and school to provide for the full range of student abilities, interests and backgrounds. Other countries respond to diversity by grouping students, whether between schools or between classes within schools, with the aim of serving students according to their academic potential and/or interests in specific programmes. The underlying assumption in differentiation is often that students' talents will develop best when students can stimulate each other's interest in learning, and create an environment that is more conducive to effective teaching.



The analysis presented in this chapter covers not only curricular differentiation (*i.e.* tracking or streaming) and school selectivity, but also other forms of horizontal differentiation and vertical differentiation. Vertical differentiation refers to the ways in which students progress through the education systems as they become older. Even though the student population is differentiated into grade levels in practically all schools in PISA, in some countries, all 15-year-old students attend the same grade level, while in other countries they are dispersed throughout various grade levels as a result of policies governing the age of entrance into the school system and/or grade repetition.

Horizontal differentiation refers to differences in instruction within a grade or education level. Horizontal differentiation, which can be applied by the education system or by individual schools, groups students according to their interests and/or performance. At the system level, horizontal differentiation can be applied by schools that select students on the basis of their academic records, by offering specific programmes (vocational or academic, for example), and by setting the age at which students are admitted into these programmes. Individual schools can apply horizontal differentiation by grouping students according to ability or transferring students out of the school because of low performance, behavioural problems or special needs.³

Chapter 3 complements this analysis with a detailed description of how different education systems implement these policies and practices and how various forms of differentiation are interrelated.

Vertical differentiation and performance

PISA shows that the prevalence of grade repetition is negatively related to the learning outcomes of education systems, even after accounting for countries' national income. In other words, school systems with high rates of grade repetition are also school systems that show lower student performance, whatever the causal nature of this relationship. Some 15% of the variation in performance across OECD countries after per capita GDP has been accounted for can be explained by differences in the rates of grade repetition (Figure IV.2.1a and Table IV.2.1).

This negative relationship between grade repetition and student performance is mirrored at the school level. In 24 OECD countries and 27 partner countries and economies, schools with more students who repeat grades tend to achieve lower scores than schools with fewer students who repeat grades. After accounting for the socio-economic and demographic background of students and schools, the relationship between student performance and grade repetition is observed in 22 OECD countries and 21 partner countries and economies (Figure IV.2.1b).

Grade repetition is not just negatively related to average performance, but also to the impact of students' socio-economic background on their performance. School systems that differentiate students vertically through grade repetition show a stronger relationship between socio-economic background and learning outcomes, even after accounting for the country's national income (Figure IV.2.1a). In other words, and consistent with the literature on grade repetition, students from socio-economically disadvantaged backgrounds appear to be hurt most by grade repetition (Hauser, 2004; Alexander, Entwisle and Dauber, 2003). Although the objective of grade repetition is for these students to have more opportunities to learn, underperforming students do not seem to benefit from repeating a grade. One hypothesis to explain this negative relationship is that having the option to have low-performing students repeat a grade places fewer demands on teachers and schools to help struggling and disadvantaged students improve their performance.⁴

Horizontal differentiation at the system level and performance

Horizontal differentiation at the system level, as measured by the number of programmes available to 15-year-olds, the age of first selection into these programmes and the percentage of selective schools in a system, appears to be unrelated to the average performance of education systems (Figure IV.2.1a). While highly selective schools, whose principals report that they use students' academic records or recommendations from feeder schools to decide who will be admitted, tend to perform better than non-selective schools in many countries (Figure IV.2.1b), the prevalence of selectivity in the education system does not relate to the system's overall performance level. Instead, education systems that contain a large proportion of selective schools tend to have greater variation in performance between schools (Table IV.2.1).

School systems that track students early into different educational programmes show lower levels of equity, but do not achieve higher levels of average performance than systems that track students later in their school careers. This finding is consistent with prior research showing that inequality is greater in more differentiated school systems (Causa and Cahpui, 2009; Schütz, West and Woessmann, 2007). Inequalities are particularly large in education systems in which horizontal differentiation occurs at early ages. Education systems in the OECD countries range from essentially undivided secondary education until the age of 15 (14 OECD countries and 7 partner countries and economies)

to systems with 4 or more school types or distinct educational programmes (the Netherlands, the Slovak Republic, the Czech Republic, Ireland, Austria, Luxembourg, Belgium, Switzerland and Germany, and the partner countries and economies Croatia, Trinidad and Tobago, Shanghai-China, Qatar, Kyrgyzstan and Singapore; see Table IV.3.2a). For example, education systems in which the first age of selection occurs one year earlier tend to show a stronger relationship between a school's performance and its socio-economic profile (*i.e.* a 10.8 score point difference corresponding to 1 unit on the *PISA index of economic, social and cultural status* of the school) (Table IV.2.3). Even if the corresponding relationship within schools is somewhat weaker in these education systems, this advantage is much smaller than the larger socio-economic disparities among schools. Thus, on balance, early selection into different institutional tracks is associated with larger socio-economic inequalities in learning opportunities without being associated with better overall performance.

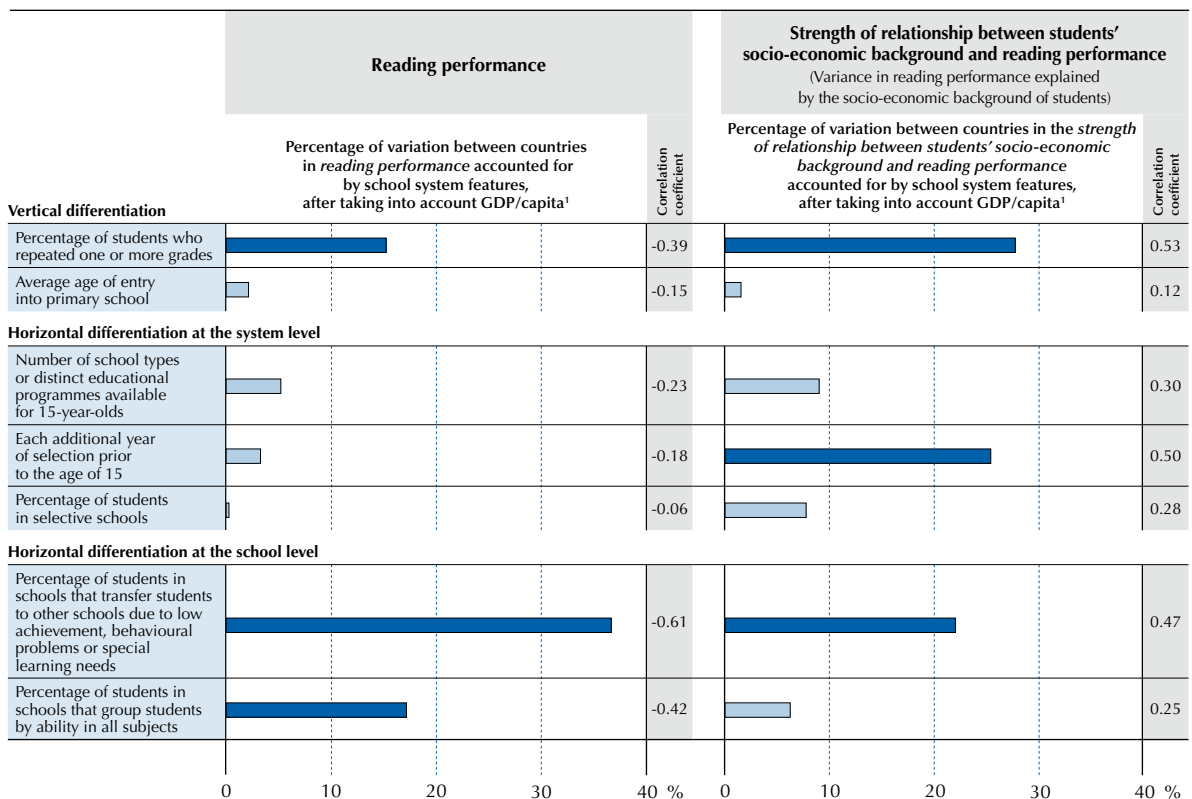
The reason why the age at which differentiation begins is closely associated with socio-economic selectivity may be because students are more dependent upon their parents and their parents' resources when they are younger. In systems with a high degree of institutional differentiation, parents from higher socio-economic backgrounds may be in a better position to promote their children's chances than in a system in which such decisions are taken at a later age, when students themselves play a bigger role.

Horizontal differentiation at the school level and performance

Two forms of horizontal differentiation at the school level appear negatively related to student performance: the more frequently schools transfer students to another school because of students' low academic achievement, behavioural problems or special learning needs, and the more schools group students by ability in all subjects, the lower the school system's performance in PISA (Figure IV.2.1a). In fact, over one-third of the variation in student performance across countries can be explained by the rate at which schools transfer students.

■ Figure IV.2.1a ■


How school systems' policies for selecting and grouping students are related to educational outcomes



Note: Correlations that are statistically significant at the 5% level ($p < 0.05$) are marked in a darker tone.

1. The percentage is obtained by squaring the correlation coefficient and then multiplying it by 100.

Source: OECD, *PISA 2009 Database*, Table IV.2.1.

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One hypothesis is that school transfers may hurt student achievement because transferring out of a school is usually difficult for students (see Chapter 3). Another hypothesis is that in systems where transferring students is a common policy or practice, teachers and the school community have less of an incentive to commit themselves to helping lower-achieving students improve.⁵

In a few countries, there is also a negative relationship between transferring students and performance at the school level (Figure IV.2.1b). As is true at the level of the school system, individual schools from which students are likely to be transferred to another school because of low academic achievement, behavioural problems or special learning needs tend to achieve lower scores than schools that do not transfer students. The relationship between ability grouping for all subjects and performance is negative in a few countries, while this relationship is positive in other countries (Figure IV.2.1b). However, whether schools group students based on their ability for all subjects seems to be closely related to schools' socio-economic profile, since in almost all countries, there is no independent relationship between grouping students by ability and performance, after accounting for the socio-economic background of students and schools.


■ Figure IV.2.1b ■

Countries in which school policies for selecting and grouping students are related to reading performance

| Schools' policies on selecting and grouping students (the model includes all these policies) | | Without accounting for the socio-economic and demographic background of students and schools | | With accounting for the socio-economic and demographic background of students and schools | |
|---|----------------|--|--|---|--|
| | | Negative relationship | Positive relationship | Negative relationship | Positive relationship |
| Percentage of students who repeated one or more grades | <i>OECD</i> | Austria, Belgium, Canada, Chile, Czech Republic, Denmark, Estonia, Finland, Germany, Hungary, Ireland, Israel, Italy, Luxembourg, Mexico, New Zealand, Poland, Portugal, Slovak Republic, Spain, Switzerland, Turkey, United Kingdom, United States | | Austria, Canada, Chile, Czech Republic, Denmark, Estonia, Finland, Hungary, Ireland, Israel, Italy, Luxembourg, Mexico, Netherlands, Poland, Portugal, Slovak Republic, Spain, Switzerland, Turkey, United Kingdom, United States | |
| | | OECD average change in score: -2.3 | | OECD average change in score: -0.1 | |
| | <i>Partner</i> | Albania, Argentina, Azerbaijan, Bulgaria, Brazil, Colombia, Croatia, Dubai (UAE), Hong Kong-China, Indonesia, Jordan, Kyrgyzstan, Latvia, Lithuania, Macao-China, Montenegro, Panama, Peru, Qatar, Romania, Russian Federation, Serbia, Singapore, Thailand, Trinidad and Tobago, Tunisia, Uruguay | | Albania, Argentina, Azerbaijan, Brazil, Colombia, Croatia, Dubai (UAE), Hong Kong-China, Indonesia, Jordan, Kyrgyzstan, Latvia, Macao-China, Panama, Peru, Qatar, Romania, Serbia, Trinidad and Tobago, Tunisia, Uruguay | |
| School with high academic selectivity for school admittance | <i>OECD</i> | Ireland | Austria, Canada, Switzerland, Chile, Czech Republic, Finland, Hungary, Netherlands, Poland, Slovak Republic, Slovenia, Turkey, United Kingdom, United States | | Austria, Czech Republic, Denmark, Hungary, Korea, Netherlands, Slovenia, Sweden, Switzerland, Turkey |
| | | OECD average change in score: 17.3 | | OECD average change in score: 7.6 | |
| | <i>Partner</i> | | Bulgaria, Hong Kong-China, Croatia, Latvia, Peru, Dubai (UAE), Qatar, Shanghai-China, Russian Federation, Singapore, Chinese Taipei | Montenegro | Bulgaria, Croatia, Shanghai-China |
| School is very likely to transfer students with low achievement, behavioural problems or special learning needs | <i>OECD</i> | Australia, Japan, Netherlands, United States | Austria, Italy, Spain, Switzerland | Israel | Denmark, Switzerland |
| | | OECD average change in score: -4.9 | | OECD average change in score: -1.5 | |
| | <i>Partner</i> | Dubai (UAE), Chinese Taipei | Brazil, Colombia, Indonesia | Dubai (UAE) | Indonesia |
| School with ability grouping for all subjects | <i>OECD</i> | Czech Republic, Denmark, Portugal, Slovak Republic | Australia, Greece, Japan | | United States |
| | | OECD average change in score: -3.0 | | OECD average change in score: -1.5 | |
| | <i>Partner</i> | | Kyrgyzstan | | Panama |

Note: Only those school systems where there is a statistically significant relationship between school policies for selecting and grouping students and reading performance are listed. OECD averages in bold denote that the estimate is statistically significant at the 5% level ($p < 0.05$).

Source: OECD, *PISA 2009 Database*. Tables IV.2.2b and IV.2.2c.

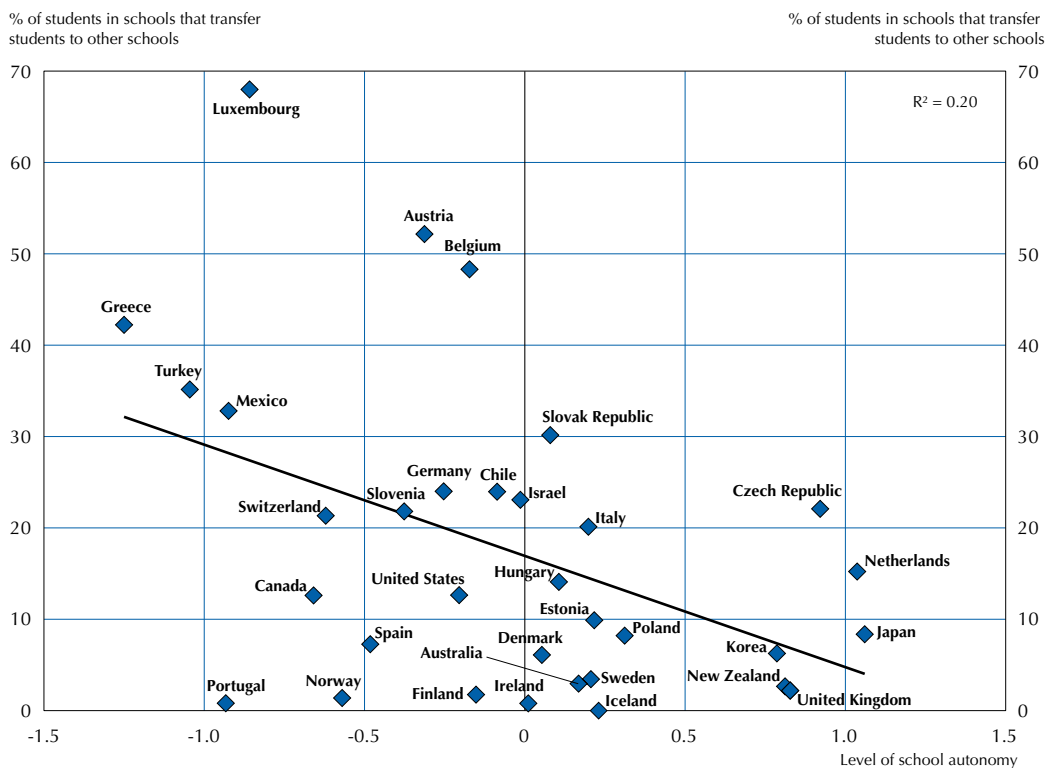
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School systems that transfer students to other schools more frequently also tend to show a stronger relationship between students' socio-economic background and performance, even after accounting for countries' national income (Figure IV.2.1a). This suggests that transferring students tends to be associated with socio-economic segregation in school systems, where students from socio-economically advantaged backgrounds end up in higher-performing schools while students from disadvantaged backgrounds end up in lower-performing schools. Within schools, however, transferring students leads to more homogeneous student populations, and the effect of students' socio-economic background on performance is mitigated. Not surprisingly, therefore, in these types of systems, PISA shows levels of socio-economic inequity *between* schools to be relatively larger than levels of inequity *within* schools. Within a system, when the proportion of schools that transfer students is 10 percentage points higher, the score point difference associated with 1 unit difference in the socio-economic background of schools is +5.1 points, while the score point difference associated with 1 unit increase in students' socio-economic background is -2.5 points⁶ (Table IV.2.3). In other words, within schools, the positive effect of transfers is outweighed by the negative effect on inequalities between schools.


Figure IV.2.2 shows that in school systems with low rates of student transfers, school principals tend to report that schools have more responsibility for establishing student assessment policies, deciding which courses are offered, determining course content and choosing textbooks. Across OECD countries, 20% of the variation in rates of student transfers is related to the differences in the *index of school responsibility for curriculum and assessment*. One hypothesis to explain this relationship is that school systems with fewer options to transfer students use other instruments to work with struggling students and that they have the autonomy to do so.

■ Figure IV.2.2 ■

School systems with low transfer rates tend to give more autonomy to schools to determine curricula and assessments



Note: The level of school autonomy is measured by the index of school responsibility for curriculum and assessment. Positive values indicate greater autonomy. Source: OECD, PISA 2009 Database, Tables IV.3.3a and IV.3.6.

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On average across OECD countries, school policies and practices for selecting and grouping students solely account for 2.6% of the performance variation among schools. This percentage is especially high in Israel and the partner countries Argentina, Panama, Trinidad and Tobago, and Tunisia (Figure IV.2.3 and Table IV.2.2a). Much of the relationship between how schools select and group students and performance is also related to the socio-economic and demographic backgrounds of students and schools. On average across OECD countries, 9.6% of the variation in student performance is jointly related to both schools' policies on selecting and grouping students and on socio-economic and demographic background. This joint portion is particularly large in Luxembourg, Turkey, Chile, Hungary and Italy, and the partner countries Trinidad and Tobago, Argentina, Uruguay and Peru. In these countries, policies on selecting and grouping students are closely related to socio-economic disparities in the school system.

Box IV.2.1 How to interpret the figures

Figures IV.2.3, IV.2.5, IV.2.7, IV.2.9, IV.2.11 and IV.2.13 in this chapter analyse the extent to which variation in student performance is related to a particular school characteristic. Their values are extracted from Tables IV.2.2a, IV.2.4a, IV.2.9a, IV.2.12a, IV.2.13a and IV.2.14a, respectively.

Figure IV.2.3, for example, examines different aspects of schools' policies and practices on selecting and grouping students (see Table IV.2.2b for the different aspects included). The total length of the bar to the right of the vertical line represents between-school variation in student performance for each country. The longer the bar, the greater the differences in student performance among schools.

For example, Figure IV.2.3 considers the extent to which between-school variation can be explained by differences in schools' policies and practices on selecting and grouping students, either independently of students' and schools' socio-economic and demographic background (light blue) or jointly with those factors (dark blue). This means that the total length of the two sections (light blue and dark blue combined) present the overall variation attributable to schools' policies and practices on selecting and grouping students.

The variation jointly accounted for by both schools' policies, practices and resources, and students' and schools' socio-economic and demographic background (dark blue) provides an indication of the extent to which school policies, practices and resources are inequitably distributed according to students' and schools' socio-economic and demographic profiles.

The figure also shows the amount of variation attributable to socio-economic and demographic background independent of schools' policies and practices on selecting and grouping students (dark grey), and the amount of variation that is not attributable either to socio-economic and demographic background or to schools' policies and practices on selecting and grouping students (light grey) (see Table IV.2.2c for the socio-economic and demographic aspects included).

The variation in performance is presented as a percentage of the average variation in student performance across OECD countries, so that performance differences can be compared across all participating countries and economies. The OECD average variation in student performance is set to 100%.

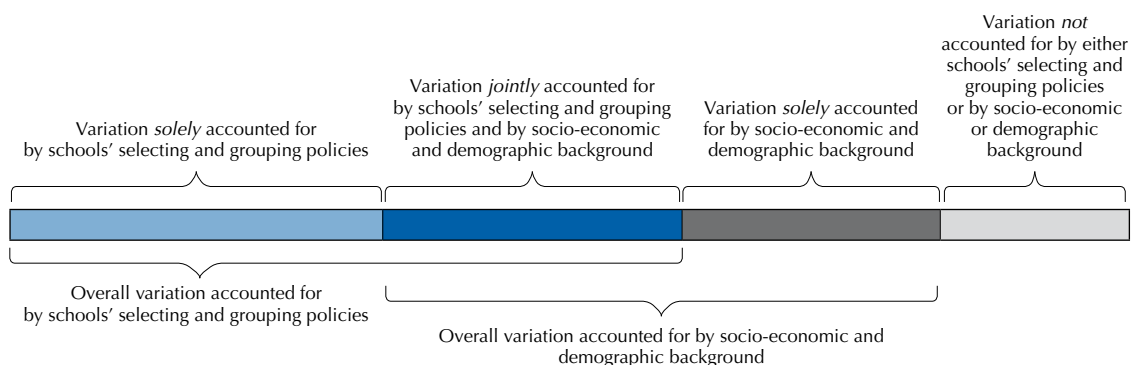


Figure IV.2.3

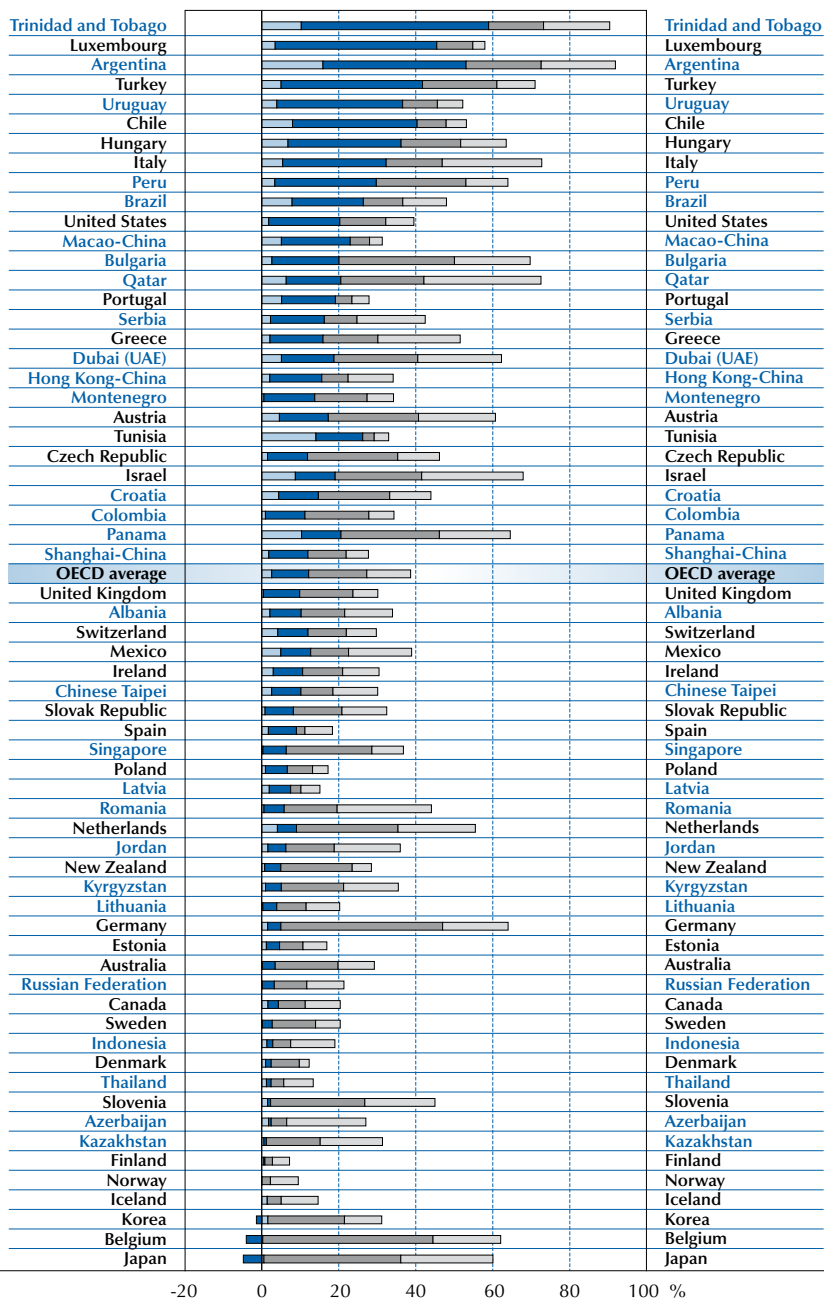
How school policies for selecting and grouping students are related to reading performance

Expressed as a percentage of the average variance in reading performance in OECD countries
(100% is the average total variance in reading performance across OECD countries)

Variance in reading performance:


- Solely accounted for by school policies for selecting and grouping students
- Jointly accounted for by students' and schools' socio-economic and demographic background and by school policies for selecting and grouping students
- Solely accounted for by students' and schools' socio-economic and demographic background
- Unaccounted for by any of the above factors

Between-school variance



Countries are ranked in descending order of the variance jointly accounted for.

Source: OECD, PISA 2009 Database, Table IV.2.2a.

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How the governance of school systems is related to student performance

Another important organisational feature of school systems is the extent to which parents and students can choose the school they attend and the degree to which schools are considered autonomous entities that make organisational decisions independently of district, regional or national entities. “Exit”, “voice” and “loyalty” are three options available to consumers when they face insufficient or deteriorating quality of goods or services. These options are also commonly used to explain or justify school choice. As applied to school choice, “exit” offers parents the possibility to select or choose a school other than the one assigned to their child; “voice” refers to parents’ opportunities to influence or change their child’s school; and “loyalty” indicates that parents either might not have “exit” or “voice” options, or choose not to exercise them. School choice and parent voice are, of course, inextricably linked. When school choice is limited, there is likely to be more parent voice. Similarly, when there are ample opportunities for “voice”, fewer parents are likely to “exit” and choose another school for their children.

Since the early 1980s, educational reforms in many countries have intended to improve the quality of instruction in schools by offering a greater diversity of courses, greater autonomy for schools to respond to local needs, and more choice for parents. Yet some of the assumptions underlying such reforms have been called into question (Schneider, Teske and Marschall, 2002; Hess and Loveless, 2005; Berends and Zottola, 2009). It is unclear, for example, whether parents have the necessary information to choose the best schools for their children. It is also unclear whether parents always give sufficient priority to the quality of the school when making these choices. Also school choice may lead to the unintended racial/ethnic or socio-economic segregation of schools (Gewirtz, 1995; Whitty and Halpin, 1998; Karsten, 1999; Viteritti, 1999; Plank and Sykes, 2003; Hsieh and Urquiola, 2006; Heyneman, 2009; Bunar, 2010a; Bunar, 2010b).

This section explores related areas of the governance of school systems and school performance. Chapter 3 provides a more detailed discussion of how school autonomy and school choice is arranged across school systems.

School autonomy and performance

Cross-country analysis of PISA suggests that the prevalence of schools’ autonomy to define and elaborate their curricula and assessments relates positively to the performance of school systems, even after accounting for national income (Figure IV.2.4a). School systems that provide schools with greater discretion in deciding student-assessment policies, the courses offered, the course content and the textbooks used are also school systems that perform at higher levels in reading.⁷ In contrast, greater responsibility in managing resources appears to be unrelated to a school system’s overall student performance.

The positive relationship between schools’ autonomy in defining and elaborating its curricula and assessment policies and student performance that is observed at the level of the education system can play out differently within countries (Figure IV.2.4b). For example, after accounting for the socio-economic background of students and schools, and for other factors related to school autonomy and school competition, schools in the Netherlands, Switzerland and Belgium that have more autonomy in defining their curricula and assessment practices also show higher performance. In contrast, schools in Luxembourg and Italy that have higher levels of autonomy regarding curricular decisions show lower reading scores when compared with schools with lower autonomy in this area. Among the partner countries and economies, Dubai (UAE) and Lithuania show a positive relationship between schools that have higher levels of curricular autonomy and higher performance. In Bulgaria, Argentina, Chinese Taipei, Peru and Shanghai-China, schools with greater autonomy show poorer student performance. Local responsibility for designing curricula, therefore, seems to be positively related to the performance of the school systems, but not always to the performance of individual schools. There are various explanations for these different patterns within countries. For example, more autonomous schools may perform better because countries may deliberately provide better-performing schools with more discretion, while imposing more constraints and regulation on lower-performing schools. Conversely, more autonomous schools may perform worse where these schools cater to lower-performing students who did not obtain access to more prestigious public programmes.

While there is a clear relationship between the degree of curricular autonomy a school system offers its schools and the system’s performance, this relationship is less clear when the degree of autonomy in allocating resources is analysed through measures such as: selecting teachers for hire, dismissing teachers, establishing teachers’ starting salaries, determining teachers’ salary increases, formulating the school budget, and deciding on budget allocations within the school. The absence of a clear relationship could result from autonomy in allocating resources changing the ways in which resources are distributed, which, in turn, may benefit some schools but not necessarily improve the system’s

overall performance. The relationship between a school's performance and its autonomy in allocating resources also differs by country. In Greece, Korea and Chile, schools that have greater autonomy in allocating resources also achieve higher scores in reading, even after students' and schools' socio-economic backgrounds are taken into account. In contrast, in Switzerland, schools that have greater autonomy in allocating resources show lower scores. Among the partner countries and economies, schools with greater autonomy in allocating resources show higher levels of student performance in Peru, but lower levels in Croatia, Kyrgyzstan, Colombia and Thailand (Figure IV.2.4b).

Within countries, the relationship between the autonomy of schools in allocating resources and learning outcomes is related to systems' accountability arrangements in important ways. For example, information on the results of external examinations and assessments often provides an important framework for the autonomy of schools by providing a basis for schools and parents to make appropriate decisions for students (Fuchs and Woessmann, 2007). Data from PISA show that in school systems where most schools post achievement data publicly, there is a positive relationship between school autonomy in resource allocation and student performance. In particular, in school systems in the OECD that have no schools posting achievement data publicly, after students' and schools' socio-economic background are taken into account, a student who attends a school with greater autonomy in allocating resources than the average OECD school⁸ tends to perform 3.2 points lower in reading than a student attending a school with an average level of autonomy. In contrast, in a school system where all schools post achievement data publicly, a student who attends a school with above-average autonomy scores 2.6 points higher in reading than a student attending a school with an average level of autonomy (Table IV.2.5).

School choice and performance

The degree of competition among schools is one way to measure school choice. Competition among schools is intended to provide incentives for schools to innovate and create more effective learning environments. However, cross-country correlations of PISA do not show a relationship between the degree of competition and student performance. Among school systems in the OECD countries, the proportion of schools that compete with other schools for student enrolment seems unrelated to the school system's overall student performance, with or without accounting for socio-economic background (Figure IV.2.4a).

Within countries, a positive relationship is often evident between the degree of school competition and schools' performance when the backgrounds of students and schools are not taken into account. In these cases, schools that compete for enrolment perform 15 points higher, on average across the OECD, than schools that do not compete for enrolment. In Canada, the Czech Republic, Germany, Italy, Mexico, Poland, Portugal, the Slovak Republic, Spain, Turkey and the partner countries and economies Bulgaria, Hong Kong-China, Kyrgyzstan, Peru and Trinidad and Tobago, schools that compete for enrolment perform better when the backgrounds of students and schools are not taken into account. However, in all of these countries and economies except Germany and Turkey, the positive relationship between school competition and student performance is no longer statistically significant when the socio-economic background of students and schools is accounted for (Figure IV.2.4b and Table IV.2.4c).

The fact that the positive relationship between school competition and performance is no longer apparent⁹ after accounting for the socio-economic background of students and schools may reflect the fact that socio-economically advantaged students, who tend to achieve higher scores (see Volume II, *Overcoming Social Background*), are also more likely to attend schools that compete for enrolment, even after accounting for location and attendance in private schools (Table IV.2.6). Also, privileged schools may tend to compete more in order to attract high-performing students, who tend to be socio-economically advantaged.

Why are socio-economically advantaged students more likely to attend schools that compete for enrolment? To understand differences in how parents choose schools for their children, PISA asked parents a series of questions regarding school choice in the questionnaire, which was distributed in eight OECD countries. On average, socio-economically disadvantaged parents are over 13 percentage points more likely than advantaged parents to report that they considered "low expenses" and "financial aid" to be very important determining factors in choosing a school (Table IV.2.7). While parents from all backgrounds cite academic achievement as an important consideration when choosing a school for their children, socio-economically advantaged parents are, on average, 10 percentage points more likely than disadvantaged parents to cite that consideration as "very important". These differences suggest that socio-economically disadvantaged parents consider that they have more limited choices of schools for their children because of financial constraints. If children from socio-economically disadvantaged backgrounds cannot attend high-performing schools because of financial constraints, then school systems that offer parents more school choices for their children will necessarily be less effective in improving the performance of all students.



The extent to which schools compete with each other for enrolment can be related to equity. Research has shown that school choice – and, by extension, school competition – is related to greater levels of segregation in the school system and, consequently, lower levels of equity (Gewirtz, 1995; Whitty and Halpin, 1998; Karsten, 1999; Viteritti, 1999; Plank and Sykes, 2003; Hsieh and Urquiola, 2006; Heyneman, 2009; Bunar, 2010a; Bunar, 2010b). Table IV.2.1 shows the cross-country correlation between the percentage of schools that compete with each other and the between- and within-school gradients of the *PISA index of economic, social and cultural status*. The between-school gradient shows the strength of the relationship between the school's average socio-economic background and school performance, while the within-school gradient depicts the average strength of the same relationship within schools. If, as suggested by the literature, school competition produces socio-economic segregation among schools, the correlation between school competition and the between-school gradient should be positive and the correlation with the within-school gradient should be non-existent or negative. This is also what the results from PISA show: a greater prevalence of school competition is related to a stronger relationship between a school's average socio-economic background and the school's average student performance. For example, education systems that have an additional 10 percentage points of schools competing for students in the same area tend to show a stronger relationship between a school's performance and its socio-economic profile (*i.e.* a 2.8 score point difference corresponding to 1 unit on the *PISA index of the economic, social and cultural status* of the school) (Table IV.2.8).

Does the existence of private schools in a system make a difference in overall performance? In PISA, private schools are those that are independently managed and operated, irrespective of whether they are publicly or privately funded.¹⁰ The results from PISA suggest that the proportion of private schools in a school system is unrelated to the system's overall performance (Figure IV.2.4a).

Within OECD countries, on average, students who attend private schools perform 25 score points higher in reading than students who attend public schools (Figure IV.2.4b and Table IV.2.4b). This relationship holds in 15 OECD countries. However, students who attend private schools are also from more advantaged socio-economic backgrounds, so part of the positive relationship between private schools and performance is due to the socio-economic characteristics of the school and students, rather than to an advantage intrinsic in private schools. After accounting for the socio-economic and demographic characteristics of students and schools, the OECD average is reduced to 3.4 score points and is no longer statistically significant (Table IV.2.4c). In fact, of the 15 OECD countries that show a positive relationship between attendance in private schools and performance, only 3 show a clear advantage in attending private school: in Slovenia, Canada and Ireland, students of similar backgrounds who attend private schools score at least 24 points higher in the reading assessment than students who attend public schools. In contrast, in Japan and the United Kingdom, students from similar backgrounds who attend private schools score at least 31 points lower than students who attend public schools. In Japan, a common explanation for this outcome is that some students who cannot attend public schools known for their high performance may opt for private schools as a second choice.

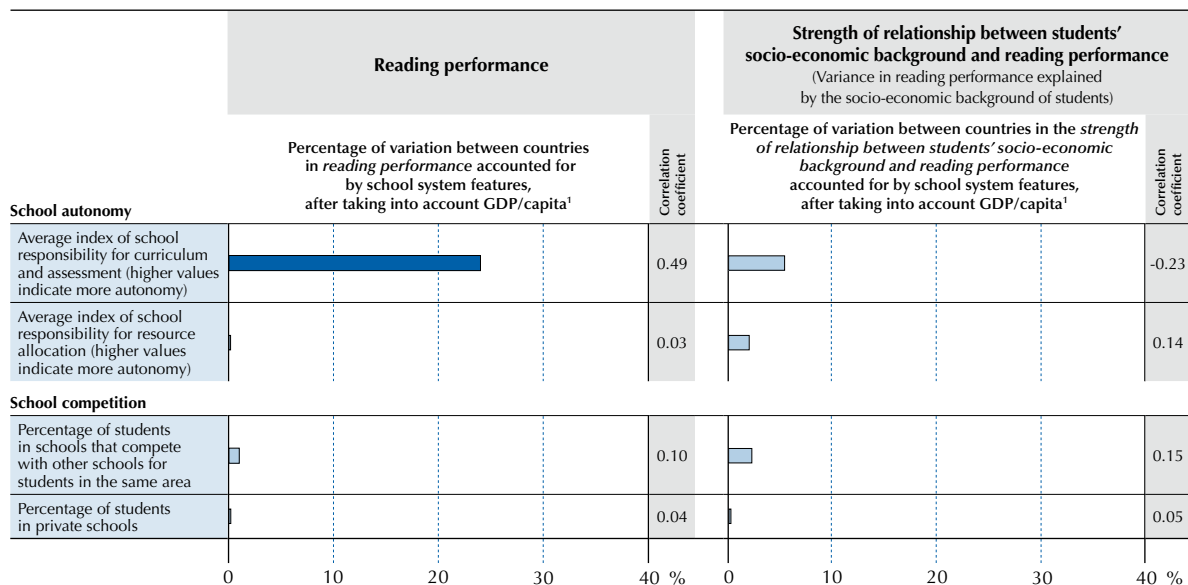
All this said, even though there may be no performance advantage for private schools after accounting for socio-economic background, private schools may still be an attractive alternative for parents who want to capitalise on the socio-economic advantages that these schools offer, including student peers from advantaged backgrounds, additional resources or the better policies and practices that are often found in more socio-economically advantaged schools.

The proportion of private schools in a school system is also unrelated to the system's level of equity in education (Figure IV.2.4a). On average across OECD countries, a very low proportion of the variation in performance is explained by differences in how schools are governed. Only 1% of the performance variation is attributable solely to differences in how schools are governed and 5% is attributable to both the governance of schools and socio-economic background (Figure IV.2.5 and Table IV.2.4a). Thus, most of the weak relationship between performance differences and differences in the governance of schools is related to differences in socio-economic background among schools. This suggests that socio-economically advantaged schools tend to compete with other schools in the same area for students or they are managed privately.

The proportion of performance variation between schools that is attributable both to how schools are governed and to socio-economic backgrounds is 15 percentage points or higher in Turkey, Luxembourg, Chile, the United States and the partner countries Peru, Uruguay, Argentina, Panama and Brazil. In these school systems, positive relationships between school governance and performance are closely related to the socio-economic disparities in the school system (Table IV.2.4a).

■ Figure IV.2.4a ■


How the governance of school systems is related to educational outcomes



Note: Correlations that are statistically significant at the 5% level ($p < 0.05$) are marked in a darker tone.

1. The percentage is obtained by squaring the correlation coefficient and then multiplying it by 100.

Source: OECD, *PISA 2009 Database*, Table IV.2.1.

StatLink  <http://dx.doi.org/10.1787/888932343380>

■ Figure IV.2.4b ■


Countries in which school governance is related to reading performance

| School governance (the model includes all of these features of school governance) | | Without accounting for the socio-economic and demographic background of students and schools | | With accounting for the socio-economic and demographic background of students and schools | |
|---|---|--|---|---|-----------------------------------|
| | | Negative relationship | Positive relationship | Negative relationship | Positive relationship |
| Index of school responsibility for curriculum and assessment (higher values indicate more autonomy) | <i>OECD</i> | Austria, Germany | Luxembourg, Portugal, Switzerland | Italy, Luxembourg | Belgium, Netherlands, Switzerland |
| | OECD average change in score: 1.6 | | OECD average change in score: -1.0 | | |
| Index of school responsibility for resource allocation (higher values indicate more autonomy) | <i>Partner</i> | Argentina, Bulgaria, Kazakhstan, Panama, Peru, Serbia, Shanghai-China | Dubai (UAE) | Argentina, Bulgaria, Peru, Shanghai-China, Chinese Taipei | Dubai (UAE), Lithuania |
| | <i>OECD</i> | Estonia, Switzerland | Chile, Germany, Greece, Korea, Luxembourg, Spain | Switzerland | Chile, Greece, Korea |
| OECD average change in score: 10.8 | | OECD average change in score: 5.8 | | | |
| School competes with other schools for students in the same area | <i>Partner</i> | Albania, Azerbaijan, Croatia | Argentina, Peru, Singapore | Colombia, Croatia, Kyrgyzstan, Thailand | Peru |
| | <i>OECD</i> | United Kingdom | Canada, Czech Republic, Germany, Italy, Mexico, Poland, Portugal, Slovak Republic, Spain, Turkey | Australia, Denmark, Korea | Germany, Turkey |
| OECD average change in score: 14.9 | | OECD average change in score: 0.9 | | | |
| Private school | <i>Partner</i> | | Bulgaria, Hong Kong-China, Kyrgyzstan, Peru, Trinidad and Tobago | Argentina, Brazil, Colombia, Macao-China, Chinese Taipei | |
| | <i>OECD</i> | Luxembourg | Australia, Austria, Canada, Chile, Czech Republic, Estonia, Hungary, Ireland, Mexico, New Zealand, Poland, Slovenia, Spain, Sweden, United Kingdom, United States | Japan, United Kingdom | Canada, Ireland, Slovenia |
| OECD average change in score: 26.6 | | OECD average change in score: 3.4 | | | |
| <i>Partner</i> | Indonesia, Trinidad and Tobago, Tunisia | Albania, Argentina, Brazil, Colombia, Jordan, Kyrgyzstan, Panama, Peru, Qatar, Uruguay | Hong Kong-China, Kazakhstan, Chinese Taipei, Tunisia | Argentina, Colombia, Kyrgyzstan, Qatar | |

Note: Only those school systems where there is a statistically significant relationship between school governance and reading performance are listed.

OECD averages in bold denote that the estimate is statistically significant at the 5% level ($p < 0.05$).

Source: OECD, *PISA 2009 Database*, Tables IV.2.4b and IV.2.4c.

StatLink  <http://dx.doi.org/10.1787/888932343380>



■ Figure IV.2.5 ■

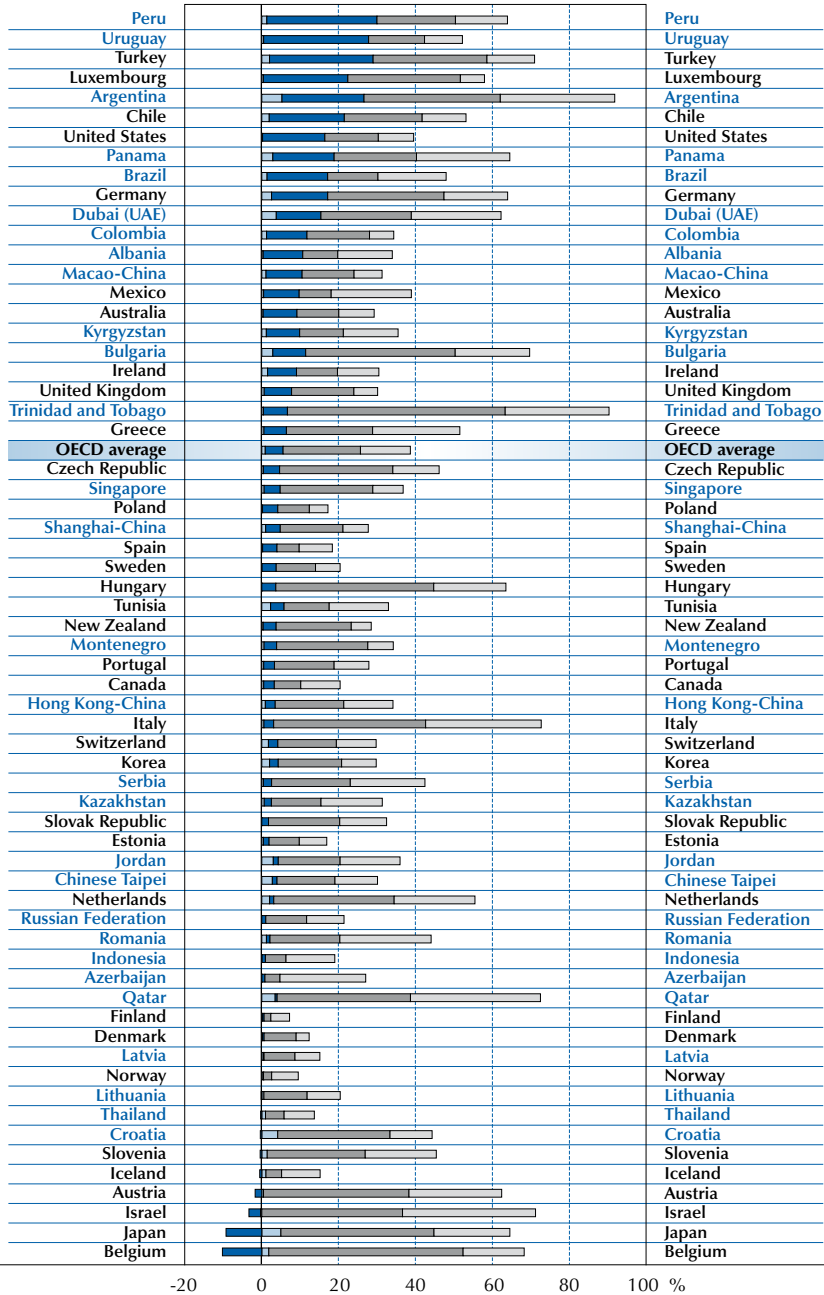
How the governance of schools is related to reading performance

Expressed as a percentage of the average variance in reading performance in OECD countries
(100% is the average total variance in reading performance across OECD countries)

Variance in reading performance:


- Solely accounted for by schools governance
- Jointly accounted for by students' and schools' socio-economic and demographic background and by school governance
- Solely accounted for by students' and schools' socio-economic and demographic background
- Unaccounted for by any of the above factors

Between-school variance



Countries are ranked in descending order of the variance jointly accounted for.

Source: OECD, PISA 2009 Database, Table IV.2.4a.

StatLink  <http://dx.doi.org/10.1787/888932343380>

How assessment and accountability policies are related to student performance

The shift in public and government thinking from mere control over the resources and content of education towards a focus on outcomes has, in many countries, resulted in the development of standards to measure the quality of educational institutions. Countries' approaches to standard-setting range from defining broad educational goals to formulating concise performance expectations in well-defined subject areas. Setting these standards has, in turn, often led to the establishment of accountability systems. Over the last decade, assessments of student performance have become common in many OECD countries, and the results are often widely reported and used to inform both specialised and public debate. However, the rationale for assessments and the nature of the instruments used vary greatly within and across countries. OECD countries, for example, use different forms of external assessments, external evaluations or inspections, as well as individual schools' self-evaluations.

One aspect relating to accountability systems concerns the existence of standards-based external examinations. These are examinations that focus on a specific school subject and assess a major portion of what students studying this subject are expected to know or be able to do (Bishop, 1998, 2001).¹¹ Essentially, they define performance relative to an external standard, not relative to other students in the classroom or school. Perhaps more important, such examinations usually have real consequences for the students' progression or certification in the education systems. PISA asked school principals whether they use standardised tests to measure student learning. These standardised tests, which may be voluntary and implemented by schools, often only have indirect consequences for students. For teachers, standardised assessments may provide valuable information on students' learning needs and may be used to tailor their instruction accordingly. In some countries, such as Brazil, Hungary, Italy, Malaysia, Mexico, Poland and the Slovak Republic, such tests are also used to determine teachers' salaries or to guide professional development (OECD, 2009b). At the school level, information from standardised tests can be used to determine the allocation of additional resources, and what interventions are required to establish performance targets and to monitor progress.

Across OECD countries, countries that use standards-based external examinations tend to perform higher, even when accounting for national income:¹² students in school systems that use standards-based external examinations perform, on average across OECD countries, 16 points higher than students in school systems that do not use these examinations (Figure IV.2.6a).¹³ In contrast, there is no measurable relationship between the prevalence of standardised tests and the performance of school systems, and that also holds for most countries at the school level (Figure IV.2.6b). This may be because, in part, the content and use of standardised tests vary considerably across schools and systems.

PISA also examined whether student achievement data is posted publicly, communicated to parents, used to make decisions regarding the allocation of resources, or tracked by administrative authorities. Across school systems, there is no measurable relationship between these various uses of assessment data for accountability purposes and the performance of school systems (Figure IV.2.6a). When looking at this relationship within countries, the pattern is mixed, but on average across OECD countries, the within-country relationship is positive for some measures (Figure IV.2.6b). This may be because policies on the use of assessment data differ greatly across countries. A somewhat consistent pattern emerges, however, in the relationship between schools that post achievement data publicly and those schools' performance. Schools whose principals report that student achievement data are posted publicly perform better than schools whose achievement data is not made publicly available in seven OECD countries and in nine partner countries and economies. However, since in most of these countries the schools that post achievement data publicly tend to be socio-economically advantaged schools, this performance advantage remains visible only in Turkey and the partner countries and economies Romania, Chinese Taipei, Colombia, Kyrgyzstan and Hong Kong-China, once socio-economic background is accounted for (Figure IV.2.6b).

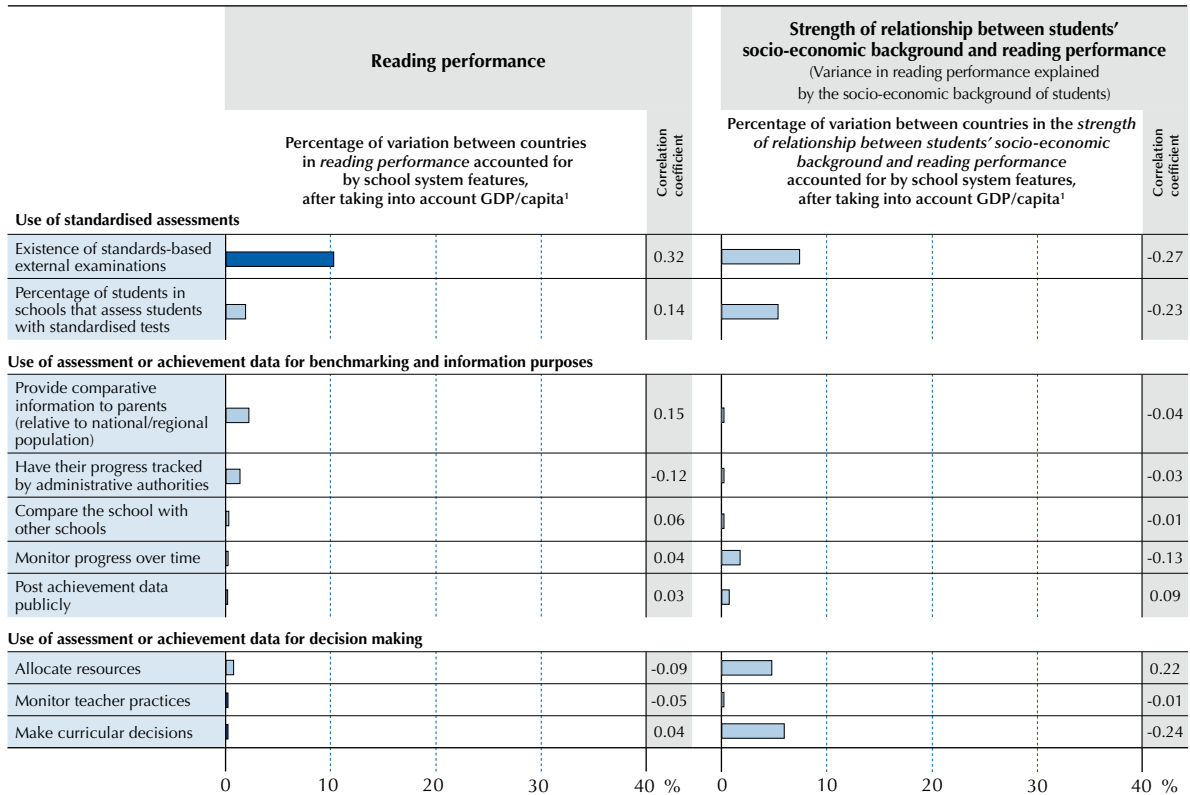
On average across OECD countries, 2% of the performance variation is attributable solely to various aspects of schools' assessment and accountability practices, but a further 4% is attributable to both assessment and accountability practices, and the socio-economic and demographic background of students and schools (Figure IV.2.7 and Table IV.2.9a).

Although the use of standardised tests tends to be unrelated to school performance, it does relate to levels of equity within school systems. School systems that have high proportions of students in schools that use standardised tests tend to show a lower impact of socio-economic background on learning outcomes between schools and a higher impact of socio-economic background on learning outcomes within schools (Table IV.2.1).¹⁴



■ Figure IV.2.6a ■


How school systems' assessment and accountability policies are related to educational outcomes



Note: Correlations that are statistically significant at the 10% level ($p < 0.10$) are marked in a darker tone.

1. The percentage is obtained by squaring the correlation coefficient and then multiplying it by 100.

Source: OECD, *PISA 2009 Database*, Table IV.2.1.

StatLink  <http://dx.doi.org/10.1787/888932343380>

Critics of the use of standardised tests that are based on student performance levels rather than on individual student progress argue that these may reinforce the advantages of schools that serve students from socio-economically advantaged backgrounds (Ladd and Walsh, 2002; Downey, Von Hippel and Hughes, 2008). In addition, teachers may respond strategically to accountability measures by sorting out or retaining disadvantaged students (Jacob, 2005; Jennings, 2005). However, while the results from PISA support the notion that the prevalence of testing is related to socio-economic inequities *within* schools, the higher level of socio-economic equalities *between* schools in school systems that use standardised tests is much greater than socio-economic inequities within schools (Table IV.2.10). One explanation for the positive association between the prevalence of standardised tests and improved equity in school systems is that such tests provide schools with instruments to compare themselves with other schools. This, in turn, allows schools to observe the inequities among schools, which could be considered the first step towards redressing them. The results from PISA also show higher levels of socio-economic equity in school systems that use achievement data to make decisions about the curriculum and track achievement data over time.

How resources invested in education are related to student performance

Effective schools require the right combination of trained and talented personnel, appropriate curricula, adequate facilities and motivated students who are ready to learn. At the same time, demands for investments in education need to be balanced against other demands on public expenditure and the overall burden of taxation. As discussed in Chapter 3, school systems differ in the amount of time, human, material and financial resources they invest in education. Equally important, school systems also vary in how these resources are spent.


■ Figure IV.2.6b ■

Countries in which school assessment and accountability policies are related to reading performance

| School assessment and accountability policies (the model includes all of these assessment and accountability policies) | Without accounting for the socio-economic and demographic background of students and schools | | With accounting for the socio-economic and demographic background of students and schools | |
|--|---|---|---|--|
| | Negative relationship | Positive relationship | Negative relationship | Positive relationship |
| Use of standardised tests | <i>OECD</i> | Austria, Belgium, Chile, Germany, Italy, United Kingdom, United States | Hungary, Portugal, Slovak Republic | Austria, Belgium |
| | OECD average change in score: -3.0 | | OECD average change in score: -1.2 | |
| <i>Partner</i> | Bulgaria, Jordan, Singapore | Azerbaijan, Colombia, Hong Kong-China, Lithuania, Shanghai-China, Uruguay | Azerbaijan, Hong Kong-China, Shanghai-China | |
| Use of assessment or achievement data: Provide information to parents (benchmark students to national or regional populations) | <i>OECD</i> | Slovak Republic, Switzerland | Turkey | Hungary, Slovak Republic, Switzerland |
| | OECD average change in score: 0.7 | | OECD average change in score: -1.4 | |
| <i>Partner</i> | Brazil, Dubai (UAE), Jordan, Kazakhstan, Qatar, Chinese Taipei | Montenegro, Trinidad and Tobago | Jordan, Latvia, Qatar | Hong Kong-China, Montenegro |
| Use of assessment or achievement data: Have their progress tracked by administrative authorities | <i>OECD</i> | Denmark, Ireland, Slovenia, United Kingdom, United States | Austria, Norway, Switzerland | Luxembourg |
| | OECD average change in score: -1.4 | | OECD average change in score: 2.7 | |
| <i>Partner</i> | | Brazil, Lithuania, Russian Federation | Singapore | Panama, Peru, Romania, Russian Federation, Chinese Taipei |
| Use of assessment or achievement data: Compare to other schools | <i>OECD</i> | Chile | Austria, Denmark, Germany, Greece, Japan, Spain, Turkey | Australia, Chile |
| | OECD average change in score: 5.5 | | OECD average change in score: 1.8 | |
| <i>Partner</i> | Albania, Brazil, Colombia, Indonesia, Kyrgyzstan, Russian Federation, Chinese Taipei, Uruguay | Jordan, Trinidad and Tobago, Tunisia | Indonesia, Kyrgyzstan, Panama, Chinese Taipei | Azerbaijan, Tunisia |
| Use of assessment or achievement data: Monitor school's progress | <i>OECD</i> | Australia, Switzerland, Turkey | Chile, Czech Republic, Mexico, United States | Austria, Finland, Korea, United Kingdom |
| | OECD average change in score: 0.1 | | OECD average change in score: -2.1 | |
| <i>Partner</i> | Hong Kong-China, Lithuania | Albania, Kazakhstan, Peru | Lithuania, Serbia | Albania, Bulgaria, Kazakhstan, Montenegro |
| Use of assessment or achievement data: Post achievement data publicly | <i>OECD</i> | | Australia, Germany, Greece, Italy, Slovak Republic, Slovenia, Turkey | Switzerland |
| | OECD average change in score: 13.7 | | OECD Average change in score: 4.0 | |
| <i>Partner</i> | Argentina, Azerbaijan, Kazakhstan, Montenegro, Qatar | Albania, Colombia, Croatia, Hong Kong-China, Kyrgyzstan, Lithuania, Peru, Romania, Chinese Taipei | Azerbaijan, Kazakhstan, Qatar | Colombia, Hong Kong-China, Kyrgyzstan, Romania, Chinese Taipei |
| Use of assessment or achievement data: Allocate resources | <i>OECD</i> | Canada, Italy, Japan | | |
| | OECD average change in score: -6.6 | | OECD average change in score: -5.2 | |
| <i>Partner</i> | Albania | | Colombia, Macao-China, Chinese Taipei | Hong Kong-China |
| Use of assessment or achievement data: Monitor teacher practices | <i>OECD</i> | Belgium, Hungary | Netherlands | |
| | OECD average change in score: -2.5 | | OECD average change in score: -3.0 | |
| <i>Partner</i> | Azerbaijan, Dubai (UAE), Hong Kong-China, Lithuania, Tunisia | Peru, Chinese Taipei | Azerbaijan, Hong Kong-China, Tunisia | Chinese Taipei |
| Use of assessment or achievement data: Make curricular decisions | <i>OECD</i> | Italy | Denmark | |
| | OECD average change in score: 0.9 | | OECD average change in score: 1.0 | |
| <i>Partner</i> | Bulgaria, Colombia, Hong Kong-China, Qatar, Shanghai-China | Chinese Taipei | Serbia, Shanghai-China | |

Note: Only those school systems where there is a statistically significant relationship between school assessment and accountability policies and reading performance are listed. OECD averages in bold denote that the estimate is statistically significant at the 5% level ($p < 0.05$).

Source: OECD, PISA 2009 Database. Tables IV.2.9b and IV.2.9c.

StatLink  <http://dx.doi.org/10.1787/888932343380>



■ Figure IV.2.7 ■

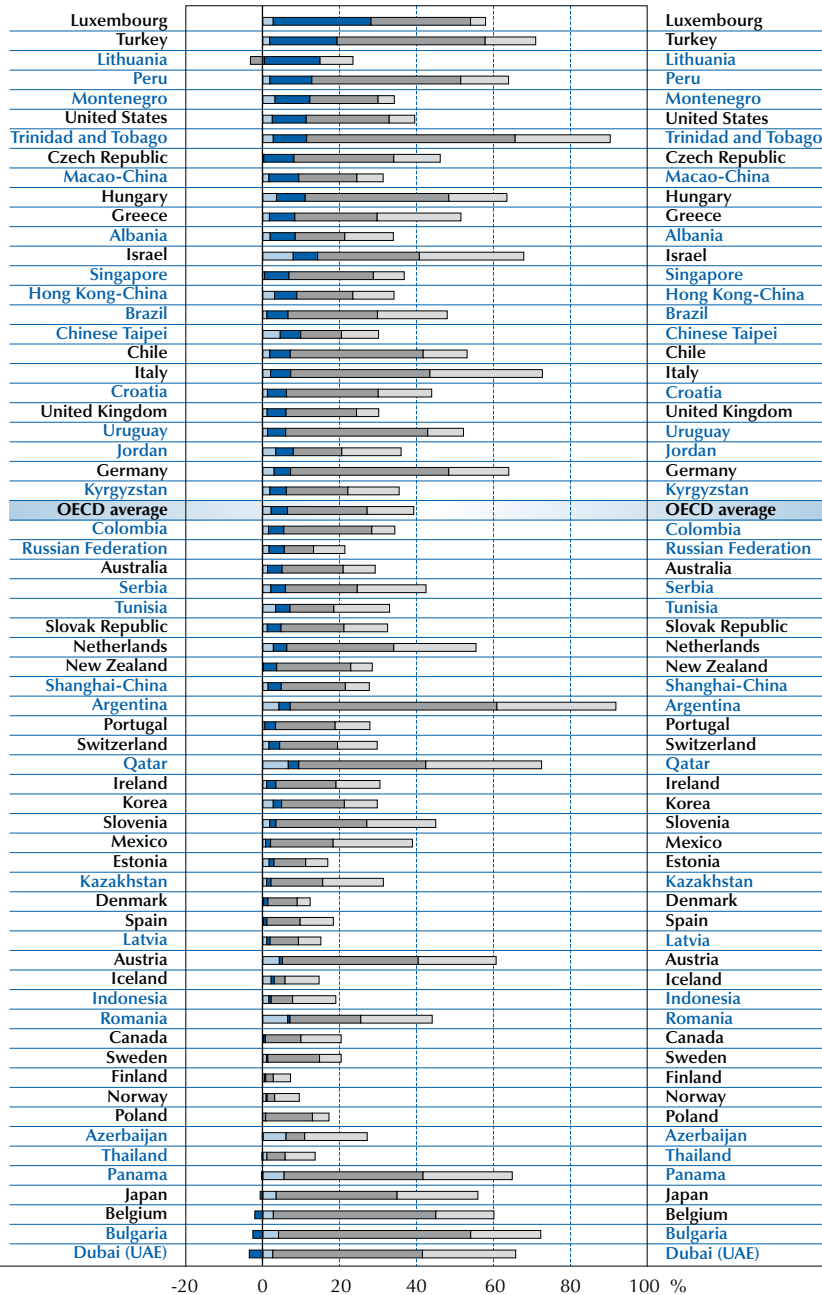
How schools' assessment and accountability policies are related to reading performance

Expressed as a percentage of the average variance in reading performance in OECD countries
(100% is the average total variance in reading performance across OECD countries)

Variance in reading performance:

- Solely accounted for by schools' assessment and accountability policies
- Jointly accounted for by students' and schools' socio-economic and demographic background and by schools' assessment and accountability policies
- Solely accounted for by students' and schools' socio-economic and demographic background
- Unaccounted for by any of the above factors

Between-school variance



Countries are ranked in descending order of the variance jointly accounted for.

Source: OECD, PISA 2009 Database, Table IV.2.9a.

StatLink <http://dx.doi.org/10.1787/888932343380>

Yet, research usually shows a weak relationship between educational resources and student performance, with more variation explained by the quality of human resources (*i.e.* teachers and school principals) than by material and financial resources, particularly among industrialised nations (Fuller, 1987; Greenwald, Hedges and Laine, 1996; Buchmann and Hannum, 2001; Rivkin, Hanushek and Kain, 2005).

The generally weak relationship between resources and performance observed in past research is also seen in PISA. At the level of the education system, accounting for the level of national income, the only type of resource that PISA shows to be correlated with student performance is the level of teachers' salaries relative to national income (Figure IV.2.8).¹⁵ As shown in Chapter 3, teachers' salaries are related to class size in that if spending levels are similar, school systems often make trade-offs between smaller classes and higher salaries for teachers. The findings from PISA suggest that teachers' salaries are correlated with overall performance, such that school systems that choose to invest in higher salaries for teachers show higher-than-average student performance. This is consistent with school-effects research that underscores the cost-effectiveness of investing in teacher quality rather than in reducing class size (Greenwald, Hedges and Laine, 1996; Rivkin, Hanushek and Kain, 2005).

Within school systems, where relationships between resources invested in education and reading performance are observed, they are typically closely associated with corresponding socio-economic differences: socio-economically advantaged schools also tend to be schools with better educational resources. Across OECD countries, and considering aspects that relate to class size, instruction time, participation in after-school lessons, availability of extra-curricular activities, and the school principal's perception of teacher shortages and a lack of material resources that adversely affects instruction, only 5% of the variation in student performance is attributable solely to the differences in the educational resources available to the schools. In contrast, 18% of the variation in student performance is attributable jointly to spending on education and the socio-economic and demographic background of students and schools (Figure IV.2.9 and Table IV.2.12a). Improving equity will thus require considering the disparities in resources among schools.

In Turkey, Italy, Luxembourg, Chile and the partner countries Trinidad and Tobago, Argentina, Peru, Uruguay and Panama, 30 percentage points or more of the variation in student performance is attributable to both factors. In these countries, socio-economically advantaged schools tend to have more educational resources and tend to perform better.

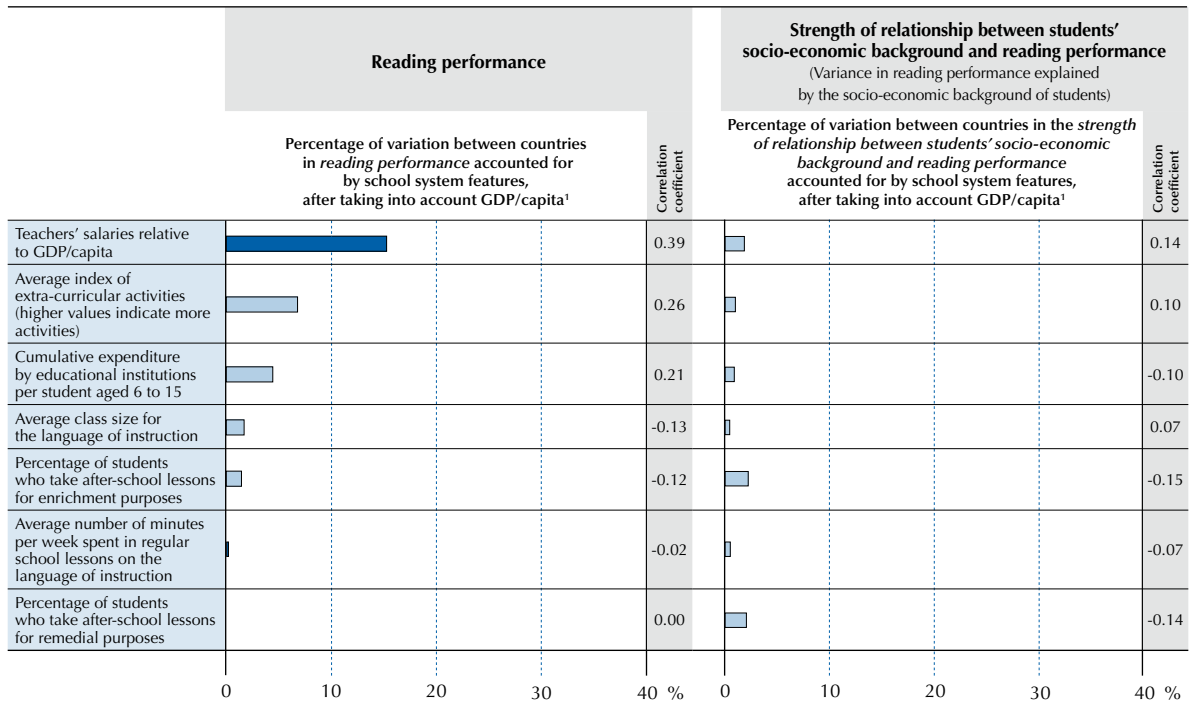
In other words, while much of the variation in student performance cannot be predicted solely by the levels of resources, resources are closely related to the socio-economic composition of individual schools, such that socio-economically advantaged students attend schools with better resources. Which resources are most likely to be oriented towards socio-economically advantaged students? Which school systems distribute resources more equitably? A correlational analysis between each school's resource level and its average socio-economic background sheds light on how resources are distributed.

Across OECD countries, it is more common for schools that serve students from socio-economically advantaged backgrounds to have larger class sizes and offer more extracurricular activities (Table IV.2.11). In 22 OECD countries, PISA shows a moderate or strong positive relationship between the socio-economic background of the school and the average class size. In 12 OECD countries, there is a moderate or strong positive relationship between the socio-economic background of the school and the *index of extra-curricular activities*, which measures the amount of extra-curricular activities offered at the school. In three OECD countries, there is a moderate relationship between the school's average socio-economic background and the *index of quality of educational resources*. This index, constructed from school principals' reports, measures the extent to which the lack of certain resources hinders the school's ability to provide instruction. High levels in the index indicate more resources. In three OECD countries, schools with more advantaged socio-economic backgrounds are less likely to suffer from teacher shortages, as indicated by the *index of teacher shortage*. This index measures the extent to which the lack of qualified teachers hinders a school's ability to provide instruction, as reported by the school principal. In two OECD countries, schools with advantaged socio-economic backgrounds provide more hours of instruction than socio-economically disadvantaged schools. In two OECD countries, socio-economically disadvantaged schools provide more hours of instruction than advantaged schools. When considering the relationships between schools' socio-economic profile and class size, learning time, extracurricular activities, teacher shortages and material resources, Japan, Luxembourg and Mexico show the strongest relationship between the availability of resources at school and the school's socio-economic intake, since three out of those five features are related to the schools' average socio-economic status.

The lack of correlation between the level of resources and performance or equity among school systems does not mean that resource levels do not affect performance at all. Rather, it implies that, given the variation in resources observed in PISA, they are unrelated to performance or equity. A school system that lacks teachers, infrastructure and textbooks will almost certainly perform at lower levels; but given that most school systems in PISA appear to satisfy the minimum resource requirements for teaching and learning, the lack of a relationship between many of the resource aspects and both equity and performance may result simply from a lack of sufficient variation among OECD countries. Within each school system, most of the relationship between school resources and reading performance is also closely associated with schools' socio-economic and demographic profile. This suggests the need for more consideration on how to distribute resources for schools more equitably.

■ Figure IV.2.8 ■


How school systems' resources are related to educational outcomes



Note: Correlations that are statistically significant at the 5% level ($p < 0.05$) are marked in a darker tone.

1. The percentage is obtained by squaring the correlation coefficient and then multiplying it by 100.

Source: OECD, *PISA 2009 Database*, Table IV.2.1.

StatLink  <http://dx.doi.org/10.1787/888932343380>

Resources invested in education include more than human and material resources; they also include students' learning time, which involves how learning time is distributed across subjects and over a student's career, including the incidence and intensity of pre-primary education, and the age at which primary schooling starts. Volume II, *Overcoming Social Background*, suggests that students who attended pre-primary education perform better in PISA than students who did not. This relationship holds even after taking into account students' socio-economic background, signalling that the relationship between pre-school attendance and performance at age 15 is not mainly a reflection of socio-economically advantaged students attending pre-primary education. When examining who benefits more by attending pre-primary education, socio-economically disadvantaged and advantaged students benefit equally from pre-school attendance in most countries, while in some countries the impact of pre-school attendance on performance is greater for students with an immigrant background than for native students. In countries that spend more on pre-school education per student, the advantage of attending pre-school for students from immigrant backgrounds tends to be greater.

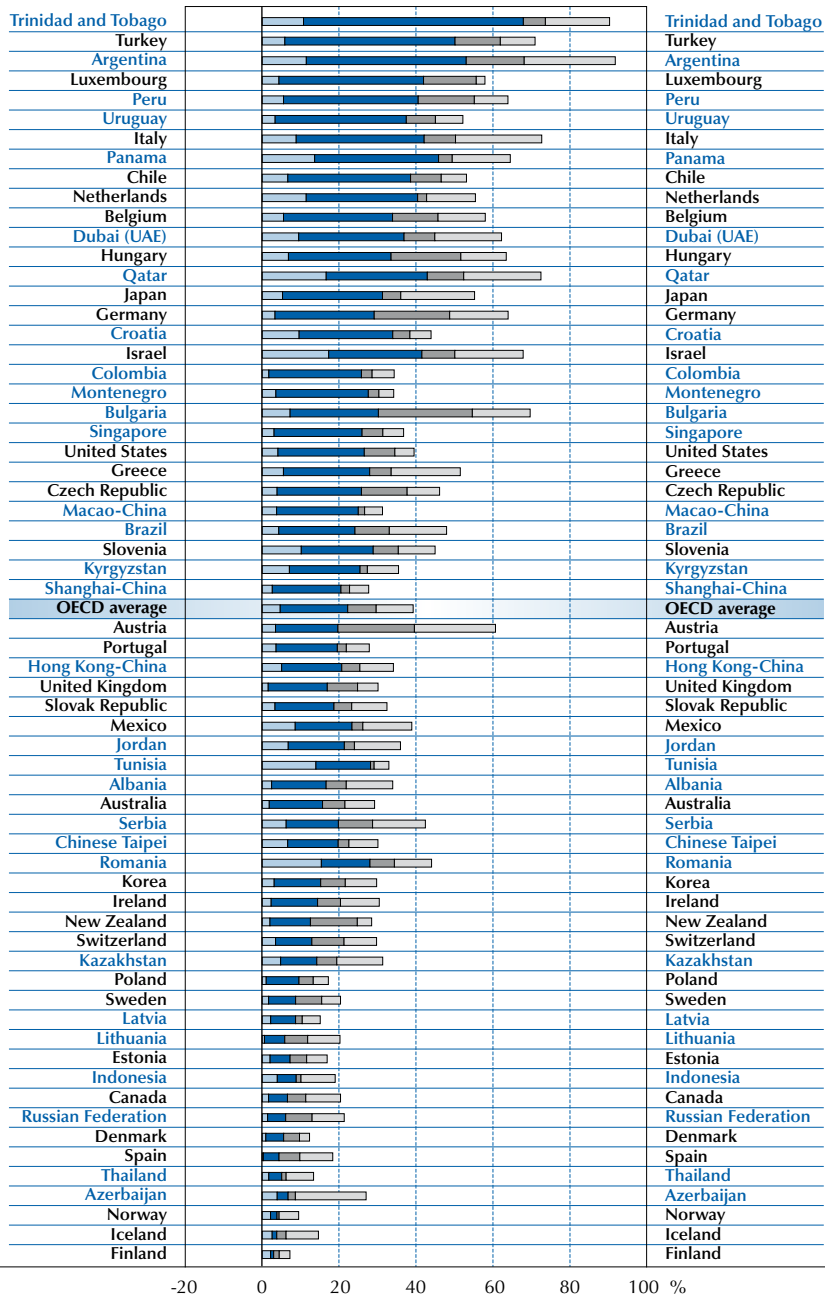
■ Figure IV.2.9 ■

How school resources are related to reading performance

Expressed as a percentage of the average variance in reading performance in OECD countries
(100% is the average total variance in reading performance across OECD countries)

Variance in reading performance:

- Solely accounted for by resources invested in education
- Jointly accounted for by students' and schools' socio-economic and demographic background and by resources invested in education
- Solely accounted for by students' and schools' socio-economic and demographic background
- Unaccounted for by any of the above factors

Between-school variance

Countries are ranked in descending order of the variance jointly accounted for.

Source: OECD, PISA 2009 Database, Table IV.2.12a.

StatLink <http://dx.doi.org/10.1787/888932343380>

The analyses in Volume II also show that the benefit of attending pre-primary education varies by country, and that this variability is largely explained by the PISA indicators related to the quality of pre-school education. The performance advantage among students who had attended pre-primary education is larger in countries where pre-primary education lasts longer, where there are smaller pupil-to-teacher ratios at the pre-primary level and where there is higher public expenditure per pupil at the pre-primary level of education.

Do the individual benefits of attending pre-primary education add up to better overall performance among school systems in which more students attend pre-school? The results from PISA show no relationship between the average performance of OECD countries and the proportion of students in these countries who had attended pre-primary school. However, when considering all countries and economies participating in PISA, they show a positive relationship between the proportion of students who attended pre-primary education and the average performance of the school system, even after taking into account the country's national income. School systems that show a 10 percentage point advantage in the proportion of students who attended pre-primary education are school systems that also score, on average, 12.3 points higher in reading performance.¹⁶ This may reflect the fact that the majority of students in most OECD countries have access to pre-primary education, and of these students, a large proportion attend for more than one year. In fact, in more than half of all OECD countries, more than 92% of 15-year-old students reported that they attended pre-primary schools for at least some time (see Table IV.3.18).

How resources, policies and practices are related to each other

Many of the aspects related to the organisation of school systems are closely interrelated (Figure IV.2.10). For example, school systems that offer a greater number of programmes to 15-year-old students also tend to select students earlier. School systems with a greater number of programmes are also school systems with higher transfer rates and school systems with higher transfer rates also tend to be systems with higher rates of grade repetition.

■ Figure IV.2.10 ■

How selected organisational features are inter-related

Values in the cells present partial correlation coefficients between two relevant measures after accounting for GDP/capita. Correlation coefficients range from -1.00 (i.e. a perfect negative linear association) to +1.00 (i.e. a perfect positive linear association). When a correlation coefficient is 0, there is no linear relationship between two measures.

| | Percentage of students who repeated one or more grades | Each additional year of selection prior to the age of 15 | Number of school types or distinct educational programmes available for 15-year-olds | Percentage of students in selective schools | Percentage of students in schools that group students by ability | Percentage of students in schools that transfer students to other schools due to low achievement, behavioural problems or special learning needs | Average index of school responsibility for curriculum and assessment (higher values indicate more autonomy) | Average index of school responsibility for resource allocation (higher values indicate more autonomy) | Existence of standards-based external examinations | Teachers' salaries relative to GDP/capita |
|--|--|--|--|---|--|--|---|---|--|---|
| Percentage of students who repeated one or more grades | | 0.23 | 0.36 | 0.08 | 0.55 | 0.41 | -0.40 | -0.14 | -0.56 | 0.33 |
| Each additional year of selection prior to the age of 15 | 0.10 | | 0.75 | 0.63 | 0.29 | 0.56 | -0.02 | 0.12 | -0.02 | 0.17 |
| Number of school types or distinct educational programmes available for 15-year-olds | -0.01 | 0.64 | | 0.63 | 0.45 | 0.48 | 0.07 | 0.17 | 0.03 | 0.30 |
| Percentage of students in selective schools | -0.14 | 0.41 | 0.55 | | 0.44 | 0.32 | 0.31 | 0.25 | 0.19 | 0.24 |
| Percentage of students in schools that group students by ability in all subjects | 0.22 | 0.09 | 0.30 | 0.24 | | 0.45 | -0.11 | 0.13 | -0.08 | 0.20 |
| Percentage of students in schools that transfer students to other schools due to low achievement, behavioural problems or special learning needs | 0.31 | 0.27 | 0.26 | 0.27 | 0.37 | | -0.44 | -0.23 | -0.29 | 0.05 |
| Average index of school responsibility for curriculum and assessment (higher values indicate more autonomy) | -0.25 | -0.07 | 0.01 | 0.23 | -0.23 | -0.27 | | 0.59 | 0.52 | 0.06 |
| Average index of school responsibility for resource allocation (higher values indicate more autonomy) | -0.07 | 0.06 | 0.08 | 0.27 | 0.01 | -0.04 | 0.53 | | 0.19 | -0.25 |
| Existence of standards-based external examinations | -0.60 | -0.03 | 0.03 | 0.13 | -0.03 | -0.18 | 0.47 | 0.12 | | -0.28 |
| Teachers' salaries relative to GDP/capita | 0.13 | 0.03 | 0.05 | 0.24 | 0.00 | -0.10 | 0.33 | -0.04 | 0.03 | |

Note: Correlation coefficients that are statistically significant at the 5% level ($p < 0.05$) are indicated in bold and at the 10% level ($p < 0.10$) are in italic. StatLink <http://dx.doi.org/10.1787/888932343380>

School systems with higher transfer rates or higher grade repetition rates also tend to offer less autonomy to schools in formulating curricula and assessments and are also somewhat less likely to use standardised tests to measure their students' achievement. School systems that provide schools with more responsibility to set their own curricula and assessment policies are also school systems in which schools have more responsibility for allocating resources.

In summary, when characteristics related to a school system's overall performance (*i.e.* grade repetition, transfer rates, ability grouping, curricular autonomy, the existence of standards-based external examinations and teachers' salaries) and national income are considered together, 58% of the variation in performance across OECD countries is accounted for. Examining the variation in performance across all participating countries and economies, these 6 system characteristics together with national income account for 62% of the variation across systems.¹⁷

HOW THE LEARNING ENVIRONMENT IS RELATED TO STUDENT PERFORMANCE

How schools are organised and governed tends to influence learning in schools and classrooms indirectly. PISA has also looked at aspects of the learning environment that affect learning more directly. This section examines how teacher-student relations, disciplinary climate, student- and teacher-related factors affecting school climate, teachers' stimulation of students, school principals' leadership and their perceptions of parents' pressure to raise academic standards and achievement relate to student performance. Most of the measures of the learning environment are based on the perceptions and opinions of students and school principals (see Chapter 4). Since it is difficult to compare perceptions and opinions across countries (see Box IV.1.1), this section examines relationships between these aspects and student performance within each country.

PISA shows that, across OECD countries, 3% of the variation in student performance is attributable solely to the differences in learning environment, while 9% is attributable to both socio-economic background and the learning environment (Figure IV.2.11 and Table IV.2.13a).

Students' backgrounds are closely related to the learning environment, and these two factors are, in turn, strongly linked to performance – perhaps because students from socio-economically advantaged backgrounds bring with them a higher level of discipline and more positive perceptions of school values, or perhaps because parents' expectations of classroom discipline and teacher commitment are higher in schools whose student populations are from socio-economically advantaged backgrounds. Conversely, schools whose student populations come from disadvantaged backgrounds may not be put under the same kind of parental pressure to improve classroom discipline or to ensure that absent or unmotivated teachers are replaced. Thus, policy makers need to consider the joint influence of socio-economic background and learning environment if they want to ensure that all schools, regardless of the profile of their student populations, have committed teachers and orderly classrooms.

In some countries, the joint influence of the socio-economic background and the learning environment on performance is particularly large. For example, 15 percentage points or more is attributable jointly to the learning environment and socio-economic background in Luxembourg, Germany, Japan, Turkey, Italy, the Czech Republic, Chile and the partner countries and economies Trinidad and Tobago, Argentina, Croatia, Uruguay, Singapore, Montenegro and Macao-China (Figure IV.2.11 and Table IV.2.13a). In most countries and economies, only a small proportion – five percentage points or less – in performance variation is attributable solely to the learning environment, except in Israel, Japan and Italy, where more than seven percentage points is attributable solely to that factor.

Among the various characteristics related to the learning environment, which of those examined are positively related to student performance? Results show that in many countries, schools with better disciplinary climates, more positive behaviour among teachers and better teacher-student relations tend to achieve higher scores in reading, even after socio-economic background is accounted for (Figure IV.2.12 and Table IV.2.13c).

For example, even after accounting for the socio-economic and demographic background of students and schools, the performance of schools is positively related to higher values on the *index of teacher-student relations* in 10 OECD countries and 7 partner countries and economies; it is related to higher values on the *index of disciplinary climate* in 16 OECD countries and 22 partner countries and economies; and is positively related to higher values on the *index of teacher-related factors affecting school climate* in 14 OECD countries and 6 partner countries and economies. School principals' perceptions of parents' pressure to raise academic standards and achievement is related to higher student performance in 19 OECD countries and 10 partner countries and economies; but after the socio-economic background of students and schools is taken into account, that positive relationship is found in only four OECD countries and five partner countries and economies.



■ Figure IV.2.11 ■

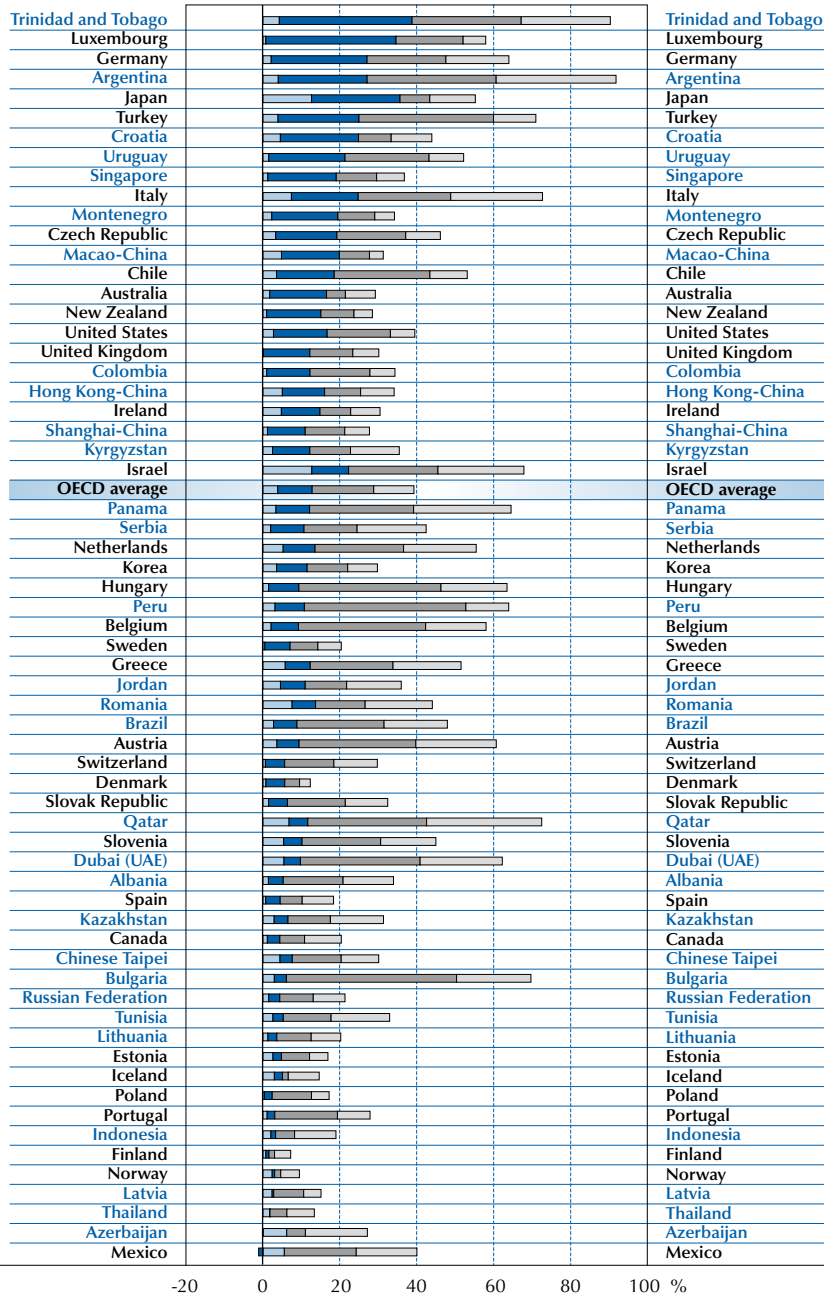
How the learning environment at school is related to reading performance

Expressed as a percentage of the average variance in reading performance in OECD countries
(100% is the average total variance in reading performance across OECD countries)

Variance in reading performance:

- Solely accounted for by the learning environment
- Jointly accounted for by students' and schools socio-economic and demographic background and by the learning environment
- Solely accounted for by students' and schools' socio-economic and demographic background
- Unaccounted for by any of the above factors

Between-school variance



Countries are ranked in descending order of the variance jointly accounted for.

Source: OECD, PISA 2009 Database, Table IV.2.13a.

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■ Figure IV.2.12 ■

Countries in which the learning environment at school is related to reading performance

| Learning environment (the model includes all of these features of learning environment) | Without accounting for the socio-economic and demographic background of students and schools | | With accounting for the socio-economic and demographic background of students and schools | | |
|---|---|--|--|--|---|
| | Negative relationship | Positive relationship | Negative relationship | Positive relationship | |
| Index of teacher-student relations (higher values indicate better relationships) (school average) | <i>OECD</i> | Austria, Germany, Spain, Switzerland | Australia, Denmark, Finland, Iceland, Ireland, Israel, Japan, Mexico | Austria | Australia, Czech Republic, Estonia, Greece, Iceland, Ireland, Israel, Japan, Mexico, Portugal |
| | OECD average change in score: 10.1 | | OECD average change in score: 16.7 | | |
| | <i>Partner</i> | Argentina, Colombia, Croatia, Kazakhstan, Kyrgyzstan, Montenegro, Panama, Serbia, Uruguay | Hong Kong-China, Jordan, Qatar, Shanghai-China, Tunisia | Kazakhstan, Kyrgyzstan | Bulgaria, Brazil, Hong Kong-China, Jordan, Peru, Qatar, Tunisia |
| Index of disciplinary climate (higher values indicate better climate) (school average) | <i>OECD</i> | | Australia, Austria, Belgium, Czech Republic, Denmark, France, Iceland, Ireland, Italy, Japan, Netherlands, New Zealand, Slovak Republic, Slovenia, Spain, Sweden, Switzerland, Turkey | | Australia, Austria, Czech Republic, Denmark, Greece, Israel, Italy, Japan, Mexico, Netherlands, New Zealand, Norway, Poland, Slovak Republic, Slovenia, Spain |
| | OECD average change in score: 28.6 | | OECD average change in score: 17.8 | | |
| | <i>Partner</i> | | Azerbaijan, Croatia, Dubai (UAE), Hong Kong-China, Kazakhstan, Kyrgyzstan, Lithuania, Macao-China, Montenegro, Panama, Qatar, Romania, Russian Federation, Singapore, Serbia, Shanghai-China, Trinidad and Tobago, Uruguay | | Azerbaijan, Brazil, Colombia, Croatia, Dubai (UAE), Hong Kong-China, Jordan, Kazakhstan, Kyrgyzstan, Latvia, Lithuania, Macao-China, Panama, Peru, Qatar, Romania, Russian Federation, Shanghai-China, Singapore, Chinese Taipei, Trinidad and Tobago, Uruguay |
| Index of teachers' stimulation of reading engagement (higher values indicate more stimulation) (school average) | <i>OECD</i> | Denmark, Greece, Israel, Slovak Republic | Austria, France, Germany | Israel, New Zealand | |
| | OECD average change in score: 0.1 | | OECD average change in score: -5.4 | | |
| | <i>Partner</i> | Brazil, Hong Kong-China, Indonesia, Singapore, Tunisia | | Brazil, Hong Kong-China, Indonesia, Latvia, Singapore | Montenegro |
| Index of student-related factors affecting school climate (higher values indicate a positive student behaviour) | <i>OECD</i> | Czech Republic, Estonia, Germany, Italy, Japan, Luxembourg, Netherlands, Slovak Republic | | Israel | Slovenia |
| | OECD average change in score: -7.7 | | OECD average change in score: -2.2 | | |
| | <i>Partner</i> | Croatia, Trinidad and Tobago, Uruguay | | Brazil, Croatia, Macao-China, Shanghai-China, Uruguay | Chinese Taipei |
| Index of teacher-related factors affecting school climate (higher values indicate a positive teacher behaviour) | <i>OECD</i> | | Australia, Austria, Belgium, Canada, Chile, Czech Republic, Denmark, Estonia, Germany, Greece, Hungary, Ireland, Italy, Japan, Korea, Luxembourg, Netherlands, New Zealand, Slovak Republic, Spain, Switzerland, United Kingdom, United States | | Austria, Belgium, Chile, Czech Republic, Estonia, Germany, Greece, Israel, Italy, Japan, Korea, Mexico, Netherlands, Spain |
| | OECD average change in score: 19.0 | | OECD average change in score: 7.9 | | |
| | <i>Partner</i> | | Argentina, Bulgaria, Brazil, Croatia, Dubai (UAE), Hong Kong-China, Indonesia, Singapore, Trinidad and Tobago, Uruguay | Chinese Taipei | Argentina, Brazil, Croatia, Romania, Thailand, Uruguay |
| Parents expect the school to set high academic standards and pressure for students to achieve them | <i>OECD</i> | | Belgium, Canada, Chile, Czech Republic, Denmark, Greece, Ireland, Israel, Italy, Japan, Korea, New Zealand, Norway, Poland, Portugal, Slovenia, Sweden, Turkey, United Kingdom | | Canada, Italy, New Zealand, Norway |
| | OECD average change in score: 26.9 | | OECD average change in score: 2.9 | | |
| | <i>Partner</i> | Azerbaijan | Albania, Brazil, Croatia, Kazakhstan, Latvia, Lithuania, Russian Federation, Singapore, Trinidad and Tobago, Uruguay | Azerbaijan | Bulgaria, Kazakhstan, Latvia, Lithuania, Trinidad and Tobago |
| Index of school principal's leadership (higher values indicate more leadership roles taken) | <i>OECD</i> | Finland, Israel, Italy, Slovak Republic | Mexico, Spain | Israel, Italy | |
| | OECD average change in score: -3.0 | | OECD average change in score: -2.4 | | |
| | <i>Partner</i> | Hong Kong-China | Jordan, Panama, Peru | Chinese Taipei | |

Note: Only those school systems where there is a statistically significant relationship between the learning environment and performance are listed. OECD averages in bold denote that the estimate is statistically significant at the 5% level ($p < 0.05$).

Source: OECD, PISA 2009 Database, Tables IV.2.13b and IV.2.13c.

StatLink  <http://dx.doi.org/10.1787/888932343380>

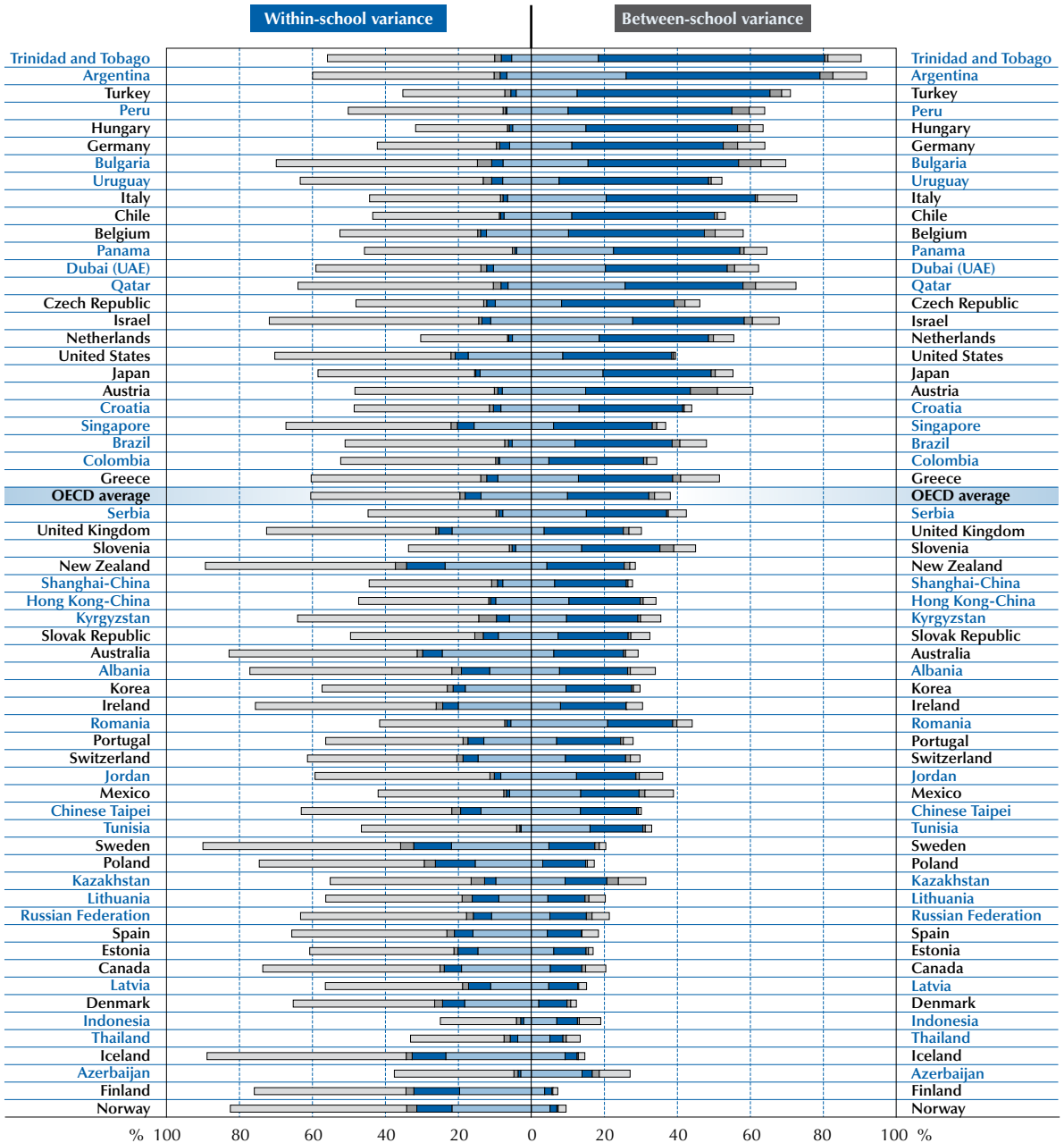


■ Figure IV.2.13 ■

How student and school characteristics are related to reading performance
 Expressed as a percentage of the average variance in reading performance in OECD countries
 (100% is the average total variance in reading performance across OECD countries)


Variance in reading performance:

- Solely accounted for by students' reading engagement and approaches to learning, the learning environment, resources, policies and practices
- Jointly accounted for by students' and schools' socio-economic and demographic background and by students' reading engagement and approaches to learning, the learning environment, resources, policies and practices
- Solely accounted for by students' and schools' socio-economic and demographic background
- Unaccounted for by any of the above factors



Countries are ranked in descending order of the between-school variance jointly accounted for.

Source: OECD, PISA 2009 Database, Table IV.2.14a.
 StatLink <http://dx.doi.org/10.1787/888932343380>



In summary, students perform better in schools that have better class discipline, more positive behaviour among teachers and better teacher-student relations, partly because such schools tend to have more students from advantaged backgrounds, who generally perform well, partly because the favourable socio-economic background of students reinforces a climate that is conducive to learning, and partly for reasons unrelated to socio-economic aspects. This relationship, which is not linked to socio-economic background, signals that a positive learning environment has, in itself, an independent relationship with performance, regardless of a school's socio-economic intake. In contrast, parental expectations of both their children and their children's schools are related to performance mainly because parents with high expectations tend to be those from more advantaged socio-economic backgrounds.

HOW THE FEATURES OF SCHOOLS AND SCHOOL SYSTEMS ARE INTERRELATED

Previous sections have described how organisational configurations of schools systems and the learning environment in individual schools interrelate with socio-economic factors to influence student performance. These relationships can also be examined in association with the findings discussed in Volume III, *Learning to Learn*, which focus on the association between students' reading habits, their approaches to learning and student performance.

After considering the socio-economic and demographic characteristics of students, their reading habits and approaches to learning, the learning environment and school organisation, across OECD countries, almost one-third of the student-level variation and almost nine-tenths of the between-school variation in performance can be explained by aspects measured by PISA (Figure IV.2.13 and Table IV.2.14a).

The learning environment shows an independent relationship with performance (Table IV.2.14c). However, the learning environment seems to be closely related to a school's organisational configuration, (this is evident when comparing the relationships between organisational variables in Tables IV.2.2c, IV.2.4c, IV.2.9c and IV.2.12c with the comparable estimates in Table IV.2.14c). School systems may thus shape the conditions for better learning outcomes, by providing organisational arrangements that promote better teacher-student relations, better disciplinary climates and better working environments for teachers.



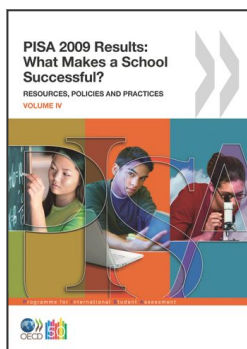
Notes

1. The correlation is a measure of the association between two variables but does not necessarily establish a causal relationship between these variables. Two variables can be associated (e.g. as one variable increases, so does the other) because of a causal relationship or because a common factor influences the variation in both variables simultaneously. Both raw correlations and partial correlations are presented. Raw correlations display the overall level of association between two variables; partial correlations account for national income, as measured by the per capita GDP of each country.
2. Since the characteristics of students and schools within each section are interrelated, it is important to estimate their overall relationship with student and school performance. Each section uses multilevel regression models with individual students' performance scores as the dependent variable, and includes student-level variables in the level-1 model and school-level variables in the level-2 model for the intercept.
3. For details on the rationale for analysing this particular set of characteristics and for measuring each feature, see Chapter 3.
4. Similar results are obtained through alternative statistical models with different specifications (i.e. 3-level hierarchical linear models). See further information in Annex A6. Given that there is a strong relationship between standards-based external examinations and repetition rates at the system level (Figure IV.2.10), the relationship between repetition rates and performance is not statistically significant when accounting for standards-based external examinations.
5. Similar results are obtained through alternative statistical models with different specifications (i.e. 3-level hierarchical linear models). See further information in Annex A6.
6. One unit in a students' socio-economic background is equivalent to one standard deviation in the *PISA index of economic, social and cultural status* across OECD.
7. Curricular autonomy, by comparison, also shows a positive relationship with individual schools' performance in a larger number of countries than for which a negative relationship is observed. The extent to which schools have autonomy is correlated with the rate at which schools transfer students because of low performance, special needs or behavioural problems (Figure IV.2.2). After taking student transfer rates into account, curricular autonomy at the system level is moderately related to student performance (correlation of 0.31, p-value of 0.10).
8. One unit on the index is equivalent to one standard deviation above the OECD average on the *index of school responsibility for curricula and assessments*.
9. This refers to the independent, or net, relationship between school competition and performance.
10. Private schools in this analysis include private schools that are dependent on and independent of the government. Private schools are classified as government-dependent private schools if they receive more than 50% of their funding from local, regional, state and/or national government sources. Schools are classified as government-independent private schools if they receive less than 50% of their funding from public sources.
11. Standards-based external examinations are defined according to John Bishop's definition of "curriculum-based external examination system" (CBEES). CBEES offers signals of student accomplishments that have real consequences for the student and defines achievement relative to an external standard, not relative to other students in the classroom or the school. To enable fair comparisons of achievement across schools and across students at different schools, CBEES is organised by discipline and keyed to the content of specific course sequences, which allocates the responsibility of preparing the student for particular examinations to one or a small group of teachers; signals multiple levels of achievement in the subject rather than indicating merely a pass-fail signal; and covers almost all secondary school students (Bishop, 1998; Bishop, 2001).
12. It is statistically significant at the 7% level when national income is taken into account.
13. This is based on the bivariate regression model with the existence of standards-based external examinations regressed on reading performance. Taking into account per capita GDP, the performance advantage for systems with standards-based external examinations is also 16 points. Across all countries and economies that participated in PISA 2009, the performance advantage for systems with standards-based external examinations is 17 points when not accounting for per capita GDP and 15 points when accounting for per capita GDP.
14. One may argue that this positive relationship between a greater use of standardised tests and equity is spurious because standardised tests are less frequently used in school systems that stratify their student populations early (Figure IV.2.10). This is because these school systems may have less of an incentive to implement standardised tests, since selection has already taken place (i.e. standardised tests are administered before the age of 15 or takes place through repetition/transfers). The correlation between the proportion of schools that use standardised tests and the equity measure, which is the impact of students' and schools' socio-economic impact on performance, is examined after accounting for the first age of selection and national income. The result shows that the relationship between a greater use of standardised tests and equity is still significant (-0.35).

15. Similar results are obtained through alternative models with different specifications (*i.e.* three-level hierarchical linear models). See further information in Annex A6.

16. These estimates result from an OLS regression model that regresses system-level reading scores on the percentage of students who attended pre-primary education (ISCED 0) and per capita GDP. Model fit for the model with all countries yields an R^2 of 0.52; model fit for the model restricted to OECD countries yields an R^2 of 0.17. The estimate for a 10 percentage point increase in pre-primary school attendance rates on reading performance is 4.5 (not statistically significant) in the sample restricted to OECD countries. Models for all countries are run with a sample size of 61 and models for OECD countries are run with a sample size of 33.

17. Caution is required as these results are based on only a limited number of cases. Due to a large amount of missing data regarding standards-based external examinations and teachers' salaries, the result for OECD countries is based on 26 OECD countries and the result for all participating countries is based on 35 countries and economies. Without including standards-based external examinations and teachers' salaries, four system characteristics and national income account for 50% of the variation in performance across 33 OECD countries and 60% of the variation in performance across 60 participating countries and economies.



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