



5

School Systems and the Impact of Socio-Economic Background

This chapter analyses the impact of the socio-economic background of schools on reading performance. The socio-economic gradient used extensively in Chapter 3 is used here to describe how students' socio-economic background is related to their performance within the same school, and how a school's average level of performance is related to the socio-economic composition of its student intake.

THE RELATIONSHIP BETWEEN PERFORMANCE AND SOCIO-ECONOMIC BACKGROUND

Socio-economic disadvantages have many facets and cannot be ameliorated by education policy alone, much less in the short term. The educational attainment of parents can only improve gradually, and average family wealth depends on the long-term economic development of a country and on a culture that promotes individual savings. However, even if socio-economic background itself is hard to change, previous chapters have shown that some countries succeed in mediating its impact on learning outcomes. So, to what extent can schools and school policies moderate the impact of socio-economic disadvantages on student performance?

This chapter extends the examination of the relationship between socio-economic background and student performance, as measured by the socio-economic gradient discussed in Chapter 3, to a closer analysis of patterns in each country, including how the socio-economic composition of schools affects these patterns. To this end, the gradient for a country is broken down into two parts: a within-school gradient and a between-school gradient. The within-school gradient describes how students' socio-economic background is related to their performance within a common school environment. The between-school gradient describes how schools' average level of performance is related to the average economic, social and cultural status of their student intake.¹

PERFORMANCE DIFFERENCES WITHIN AND BETWEEN SCHOOLS

As discussed in Volume IV, *What Makes a School Successful?*, the ways in which students are allocated to schools can result in large gaps and marked variations in performance between schools. There may also be large variations in performance among schools due to the socio-economic and cultural characteristics of the communities that are served or to geographical differences, such as differences between regions, provinces or states in federal systems, or between rural and urban areas. Differences can also be attributed to the organisation of the schooling systems and to characteristics that are more difficult to quantify, such as differences in the quality or the effectiveness of instruction that those schools provide. Variation in performance also occurs within schools. Students attending the same school may display different abilities or effort, or may be exposed to different learning opportunities.

Figure II.5.1 shows the extent to which the reading performance of 15-year-olds varies between and within schools in each country. Countries are sorted according to the total variance in student performance as a percentage of the average variance across OECD countries (a figure that appears next to the country names). Countries at the bottom end of the figure have a student variance well above the OECD average. For example, the total variance in Israel is 44% higher than that observed on average across OECD countries. In the figure, the total length of both the dark blue and the light blue bars indicates this observed total variation in reading performance.² In countries where a sizable proportion of 15-year-olds are not at school, the variance in student performance is likely to be underestimated (Table A2.1). This effect may explain, at least partially, the list of countries that appears at the top of this figure.

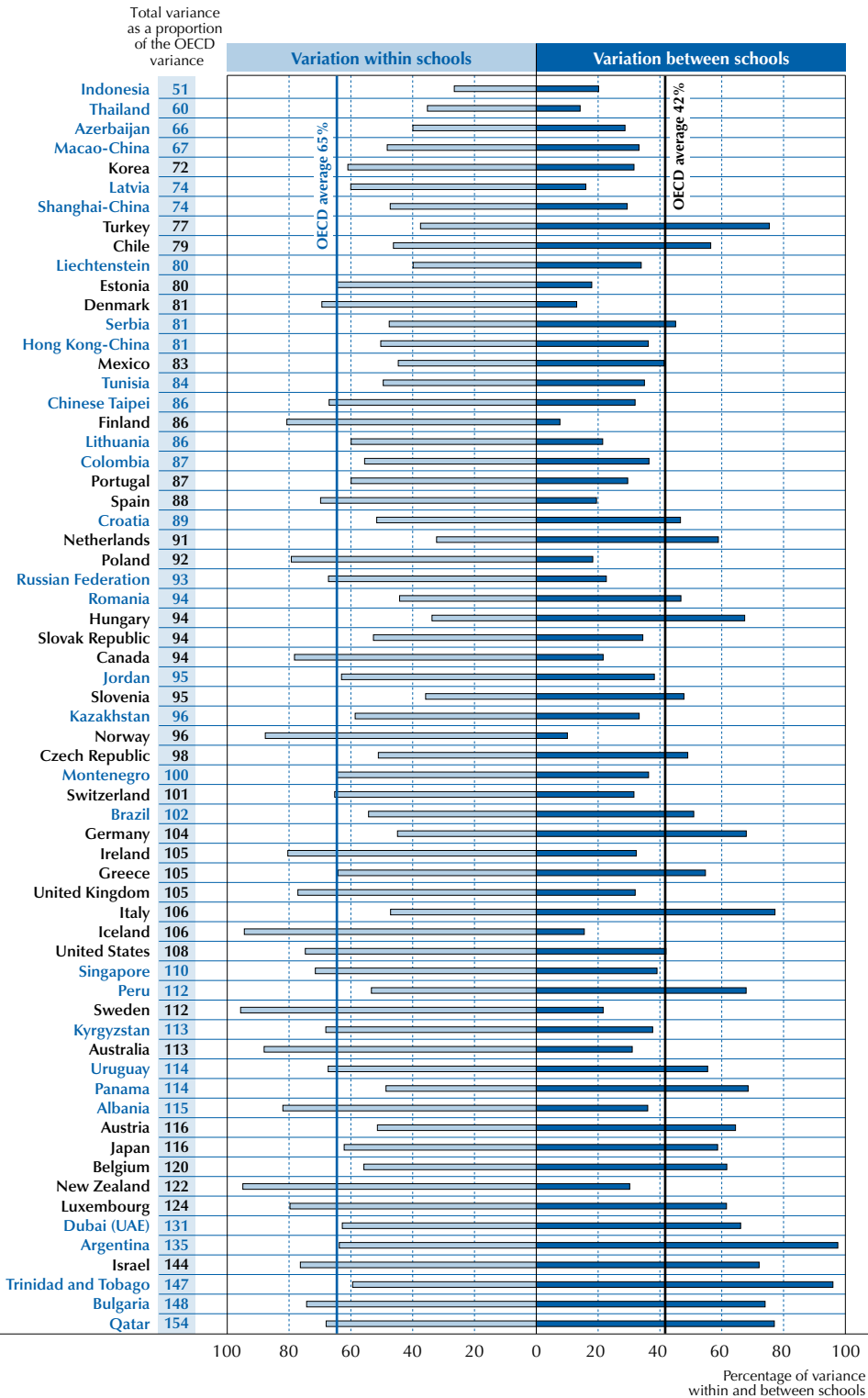
The darker segment of the bar in Figure II.5.1 represents the performance variation that can be attributed to differences in student results in different schools (between-school variation); the light bar represents the part of the performance variation that can be attributed to the range of student results that cannot be attributed to differences between schools and can thus be attributed to differences in the performance of students within schools (within-school variation).³ The vertical lines in Figure II.5.1 mark the OECD averages of the percentage of the total variance in student performance that can be attributed to either differences among schools or differences among students within schools.

In Belgium, for example, where the overall variance is 20% above the OECD average, the proportion of the total variance that is attributed to between-school differences is higher than the OECD average, but the within-school variance is lower than the OECD average. The same holds for Germany, Italy, Austria, Greece and Japan, among OECD countries with higher total variance than the OECD average and higher variance between schools, but lower within school variance than the OECD average. In contrast, in Sweden, New Zealand, Iceland, Australia, Ireland, the United Kingdom and Switzerland, the above-average total variation is driven by large performance differences within schools. In Israel, the United States and Luxembourg, both the between- and within-school variations contribute to a total variance in student performance that is above the OECD average.

The proportion of the variance in student performance that occurs between schools can be interpreted as a measure of vertical or academic inclusion (Monseur and Crahay, 2008; Willms, 2010).⁴ Table II.5.1 provides an index of inclusion.



■ Figure II.5.1 ■
Variation in reading performance between and within schools
 Expressed as a percentage of the variance in student performance across OECD countries



Countries are ranked in ascending order of the total variance as a proportion of the overall variance in student performance across the OECD.

Source: OECD, PISA 2009 Database, Table II.5.1.

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inclusion. Where there is substantial variation in performance among schools but less variation among students within schools, these students tend to be grouped systematically in schools in which most students have relatively similar abilities. This may reflect school choices made by families according to geographic location and/or policies on school enrolment or on allocating students to different curricula in the form of tracking or streaming (see Volume IV, *What Makes a School Successful?*, for a more detailed analysis on the relationship between school policies and practices and equity). Where performance variation is concentrated within schools (*i.e.* high academic inclusion), educational policies that targeted individual schools are likely to miss out on many low-performing students. These, and other policy implications related with the distribution of performance between and within schools are discussed in more detail in the policy implication section of this volume.

DIFFERENCES IN THE SOCIO-ECONOMIC BACKGROUND OF STUDENTS AND SCHOOLS

Socio-economic background and student performance vary greatly within countries across schools and students. On average across OECD countries, the difference between the 25th percentile and the 75th percentile in the *PISA index of social, economic and cultural status* of students amounts to 1.29 units on that index. The dispersion of schools' socio-economic backgrounds can be calculated in a similar way. The gap between the 25th and 75th percentile of the socio-economic background of schools is about half that of students (0.65 units).

Figures II.5.2 and II.5.3⁵ show that the range between these two percentiles, both between individuals and between schools, varies greatly from one country to another (Table II.5.2). Longer bars indicate more diverse background of students and schools within the school system.

The proportion of the variation in socio-economic background between schools provides a measure of horizontal or social inclusion (to be distinguished from vertical or academic inclusion as discussed above). Table II.5.2 provides the index of social inclusion for PISA 2009. In a socially inclusive school system, the distribution of socio-economic backgrounds in each school reflects the distribution of socio-economic background in the system, that is, each school accommodates a range of socio-economic profiles among its students similar to the range in the population in general. In contrast, where students with very similar socio-economic backgrounds attend the same schools, the system displays low social inclusion. The extent of social inclusion for each school system may also reflect geographic location, policy, institutions or family choices.

Countries with high social inclusion also tend to show relatively high levels of academic inclusion, whether in reading, mathematics or science.⁶ Every OECD country with academic and social inclusion above the OECD average, except Spain, has a mean performance at or above the OECD average (Tables II.5.1 and II.5.2). These countries include Australia, Canada, Denmark, Estonia, Finland, Iceland, Ireland, New Zealand, Norway, Sweden, Switzerland and the United Kingdom. Schools in the OECD countries Chile, Hungary, Mexico, Turkey, Greece, Austria, Belgium and Italy show below-average levels of both academic and social inclusion. This signals a school system in which students of similar socio-economic background and academic performance generally attend the same schools.

PERFORMANCE DIFFERENCES AND THE SOCIO-ECONOMIC BACKGROUND OF STUDENTS AND SCHOOLS

Chapter 3 introduced the socio-economic gradient as a tool to analyse the relationship between socio-economic background and student performance. The following section explores the extent to which differences in performance between schools and among students within schools can be attributed to differences in socio-economic background between and within schools.

Figure II.5.4 shows the proportion of the between- and within-school variance in performance that can be attributed to socio-economic background differences within and between schools. The lighter segment of the bar represents the between-school variation that is explained by schools' socio-economic background; the dark bar represents the within-school variation that is explained by the socio-economic background of students within schools. The sum of both lengths gives an indication of the extent to which socio-economic differences are associated with performance differences. Countries are ranked according to total explained variance.

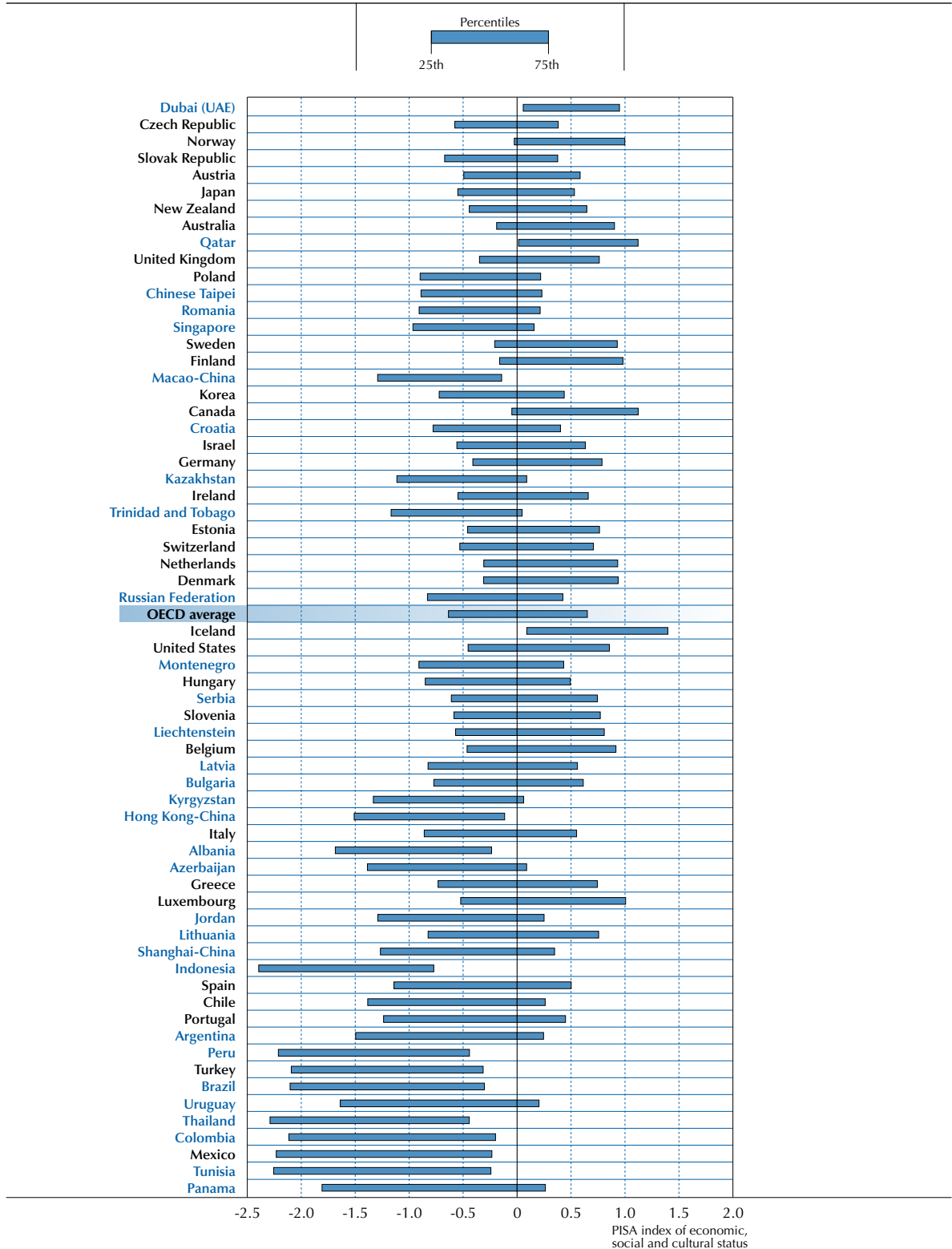
In many countries, variation in socio-economic background is closely related to variation in performance across and, to a lesser extent, within schools. Across OECD countries, differences in the socio-economic backgrounds of students attending different schools account for 57% of the performance differences between schools. However, this proportion varies considerably across countries. For example, and relative to the overall performance variation in OECD countries, in Finland, Iceland and Norway, differences in the socio-economic background of schools account for less than 30% of the already-small performance differences between schools.



■ Figure II.5.2 ■

Range of students' socio-economic background

Student variability in the distribution of the PISA index of economic, social and cultural status



Countries are ranked in ascending order of the interquartile range of the distribution of student-level socio-economic background.

Source: OECD, PISA 2009 Database, Table II.5.2.

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■ Figure II.5.3 ■

Range of schools' socio-economic background*School variability in the distribution of the students' average PISA index of economic, social and cultural status*

Countries are ranked in ascending order of the interquartile range of the distribution of school-level socio-economic background.

Source: OECD, PISA 2009 Database, Table II.5.2.


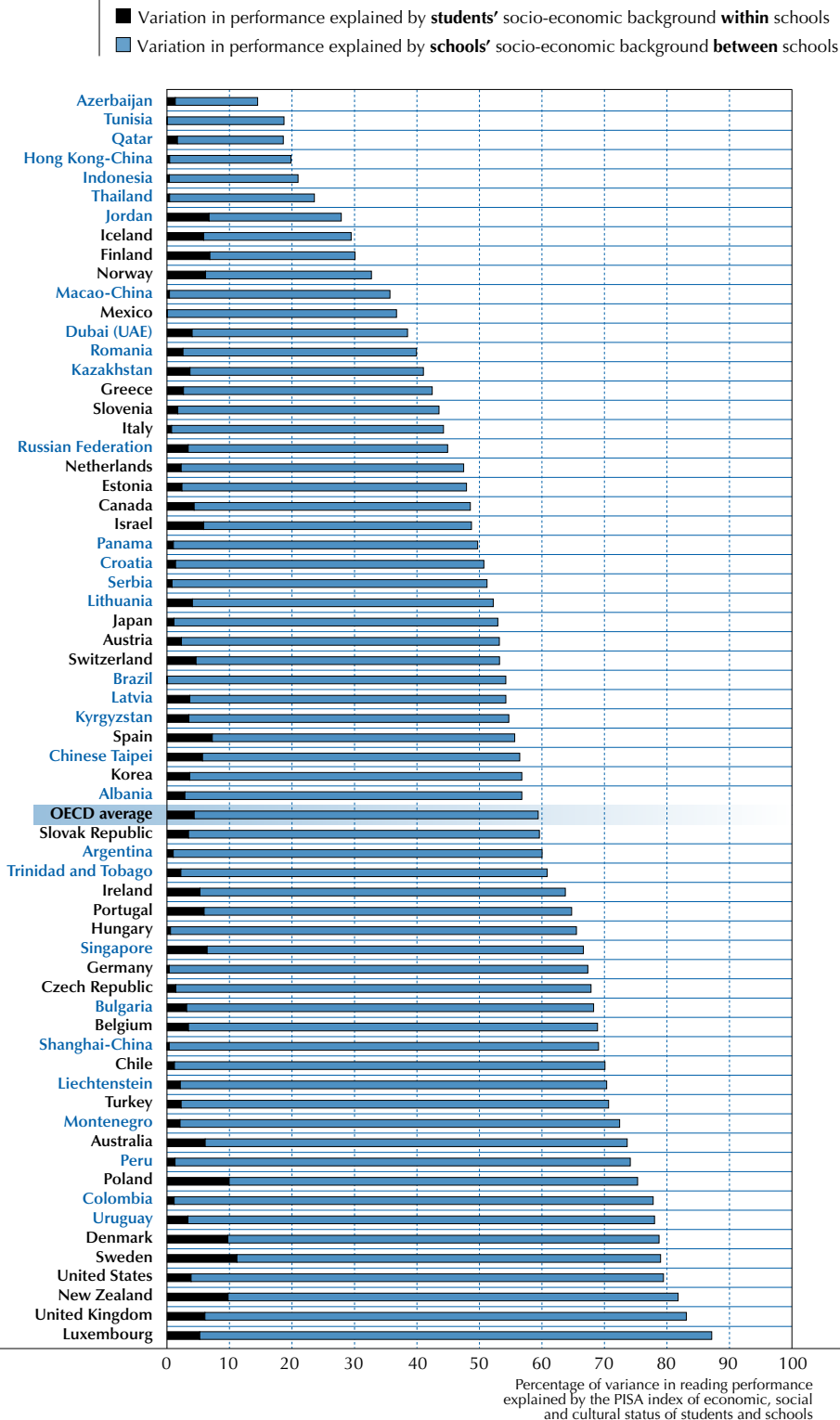
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Figure II.5.4

Variation in reading performance explained by students' and schools' socio-economic background

Expressed as a percentage of the average variance in student performance in OECD countries



Countries are ranked in ascending order of the percentage of overall variance in reading performance explained by the PISA index of economic, social and cultural status of students and schools.

Source: OECD, PISA 2009 Database, Table II.5.2.

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In the United Kingdom, the United States and New Zealand, the between-school performance variance explained by the socio-economic intake of schools is larger than 70%, and in Luxembourg it exceeds 80%. Among the partner countries and economies, the range is similar. In Azerbaijan, Qatar, Tunisia, Hong Kong-China, Indonesia, Jordan and Thailand, less than 30% of the performance variation between schools is explained by socio-economic background, while in Colombia, Uruguay, Peru and Montenegro, more than 70% is so explained.

In the same way that the strength of the relationship between socio-economic background and performance can be separately examined at the level of schools and students within schools, so too can the slope of the gradient.⁷

Figure II.5.5 displays the between- and within-school slopes of the socio-economic gradient. The length of each bar indicates the difference in scores on the PISA reading scale that is associated with an increment of half a standard deviation on the *PISA index of economic, social and cultural status* for the individual student (grey bar) and for the school's average (blue bar). Differences in the averages of schools' socio-economic backgrounds are, as observed in Figures II.5.2 and II.5.3, smaller than comparable differences between individual students, given that every school's intake includes students from mixed socio-economic backgrounds.⁸ A difference of 0.25 in the *PISA index of economic, social and cultural status* is thus a considerably more important gap across schools than among students.

To help interpretation, Figure II.5.5 includes the typical range of the average socio-economic background of schools for each country. Half a student-level standard deviation is the benchmark for measuring performance gaps in the figure because this value describes realistic differences between schools in terms of their socio-economic composition. On average across OECD countries, the difference between the 75th and 25th quartiles of the distribution of the school mean *PISA index of economic, social and cultural status* is 0.65 of a student-level standard deviation (Table II.5.2). Diversity in the socio-economic background of schools ranges from half or less of a standard deviation in Norway, Sweden, Finland, the Czech Republic, Estonia, Ireland, the Netherlands and Canada and the partner country Singapore, to one standard deviation or more in Mexico and Chile and the partner countries Panama, Thailand, Peru, Colombia, Argentina and Indonesia.

In almost all countries, and for all students, the blue bars in Figure II.5.5 indicate that regardless of their own socio-economic background, students attending schools in which the average socio-economic background is advantageous tend to perform better than when they are enrolled in a school with a disadvantaged socio-economic intake. In the majority of the OECD countries, the relationship between the average economic, social and cultural status of students in a school and their performance is steeper than the relationship between the individual student's socio-economic background and their performance in the same school.

The magnitude of the differences in performance associated with the socio-economic composition of the school is striking.⁹ In Japan, the Czech Republic, Germany, Belgium and Israel, and the partner countries Trinidad and Tobago and Liechtenstein, the improvement in student performance associated with a school's average economic, social and cultural status is substantial. In these countries, half a unit increase on the *PISA index of economic, social and cultural status* at the school level is equivalent to a difference of more than 50 score points.

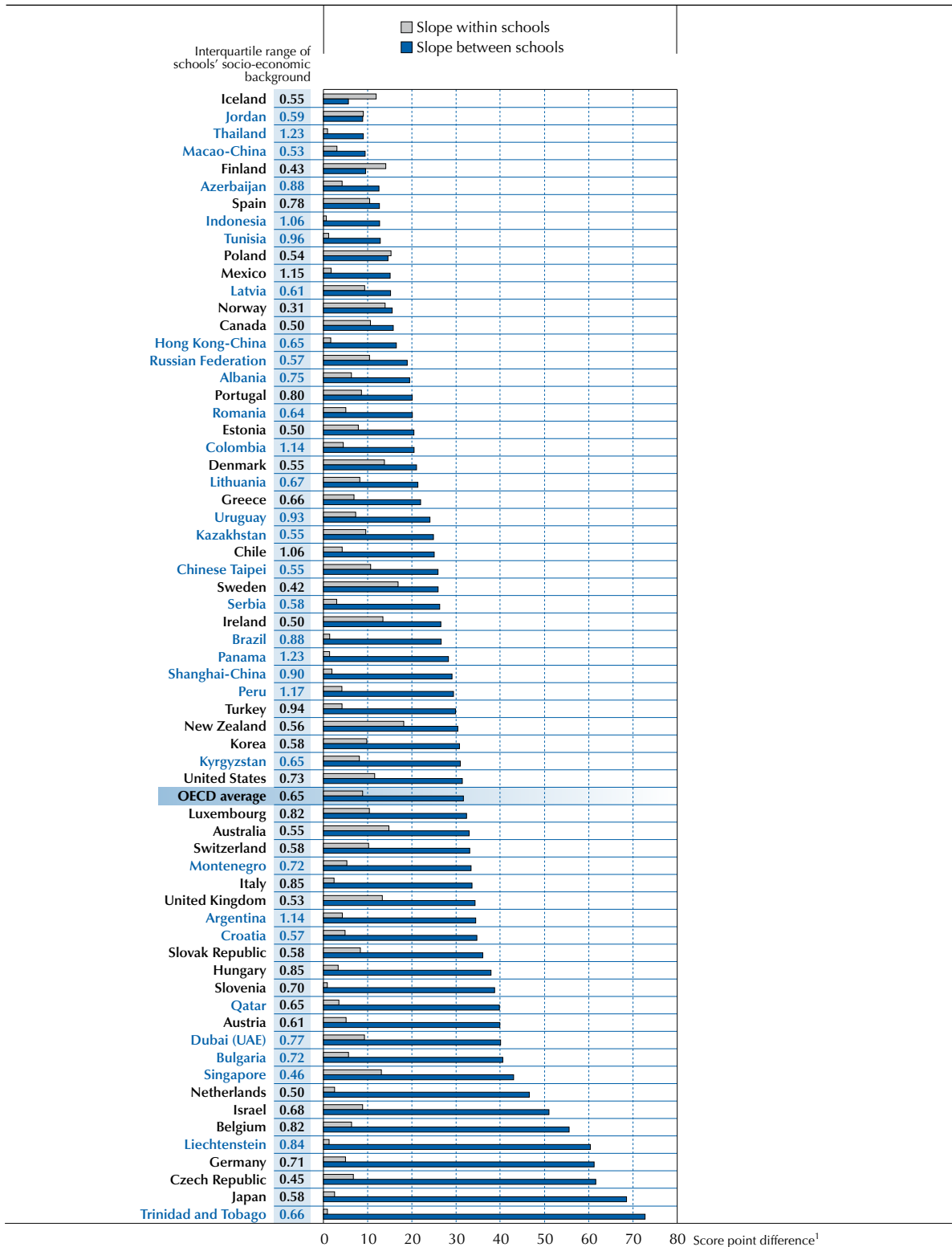
To put these numbers in more concrete terms, consider the hypothetical case of two students in any of these countries living in families with an average socio-economic background, as measured by the *PISA index of economic, social and cultural status*. One student attends a socio-economically advantaged school, say where the mean *PISA index of economic, social and cultural status* of the school's intake is one-quarter of a (student-level) standard deviation above the OECD average. Most of this student's peers will come from families that are more affluent. The other student attends a more socio-economically disadvantaged school: the school's mean *PISA index of economic, social and cultural status* is one-quarter of a standard deviation below the OECD average, so that the student comes from a more affluent family than many of his or her peers. The result indicates that the first student would be expected to show, on average across the OECD countries, 32 score point higher reading performance than the second student, and this difference is expected to exceed 50 score points in several countries (blue bar in Figure II.5.5).¹⁰

Within-school differences in socio-economic background across students display a gentler relationship with performance than the between-school differences. Consider the case of two students in the same country living with families whose different economic, social and cultural status gives them scores on the index that are one-quarter of a student-level standard deviation above, and one-quarter below the mean. If these students attend the same school, with an average socio-economic profile, the predicted performance gap is smaller: on average across OECD countries it stands at 9 score points. It is between 10 and 18 score points in New Zealand, Sweden, Poland, Australia, Finland, Norway, Denmark, Ireland, the United Kingdom, Iceland, the United States, Canada, Spain, Luxembourg and Switzerland, and in the partner countries and economies Singapore, Chinese Taipei and the Russian Federation (grey bar in Figure II.5.5).



■ Figure II.5.5 ■

Slope of the socio-economic gradient between and within schools



Note: Data on blue background are values of the interquartile range of the school-level average PISA index of economic, social and cultural status. Countries are ranked in ascending order of the slope between schools.

1. Score point difference associated with a 0.5 unit increase in the student- or school-level PISA index of economic, social and cultural status.

Source: OECD, PISA 2009 Database, Table II.5.2.

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Some of the contextual effect of socio-economically advantaged schools, the between-school strength and slope of the gradient, can be attributed to peer groups as, for example, talented students work with each other. However, the socio-economic advantage of schools more often implies a better learning environment and access to better educational resources at school. Also, the manner in which students are allocated to schools within a district or region, or classes and programmes within schools, can have implications for the teaching and learning conditions in schools, which are associated with educational outcomes. A number of studies have found that schools with a higher average socio-economic background among their students are likely to have fewer disciplinary problems, better teacher-student relations, higher teacher morale, and a general school climate that is oriented towards higher performance. Often, such schools also have faster-paced curricula. Talented and motivated teachers are more likely to be attracted to schools with a higher socio-economic background and less likely to transfer to another school or to leave the profession. The potential influence of such school characteristics is examined in Volume IV, *What Makes a School Successful?*

External factors that PISA does not examine may also explain socio-economic backgrounds' effect on the learning environment. For example, the parents of a student attending a more socio-economically advantaged school may be more engaged in the student's learning at home - even if their socio-economic background is comparable to that of the parents of a student attending a less privileged school. Since no data on students' earlier achievement are available from PISA, it is not possible to infer students' abilities and motivations. Therefore, neither is it possible to determine whether or to what extent the socio-economic background of students at the school directly determines performance. Factors such as peer interactions indirectly influence performance by contributing to those school features associated with success, such as better classroom atmosphere or more school resources.

Moving all students to schools with a higher socio-economic background is, of course, a practical impossibility. The results shown in Figure II.5.5 should not lead to the conclusion that transferring a group of students from a school with a socio-economically disadvantaged intake to a school with a privileged intake would automatically result in the gains suggested in the figure. The estimated effects shown in these figures describe the distribution of school performance and should not necessarily be interpreted as causal.

In any attempt to develop education policy in the light of the above findings, the nature of the formal and informal selection mechanisms that contribute to between-school socio-economic segregation, and the effect of this segregation on student performance, must be taken into consideration. In some countries, socio-economic segregation may be firmly entrenched, through residential segregation in major cities or by a large urban/rural socio-economic divide. In other countries, the school system tends to stream or track students into programmes with different curricula and teaching practices, often resulting in socio-economic segregation across these tracks or streams. The policy options are either to reduce socio-economic segregation or to mitigate its effects (for further analysis, see Volume IV, *What Makes a School Successful?*).

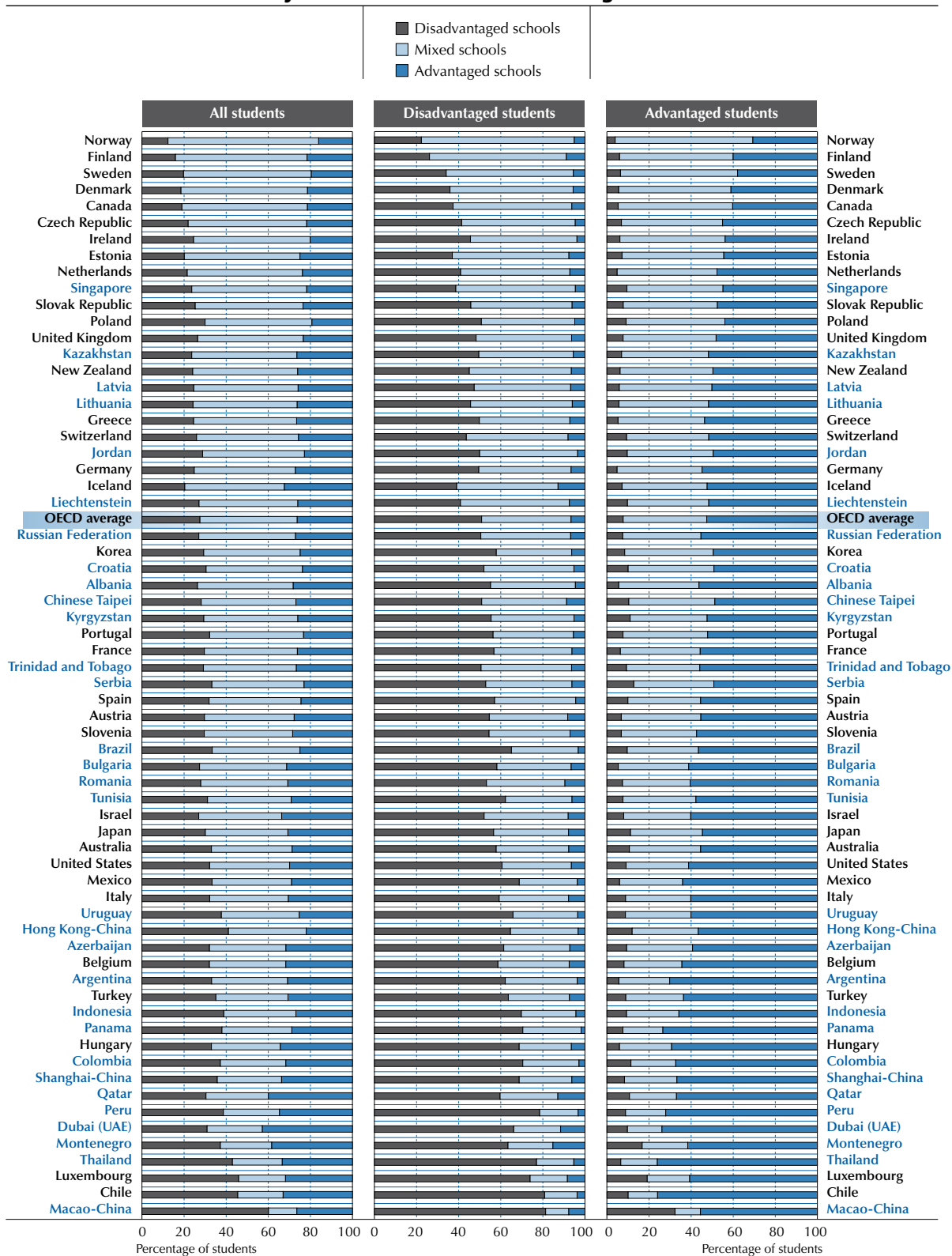
PREDICTED AND ACTUAL PERFORMANCE OF STUDENTS IN DIFFERENT SOCIO-ECONOMIC CONTEXTS

How does a school's socio-economic composition relate to the performance of students from different socio-economic backgrounds? To answer this question, schools are grouped according to their socio-economic intake relative to the national average. Three categories of schools are identified: socio-economically disadvantaged schools, in which the average socio-economic background of students is below the national average; socio-economically advantaged schools, in which the average socio-economic background of students is above the national average; and socio-economically mixed schools, whose socio-economic intake is around the national average.

Figure II.5.6 shows that while in some school systems most students attend mixed schools, in others a majority of students attend advantaged or disadvantaged schools. The figure also shows that the socio-economic segregation of schools is stronger in certain school systems where there is a lower percentage of mixed schools. Consistent with the index of social inclusion presented in Chapter 3, the figure also shows that disadvantaged students are more likely to attend mixed or advantaged schools in certain school systems. Thus, countries vary markedly in the extent to which disadvantaged students are overrepresented in disadvantaged schools, and also, in the extent to which advantaged students are overrepresented in advantaged schools.



Figure II.5.6
Percentage of students in disadvantaged, mixed and advantaged schools, by students' socio-economic background



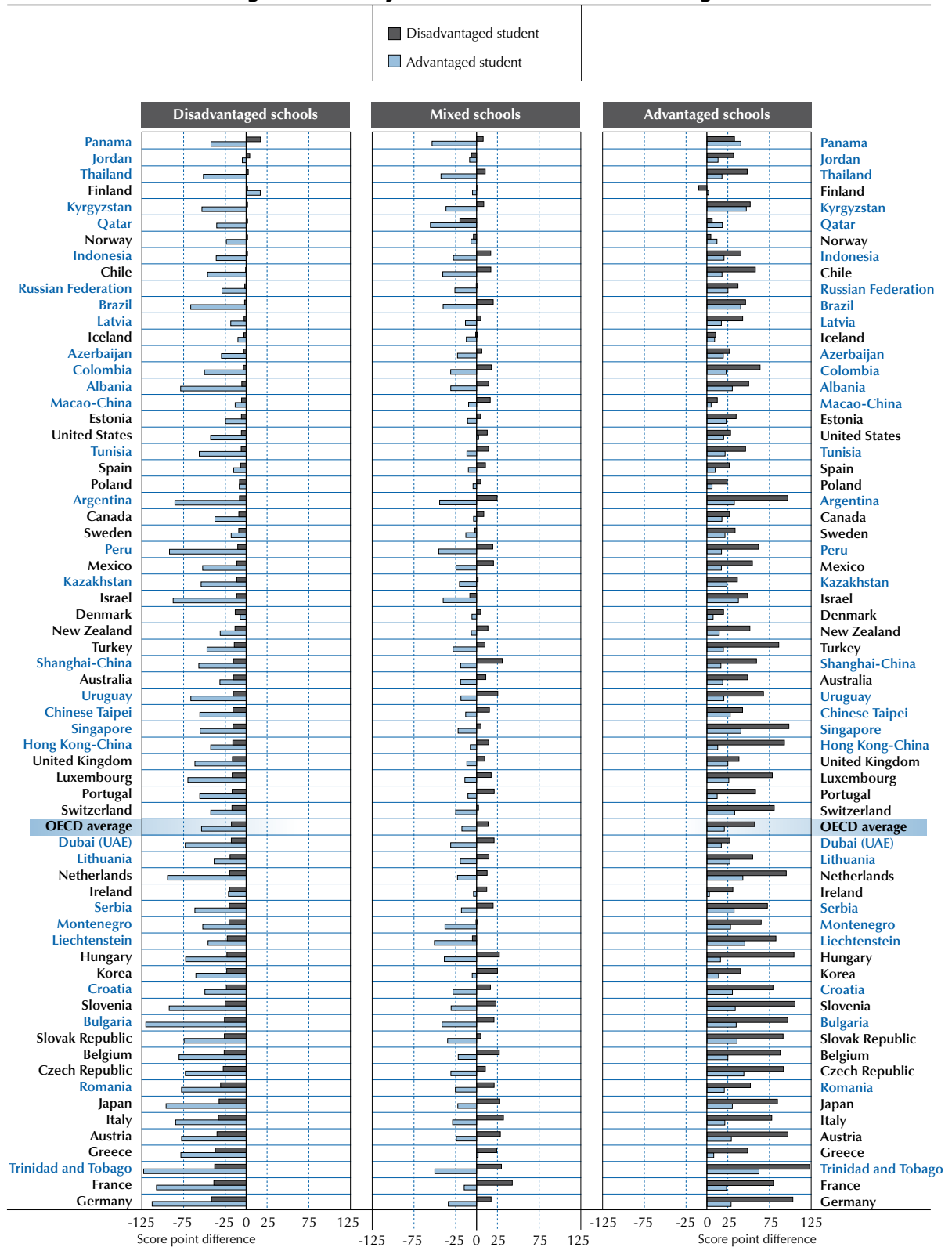
Countries are ranked in descending order of the percentage of all students in mixed schools.

Source: OECD, PISA 2009 Database, Table II.5.10.

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■ Figure II.5.7 ■

Difference between observed and predicted performance in disadvantaged, mixed and advantaged schools, by students' socio-economic background



Countries are ranked in ascending order of the difference between observed and predicted performance of disadvantaged students in disadvantaged schools.

Source: OECD, PISA 2009 Database, Table II.5.10.

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Figure II.5.7 compares students' actual performance in advantaged, disadvantaged and mixed schools with their predicted performance based on their individual socio-economic background. Schools with a mixture of socio-economic intake perform not statistically significantly differently from the country average; schools with an advantaged socio-economic intake perform above the country average; and schools with a disadvantaged socio-economic intake perform below the country average. In the figure, countries are sorted by the difference in observed and expected performance of disadvantaged students attending disadvantaged schools. The figure highlights that while the differences between observed and expected performance are relatively small in those systems at the top of the figure, in others systems, across the three categories of schools, student performance is closer to what would have been predicted by the students' socio-economic background, regardless of the type of school they attend.

In general, Figure II.5.7 shows that students attending schools with a relatively disadvantaged intake perform at lower levels, on average, than what would be predicted based on the students' own socio-economic background; the opposite is true for those attending schools with more advantaged intakes. For mixed schools, the gap between expected and actual performance is smaller. In some countries, disadvantaged students perform better than expected and advantaged students perform worse than expected, depending on the socio-economic composition of the school they attend (Table II.5.10). Advantaged students perform as expected in mixed schools in the OECD countries Canada, Denmark, Finland, France, Greece, Ireland, Korea, New Zealand, Norway, Poland and the United States.

PERFORMANCE, SOCIO-ECONOMIC BACKGROUND AND THE ROLE OF PARENTS

As part of the PISA 2009 assessment, 14 countries complemented the perspectives of students and school principals with data collected from parents. These data provide important insights into the role that parents can play in raising student performance and moderating the impact of socio-economic background.

Parents' responses show a close relationship between their own involvement and their child's engagement in reading-related activities during the first year of primary school and their reading performance at age 15. For example, students whose parents reported that they had read a book with their child "every day or almost every day" or "once or twice a week" during the first year of primary school performed higher in PISA 2009 than students whose parents reported that they had done this "never or almost never" or "once or twice a month". On average across the 14 countries that had collected information on this question, the difference is 25 score points, but it ranges from four score points in the partner country Lithuania to 63 score points in New Zealand, as Figure II.5.8 shows. Comparing students of similar socio-economic backgrounds, those students with more engaged parents perform better in eight cases. The score point difference is reduced to 14 points, suggesting that, in general, socio-economic background and parental engagement go hand in hand. For example, more educated parents tend to read books with their children more often. Similar results are obtained for other kinds of activities parents were asked about, including "tell stories", "sing songs", "play with alphabet toys", "talk about things you had done", "talk about what you had read", "play word games", "write letters or words" and "read aloud signs and labels" (Table II.5.3).

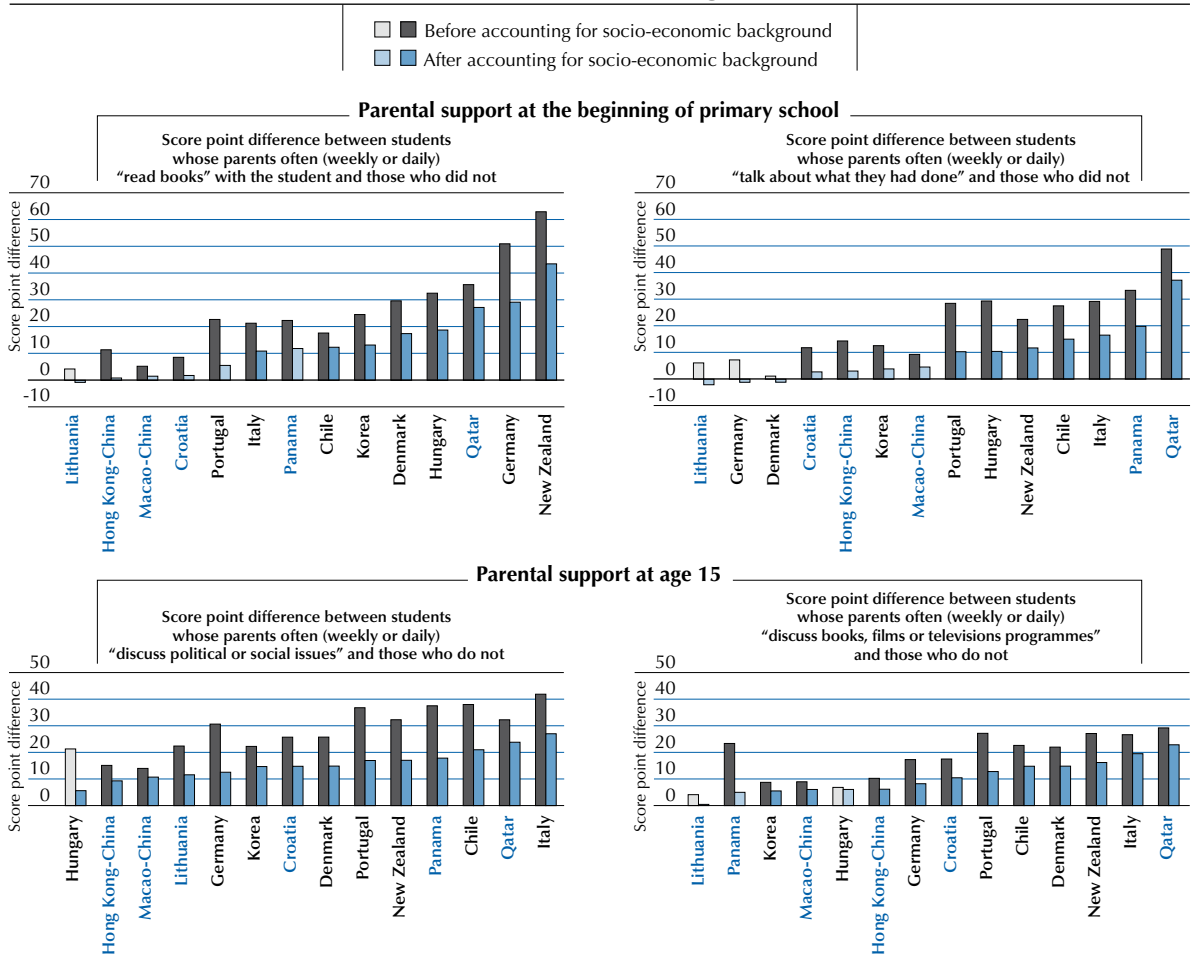
Parents' engagement in educational activities when students are 15 years old is also related to student performance. For example, students whose parents discuss political or social issues once a week or more score 28 score points higher, on average, than those who do not or who talk about these issues less often. The performance advantage is largest in Italy, at 42 score points, and smallest in the partner economy Macao-China, at 14 score points, but it can be observed across all countries, as Figure II.5.8 shows. In addition, while accounting for socio-economic background reduces the size of the advantage, it is still present in all countries except Hungary. Other activities, such as "discuss books, films or television programmes", "discuss how well your child is doing at school", "eat (the main meal) with your child around the table" or "spend time just talking to your child" show similar but somewhat weaker results. The data also suggest that parents whose children tend to do poorly at school become more involved and engaged with helping out with homework (Figure II.5.8 and Table II.5.4).

PERFORMANCE, SOCIO-ECONOMIC BACKGROUND AND PARTICIPATION IN PRE-PRIMARY EDUCATION

Many of the inequalities that exist within school systems are already present when students enter formal schooling and persist as students progress through school (Entwisle, Alexander and Olson, 1997; Downey, Von Hippel and Broh, 2004). Because inequalities tend to grow when school is out of session, earlier entrance into the school system may reduce educational inequalities. In addition, with earlier entrance into pre-primary education, students are better prepared to enter and succeed in formal schooling.

■ Figure II.5.8 ■

Parents' educational support at home and student performance, before and after accounting for socio-economic background



Note: Values that are statistically significant are marked in a darker tone.

Countries are ranked in ascending order of score point differences after accounting for socio-economic background.

Source: OECD, PISA 2009 Database, Tables II.5.3 and II.5.4.

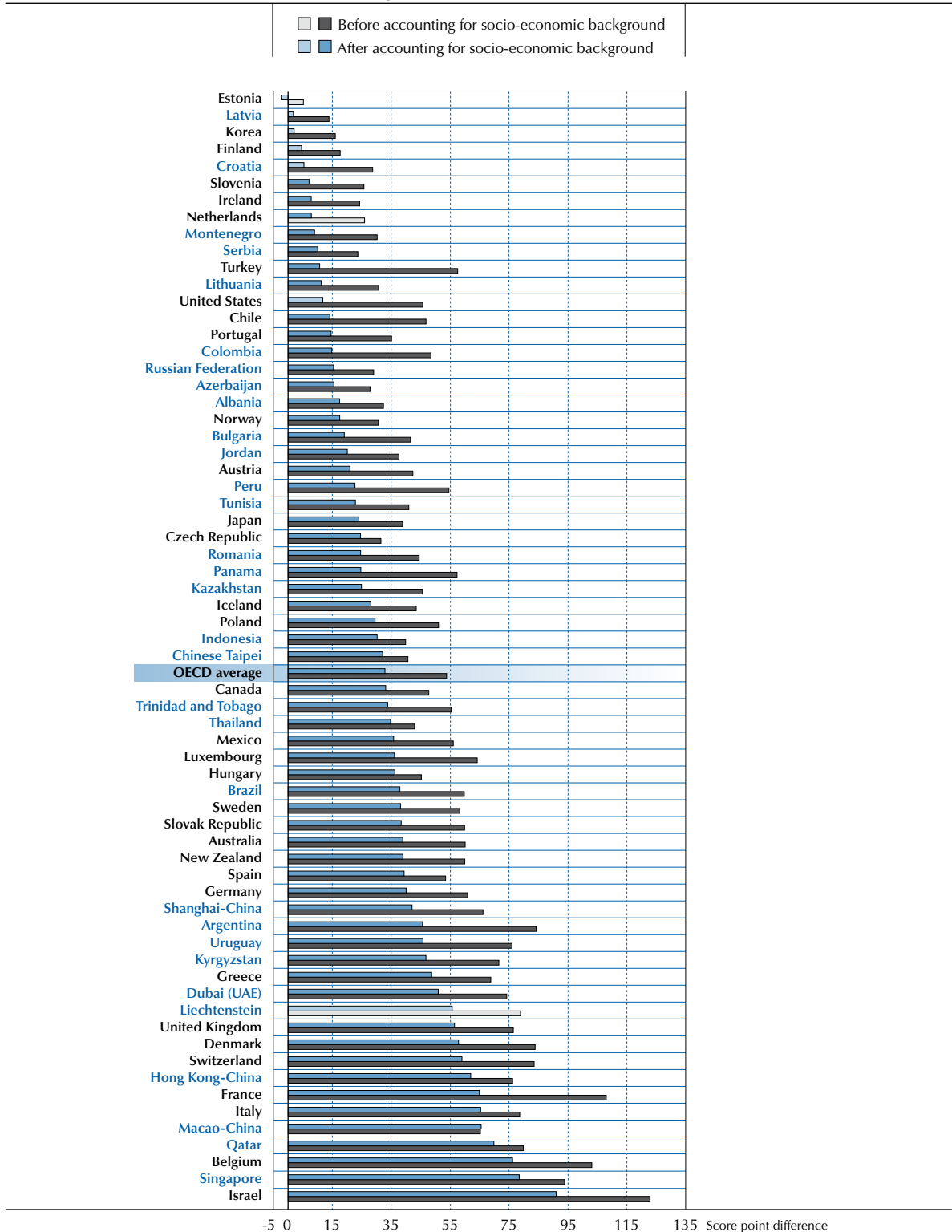
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On average across OECD countries, 72% of the 15-year-old students assessed by PISA reported that they had attended more than one year of pre-primary education when they were children. According to students' responses, more than one year of pre-primary education is practically universal in Japan, the Netherlands, Hungary, Belgium, Iceland and France, where over 90% of 15-year-olds reported that they had attended pre-primary education for more than one year. More than 90% of students in 27 OECD countries had attended pre-primary education for at least some time, and more than 98% of students in Japan, Hungary, France and the United States reported having done so. Pre-primary education is rare in Turkey, where less than 30% of 15-year-olds attended pre-primary education for any period of time. More than one year of pre-primary education is uncommon in Chile, Ireland, Canada and Poland, where less than 50% of students had attended pre-primary education for that length of time (Table II.5.5).

In the partner countries and economies Liechtenstein, Hong Kong-China and Singapore, more than 90% of students reported that they attended more than one year of pre-primary education. In 10 of the 31 partner countries and economies, more than 90% of students attended pre-primary education for some time. Only in Liechtenstein and Chinese Taipei did more than 98% of students report that they attended pre-primary education for some time. In contrast, in Azerbaijan, Kyrgyzstan and Kazakhstan, less than 45% of students had attended pre-primary education; and in Azerbaijan, Kyrgyzstan, Tunisia, Qatar and Indonesia, less than 25% of students had attended pre-primary education for more than one year.



■ Figure II.5.9 ■
Performance difference between students who had attended pre-primary school for more than one year and those who had not



Note: Score point differences that are statistically significant are marked in a darker tone.

Countries are ranked in ascending order of the score point difference between students who report having attended pre-primary school (ISCED 0) for more than one year and those without pre-primary school attendance after accounting for socio-economic background.

Source: OECD, PISA 2009 Database, Table II.5.5.

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Figure II.5.9 shows the performance advantage of students who reported attending pre-primary education for more than one year over those who did not, both before and after accounting for students' socio-economic background. In all 34 OECD countries, students who attended pre-primary education for more than one year outperformed students who did not. This finding remains unchanged after socio-economic background is accounted for. On average across OECD countries, the advantage before accounting for socio-economic factors stands at more than 54 score points, and after at 33 score points. In general, this reduction signals that attendance in pre-primary education for more than one year and socio-economic characteristics are somewhat related, yet there is still a strong independent relationship between attending primary school and performance at age 15.

In the OECD countries Israel, France and Belgium, students who reported attending pre-primary education for more than one year perform at least 100 score points higher in reading than students who did not attend pre-primary education. Strong relationships remain in these countries even after students' socio-economic background is accounted for. However, in Estonia, Korea and Finland, and in the partner country Latvia, the difference in reading scores between those who attended and those who did not attend pre-primary education is 20 points or less.

Why does the relationship between performance and pre-primary attendance vary across countries? One hypothesis points to differences in the quality of pre-primary education. This hypothesis is supported by the fact that the relationship between pre-primary attendance and performance tends to be greater in school systems with a longer duration of pre-primary education, smaller pupil-to-teacher ratios in pre-primary education and higher public expenditure per child at the pre-primary level of education (Table II.5.6).

Within countries, does the relationship between pre-primary attendance and performance of 15-year-olds vary significantly across population subgroups? Specifically, do students from socio-economically disadvantaged backgrounds benefit more from pre-primary attendance than students from advantaged backgrounds? Are pre-primary attendance and immigrant status related?

When the relationship between pre-primary attendance and performance in reading at age 15 is compared between different socio-economic backgrounds, there is no significant difference between students from socio-economically disadvantaged and advantaged backgrounds (Table II.5.7). Disadvantaged and advantaged students benefit equally from pre-primary attendance in 31 OECD countries and 25 partner countries and economies. The performance advantage of attending pre-school is greater for socio-economically disadvantaged students in the United States and Lithuania; while in two OECD countries and five partner countries and economies, the advantage is greater for students from higher socio-economic backgrounds.

Part of the variation in the strength of the relationship between pre-primary attendance and the socio-economic background of students may be due to the fact that many other factors apart from pre-primary attendance (e.g. education in and out of school that students received between the ages of six and 15) may influence the performance of 15-year-olds. Many studies have concluded that while pre-primary attendance may raise students' cognitive test scores and build a foundation for students to develop further in the course of their study, the gains attributed to attendance in pre-primary education diminish over time, in part because students return to socio-economically advantaged or disadvantaged environments and schools (Barnett, 1995; Lee, 1995). The estimates provided here are limited because they cannot take many of these issues into account. Accounting for the socio-economic background of the student and the school addresses the issue only partially.

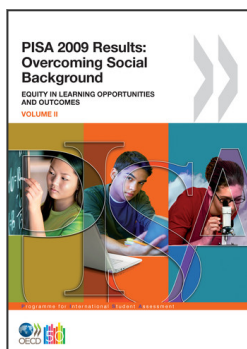
When the relationship between pre-primary attendance and performance is compared between students with and without an immigrant background, a significant difference is found in some countries (Table II.5.8). In Finland, Ireland and Canada and the partner country Qatar, the relationship between attendance in pre-primary education and performance is greater for students with an immigrant background than for students without an immigrant background.

The analyses presented in this chapter delve deeper into the relationship between socio-economic background and reading performance. These analyses show not only that the student's own socio-economic background is related to his/her performance, but that the school's composition may be even more important in shaping the learning outcomes of students. Disadvantaged students tend to perform better than expected from their individual socio-economic background when they attend socio-economically advantaged schools and advantaged students tend to perform worse than expected when they attend socio-economically disadvantaged schools. It is telling, moreover, that those school systems with the greatest levels of both academic and social inclusion, that is, those systems in which students of different socio-economic backgrounds and academic performance attend the same schools, are, generally, school systems that also perform above the OECD average.



Notes

1. The decomposition is a function of the between-school slope, the average within-school slope, and η^2 , which is the proportion of variation in socio-economic background that is between schools. The statistic η^2 can be considered a measure of segregation by socio-economic background (Willms and Paterson, 1995), which theoretically can range from zero for a completely desegregated system, in which the distribution of socio-economic background is the same in every school, to one for a system in which students within schools are from similar socio-economic backgrounds, but the schools vary in their average socio-economic profile. One can also think of the term $1-\eta^2$ as an index of socio-economic inclusion, which would range from 0 for a segregated schooling system to 1 for a fully desegregated schooling system. The overall slope is related to the within- and between-school slopes through the segregation and inclusion indices: $\beta_t = \eta^2 * \beta_b + (1-\eta^2) * \beta_w$, where β_t is the overall slope, β_b is the between-school slope, and β_w is the average within-school slope. Note that there are two multilevel regression models, the first one is the null model on student performance and the second one includes only the student's socio-economic background.
2. Variation is expressed by statistical variance. This is obtained by squaring the standard deviation referred to in Volume I, *What Students Know and Can Do*. The statistical variance rather than the standard deviation is used for this comparison to allow for the decomposition of the components of variation in student performance. For reasons explained in the *PISA 2009 Technical Report* (OECD, forthcoming) and, most important, because the data in this table only account for students with valid data on their socio-economic background, the variance differs slightly from the square of the standard deviation shown in Volume I. The *PISA 2009 Technical Report* (OECD, forthcoming) also explains why, for some countries, the sum of the between-school and within-school variance components differs slightly from the total variance. The average is calculated over OECD countries.
3. These results are influenced by differences in how schools are defined and organised within countries and by the units that were chosen for sampling purposes. For example, in some countries the schools in the PISA sample were defined as administrative units (even if they spanned several geographically separate institutions, as in Italy); in others, they were defined as those parts of larger educational institutions that serve 15-year-olds; in others, they were defined as physical school buildings; and in others, they were defined from a management perspective (e.g. entities having a principal). Annex A2 and the *PISA 2009 Technical Report* (OECD, forthcoming) provides an overview of how schools were defined. Note also that, because of the manner in which students were sampled, the within-school variance includes performance variation between classes as well as between students.
4. More specifically, the index is defined as one minus the variation in student performance that lies between schools as a proportion of the variation that takes place between and within schools.
5. Figure II.5.2 and II.5.3 depict the inter-percentile range between the 5th and 95th percentile.
6. The relationship is strongest for reading. The correlation between the country rankings on social inclusion and academic inclusion is 0.47 for reading and 0.38 for mathematics and science.
7. The within- and between-school slopes of the socio-economic gradient represent, respectively, the gap in the predicted scores of two students within a school separated by a fixed level of socio-economic background, and the gap in the predicted scores of two students with identical socio-economic backgrounds attending different schools where the average background of their fellow-students is separated by the same fixed level. The slopes were estimated with a multilevel model that included the *PISA index of economic, social and cultural status* at the student and school levels.
8. The average socio-economic background of the school is calculated as the average of the students sampled. As such, this is a more accurate measure of socio-economic background than the *PISA index of social, economic and cultural status* at the student level. The within-school estimates, which are based on students' reports, are therefore biased downwards. The bias explains, at least in part, the differences between these two estimates. The magnitude of the difference is so large, however, that it is unlikely that the bias is the sole explanation for this difference.
9. Annex A2 discusses the construction of the primary sampling units and how this may affect different within- and between-school analyses.
10. This example assumes that the socio-economic gradients are linear, which is not the case for some countries, as discussed in Chapter 3 of this volume.



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