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Are disadvantaged students affected by the socio-economic profile of their school?

This chapter examines the socio-economic segregation of disadvantaged students across schools and changes in this segregation over the past decade. It quantifies the disparities in student performance due to the socio-economic profile of the schools that disadvantaged students attend. The chapter identifies certain school policies and practices, and student behaviours that may mediate the relationship between the socio-economic profile of schools and student performance. It concludes by analysing the relationship between socio-economic diversity in schools and student performance.

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What the data tell us

- Countries that participated in the 2015 PISA assessment differ in the degree to which their school systems segregate disadvantaged students into certain schools. On average across OECD countries, in all PISA cycles since 2006, 48% of disadvantaged students attend disadvantaged schools.

- On average across OECD countries, disadvantaged students who attend advantaged schools score 78 score points higher than their disadvantaged peers who attend disadvantaged schools. However, in Finland, Iceland, Macao (China), Norway and Poland, there is no significant difference in the performance of disadvantaged students related to whether they attend advantaged or disadvantaged schools.

- The level of science-specific resources, the extent to which student behaviour hinders learning, the availability of science competitions, class size, student truancy, the disciplinary climate, and various pedagogical strategies are all potential mediating factors between a school's socio-economic profile and the performance of disadvantaged students.

- On average across OECD countries, students attending more socio-economically diverse schools tend to perform worse than students who attend more homogeneous schools, even after accounting for students' and schools' socio-economic profile. However, at the national level, this relationship is observed in only 18 education systems, while in 46 countries and economies, socio-economic diversity in school is unrelated to student performance. In six countries, students who attend more diverse schools show better science performance.

PISA consistently finds a strong and positive link between a school's socio-economic profile and student performance: socio-economically disadvantaged schools (defined as schools whose socio-economic profile, as measured by the PISA index of economic, social, and cultural status [ESCS], is among the bottom 25% within their country or economy) usually have lower average performance than those that enrol students of more advantaged socio-economic status (OECD, 2016[1]). While previous PISA reports have considered this issue by looking at all students, this chapter focuses particularly on disadvantaged students, defined as those among the bottom 25% of socio-economic status in their country or economy.

How does the performance of a disadvantaged student vary depending on the socio-economic profile of the school that he or she attends? Are these disparities associated with differences in such factors as material resources, teacher qualifications or practices, school climate or student behaviour? And are the relationships stronger in some countries than in others?

Addressing these school disparities with a focus on disadvantaged students is particularly important from the standpoint of equity because disadvantaged students who attend disadvantaged schools face a "double disadvantage". In addition to the disparities in learning opportunities they already face as a result of their family's socio-economic status, they are often confronted with more difficult learning environments that tend to be found in schools with a lower socio-economic profile. Such doubly disadvantaged students are particularly likely to perform poorly in school. Equity in education can be compromised as a result.

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This chapter offers insights into how disadvantaged students can be supported by improving the quality of their schools. It measures whether disadvantaged students in the countries and economies that participated in PISA 2015 are concentrated within certain schools. Specifically, it calculates the proportion of disadvantaged students who are enrolled in a disadvantaged school, and thus who suffer from a double disadvantage.[1] The chapter then compares the average performance of disadvantaged students who attend schools of different socio-economic profiles. Finally, the chapter considers factors that mediate the relationship between a school's socio-economic profile and the performance of its disadvantaged students. This final analysis offers suggestions for policy makers and educators about what can be done to support disadvantaged students who attend disadvantaged schools.

SOCIO-ECONOMIC SEGREGATION OF DISADVANTAGED STUDENTS IN SCHOOLS

The *PISA 2015 Results (Volume I)* (OECD, 2016[1]) showed that both student socio-economic status and school socio-economic profile, defined as the average socio-economic status of the students in a school, are strongly associated with student performance.[2] Students who come from more advantaged backgrounds, and whose classmates are also more advantaged, obtain better scores in the PISA assessment.

Hence, disadvantaged students attending disadvantaged schools are, *a priori*, doubly disadvantaged as they strive for achievement. Before quantifying the magnitude of this double disadvantage in terms of score points, it is important to quantify the degree to which this double disadvantage exists. To what extent do disadvantaged students have the opportunity to meet and interact with students from different socio-economic backgrounds? Put another way, to what extent are disadvantaged students concentrated in the same schools?

Figure 4.1 shows the proportion of disadvantaged students who are enrolled in disadvantaged schools in PISA 2015. As in previous chapters, disadvantaged students are those who are in the bottom quarter of the PISA index of economic, social and cultural status (ESCS) in their education system; disadvantaged schools are those in the bottom quarter of school-level ESCS in their education system.[3]

On average across OECD countries, 48% of disadvantaged students attend disadvantaged schools. Among OECD countries, the Nordic countries of Finland, Norway and Sweden are the least socio-economically segregated by this measure: less than 43% of disadvantaged students attend disadvantaged schools in these three education systems.

The OECD countries where disadvantaged students are the most segregated are Hungary and Mexico, where over 55% of disadvantaged students are found in disadvantaged schools. In nine other OECD countries – Australia, Belgium, Chile, the Czech Republic, France, Israel, the Slovak Republic, Spain and the United States – over half of all disadvantaged students attend disadvantaged schools.

Large differences in the segregation of disadvantaged students are also observed in partner countries and economies. In all five partner education systems in the Western Balkans – Albania, Croatia, the Former Yugoslav Republic of Macedonia (hereafter "FYROM"), Kosovo and Montenegro – 45% or less of all disadvantaged students are found in disadvantaged schools. However, in the Ciudad Autónoma de Buenos Aires (Argentina) (hereafter "CABA [Argentina]") and Peru, over 60% of disadvantaged students are found in disadvantaged schools.

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Figure 4.1 ■ **Disadvantaged students in disadvantaged schools**
Percentage of disadvantaged students in disadvantaged schools
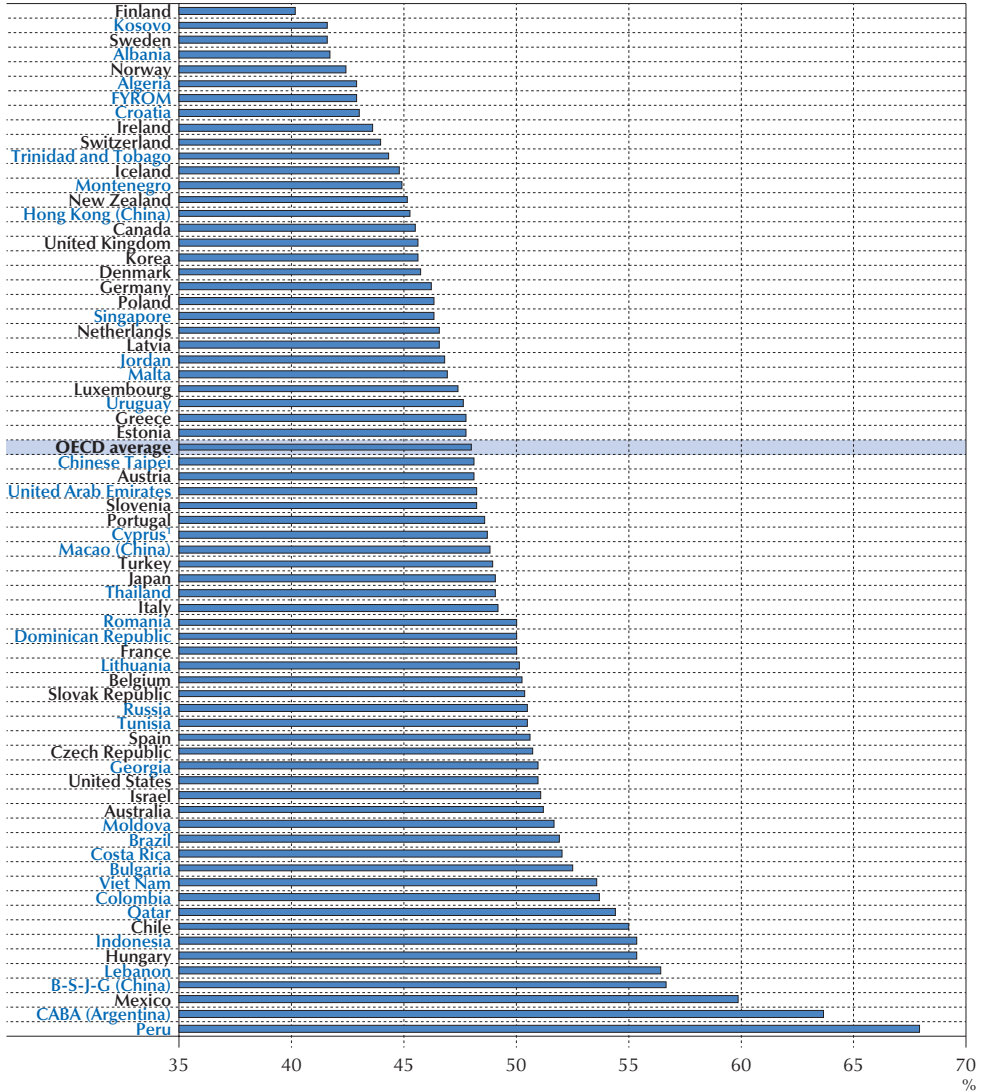
1. See notes at the beginning of this chapter.

Note: Disadvantaged students are those students in the bottom quarter of the national distribution of the PISA index of economic, social and cultural status (ESCS). Disadvantaged schools are schools in the bottom quarter of the national distribution of the school-level ESCS index, which is calculated as the average ESCS index among students in a school. Only schools with at least 10 students with a valid ESCS index were used for this analysis. The national distribution of the school-level ESCS index is weighted at the student level.

Countries and economies are ranked in ascending order of the percentage of disadvantaged students found in disadvantaged schools.

Source: OECD, PISA 2015 Database, Table 4.1.

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As shown in Figure 4.2, there has been no significant change in the average level of segregation of disadvantaged students, on average across OECD countries, over the past decade. On average across all OECD countries, 48% of disadvantaged students have been found in disadvantaged schools in every PISA cycle since 2006 (Table 4.1).

Figure 4.2 ▪ **Evolution since 2006 of the percentage of disadvantaged students in schools, by school socio-economic profile**
OECD average
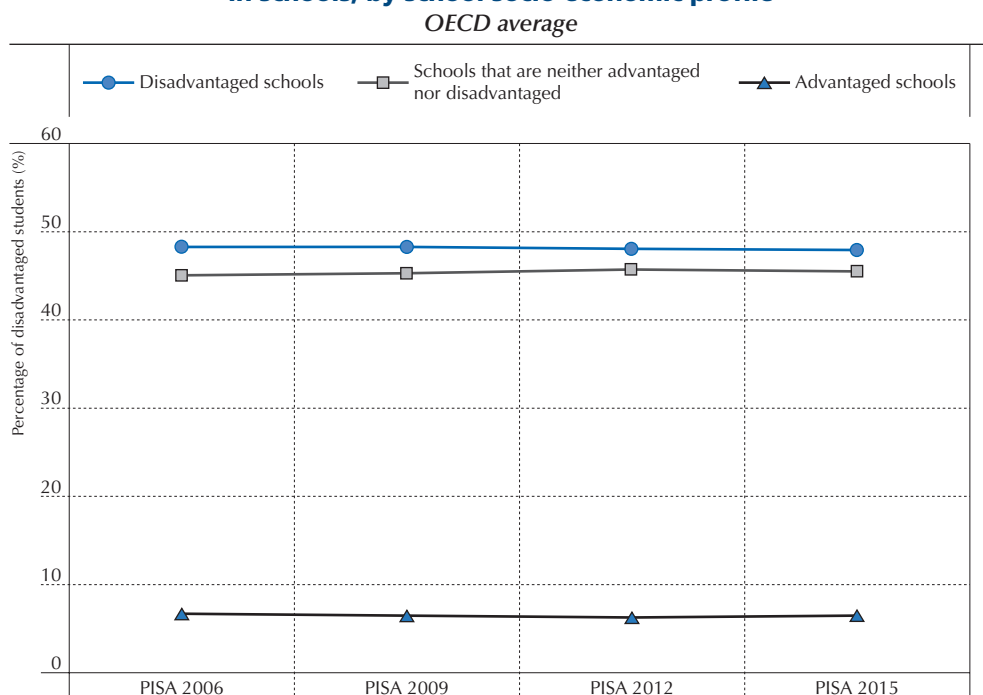
Note: Disadvantaged students are those students in the bottom quarter of the national distribution of the PISA index of economic, social and cultural status (ESCS). Disadvantaged schools are schools in the bottom quarter of the national distribution of the school-level ESCS index, which is calculated as the average ESCS index among students in a school. Advantaged schools are schools in the top quarter of the national distribution of the school-level ESCS index. Only schools with at least 10 students with a valid ESCS index were used for this analysis. The national distribution of the school-level ESCS index is weighted at the student level, so that schools with a larger population carry a greater weight.
Source: OECD, PISA 2006, 2009, 2012 and 2015 Databases, Table 4.1.
StatLink https://doi.org/10.1787/888933830633

There has also been no significant change in the average level of segregation of disadvantaged students in most PISA-participating education systems. Among OECD countries, the only significant change is observed in Luxembourg, where disadvantaged students have become less segregated in disadvantaged schools since 2006. The opposite trend is observed in Macao (China) and Singapore, where segregation has increased since 2009 (Table 4.1).

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Figure 4.2 also shows that most disadvantaged students who do not attend disadvantaged schools attend socio-economically average schools (which are neither advantaged nor disadvantaged); only a few attend advantaged schools. On average across OECD countries, between 45% and 46% of disadvantaged students attended schools with an average socio-economic profile between PISA 2006 and 2015, and only between 6% and 7% attended advantaged schools during the same period.

This latter finding is consistent with the observation that on average across OECD countries, disadvantaged schools, as well as schools with an average socio-economic profile, are more socio-economically diverse than advantaged schools (Table 4.4). Disadvantaged students who attend advantaged schools may be those whose parents have actively sought out such schools or those whose performance may have justified attending an academically stronger school, which is likely to be more advantaged. Conversely, advantaged students in disadvantaged schools may be those who are weaker academically and therefore have been sorted into schools with other students who are struggling and who are disproportionately likely to be of lower socio-economic status, or those whose parents are less inclined to seek out enrichment opportunities for their child.

As one quarter of students are, by definition, disadvantaged, and roughly 50% of disadvantaged students attend disadvantaged schools, roughly one in eight students is doubly disadvantaged by both their student- and school-level socio-economic profiles. The second section of this chapter addresses the size of and possible mechanisms behind the performance gap associated with this double disadvantage.

Why is the segregation of disadvantaged students in schools more frequently observed in some countries than in others?

Several factors may explain the large variation observed across countries and economies in the level of segregation of disadvantaged students in schools. When assignment to schools is mainly based on the distance between the family's residence and the school (as is the case in the large majority of OECD countries [Musset, 2012[2]]), social segregation at school reproduces, at least to some extent, social segregation in the neighbourhood. For example, in some countries in Latin America, metropolitan areas are clearly split into privileged and non-privileged zones (Chmielewski and Savage, 2015[3]), a phenomenon that is manifested in the development of exclusive gated communities (Coy and Pöhler, 2002[4]; Sabatini and Salcedo, 2007[5]). This high level of residential segregation is reflected by the position of many Latin American countries at the top end of the spectrum of the proportion of disadvantaged students enrolled in disadvantaged schools (Figure 4.1).

Education policies may also affect the social segregation of disadvantaged students within schools. For instance, segregation is relatively uncommon in most of the Nordic countries. These countries have long championed social inclusion, cohesion and equality, both in schools and in society as a whole (Antikainen, 2006[6]). School systems in these countries have tried to provide equal opportunities to all students by successively breaking down barriers related to geography, socio-economic status, gender and immigrant background (Lie, Linnakylä and Roe, 2003[7]).

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More generally, how school systems manage academic heterogeneity and how they govern school choice can affect the social composition of schools (Liu et al., 2015[8]). For instance, one may hypothesise that tracking leads to greater socio-economic stratification: after tracking, advantaged children are often over-represented in academic tracks while disadvantaged children are more frequently found in vocational tracks. Moreover, some school choice policies may increase school socio-economic segregation as better-educated and more-motivated parents are more likely to take advantage of these policies. This results in the concentration of advantaged students in what are perceived to be the "best" schools. Such segregation may be amplified if schools are allowed to select students on the basis of either academic and/or financial criteria (for instance, through school fees). Evidence from Chile, for instance, suggests that the rise in private schools funded through voucher programmes has led to an increase in socio-economic segregation in schools because advantaged parents are more likely than disadvantaged parents to choose private government-dependent schools for their children (Schneider, Elacqua and Buckley, 2006[9]; Valenzuela, Bellei and Ríos, 2014[10]; Hsieh and Urquiola, 2006[11]).

However, as suggested in *School choice and school vouchers: An OECD perspective* (OECD, 2017[12]), the impact of school choice on segregation can be mitigated. Vouchers for enrolling students in private or charter schools can be targeted to low-income families rather than being offered to all families, and schools can be prevented from "skimming" wealthier and more able students (Altonji, Huang and Taber, 2015[13]). For example, in the Netherlands, school funding partially depends on the socio-economic status and needs of the students, which provides incentives for schools to enrol disadvantaged students. This may partly explain why disadvantaged students are relatively less segregated into certain schools, as these students can be found in significant numbers in all sorts of schools.

HOW THE PERFORMANCE OF DISADVANTAGED STUDENTS MAY BE AFFECTED BY A SCHOOL'S SOCIO-ECONOMIC PROFILE

The previous section shows that the degree of socio-economic segregation in schools varies across education systems and persists over time. How is this segregation reflected in student performance?

Why does a school's socio-economic profile matter for student performance?

Many factors may explain why a school's social composition affects, directly or indirectly, the academic performance of children (Thrupp, 1995[14]; Nash, 2003[15]). Empirical evidence suggests that performance deteriorates as the share of low achievers increases, while the proportion of high achievers correlates positively with performance (Hanushek et al., 2003[16]; Lavy, Silva and Weinhardt, 2012[17]; Burke and Sass, 2013[18]). This could be because teachers adjust their style of teaching and their expectations to the type of students in their classes (Liu et al., 2015[8]), or because peer pressure and competition may stimulate students to work harder. As disadvantaged students are more likely to perform poorly at school, a larger proportion of disadvantaged students in a school is usually related to a lower likelihood of attending school with top-achieving students. Furthermore, low achievement is often related to disruptive behaviour, such as truancy

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or behaviour that requires teacher attention. A school climate that is not conducive to learning has a potentially detrimental impact on performance (Opdenakker and Damme, 2007[19]).

Teaching conditions are often more challenging in disadvantaged schools, thus these schools may fail to attract and retain the best teachers. The OECD report, *Effective Teacher Policies* (OECD, 2018[20]), finds that in more than a third of the countries that participated in PISA 2015, teachers in the most disadvantaged schools are less qualified or experienced than those in the most advantaged schools. Even if most countries provide extra financial support to disadvantaged schools, this may not compensate for an initial lack of human resources. Furthermore, in most of the countries and economies that participated in PISA 2015, advantaged schools are better equipped than disadvantaged schools (OECD, 2016[21]).

All of this suggests that students from the most disadvantaged backgrounds may suffer from a double disadvantage when they are clustered in specific schools. Not only might these students lack the parental support they need, they may also have less stimulating learning conditions than they would have in advantaged schools.

The performance of disadvantaged students and schools' socio-economic profile

Figure 4.3 shows the performance of students of different socio-economic status who attend schools with different socio-economic profiles. On average across OECD countries, disadvantaged students attending advantaged schools score 78 points higher than those attending disadvantaged schools. Disadvantaged students attending schools of average socio-economic profile (schools that are neither advantaged nor disadvantaged) score 36 points higher than those attending disadvantaged schools.[4]

Among disadvantaged students, disparities in science performance related to their schools' socio-economic profile vary in magnitude across countries. A school's socio-economic profile matters the most in Belgium, Beijing-Shanghai-Jiangsu-Guangdong (China) (hereafter "B-S-J-G [China]"), Bulgaria, CABA (Argentina), France, Hungary, the Netherlands, the Slovak Republic and Slovenia, where disadvantaged students attending advantaged schools score over 130 points higher than those in disadvantaged schools. By contrast, in Algeria, Estonia, Jordan, Moldova and Sweden, disadvantaged students attending advantaged schools score only between 20 and 40 points higher than those in disadvantaged schools. Most notably, in Finland, Iceland, Macao (China), Norway and Poland, there is no significant difference in the performance of disadvantaged students related to whether they attend advantaged or disadvantaged schools (Table 4.5). This implies that disadvantaged schools in these six countries serve disadvantaged students as well as advantaged schools do. However, such students still suffer from their individual disadvantaged status compared to advantaged students.

Part of the difference in performance between disadvantaged students who attend disadvantaged schools and disadvantaged students who attend advantaged schools is a reflection of the socio-economic disparities among the students themselves. Indeed, disadvantaged students who attend disadvantaged schools are likely to be more disadvantaged than disadvantaged students

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who attend schools that are not disadvantaged. This could be because of social segregation, as discussed above, or because a school's socio-economic profile is defined as the average socio-economic status of its students. Lower individual socio-economic status is associated with poorer performance, even before considering the impact of a school's socio-economic profile.

Figure 4.3 ▪ **Science performance, by student and school socio-economic profile**
OECD average
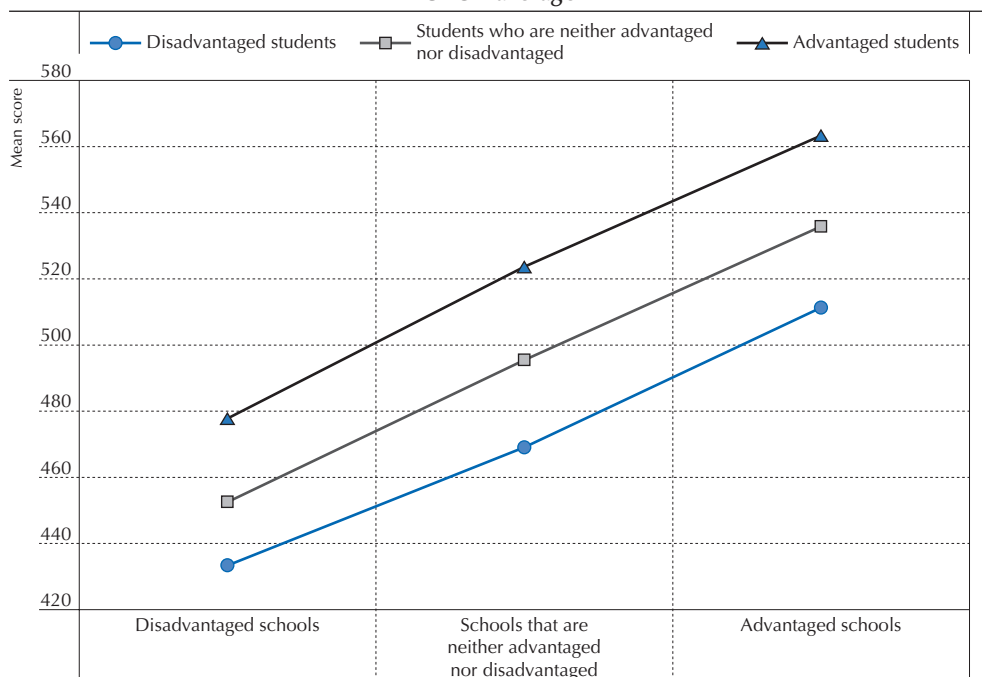
Note: Disadvantaged students are those students in the bottom quarter of the national distribution of the PISA index of economic, social and cultural status (ESCS). Advantaged students are those students in the top quarter of this distribution. Disadvantaged schools are schools in the bottom quarter of the national distribution of the school-level ESCS index, which is calculated as the average ESCS index among students in a school. Advantaged schools are schools in the top quarter of the national distribution of the school-level ESCS index. Only schools with at least 10 students with a valid ESCS index were used for this analysis. The national distribution of the school-level ESCS index is weighted at the student level.
Source: OECD, PISA 2015 Database, Table 4.5.
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However, as shown in Figure 4.4, on average among disadvantaged students in OECD countries, a one-unit increase in school-level ESCS is associated with a 60 score-point improvement in student performance, even after accounting for students' socio-economic status.[5] In the Czech Republic, France, Japan, Malta, the Netherlands, Slovenia and Chinese Taipei, each additional unit of school-level ESCS is associated with a more than 100 score-point improvement in performance among disadvantaged students (Table 4.6b).

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Figure 4.4 ■ **Change in student performance associated with school socio-economic profile**

Score-point difference in science among disadvantaged students associated with a one-unit increase in school socio-economic profile, after accounting for student socio-economic status
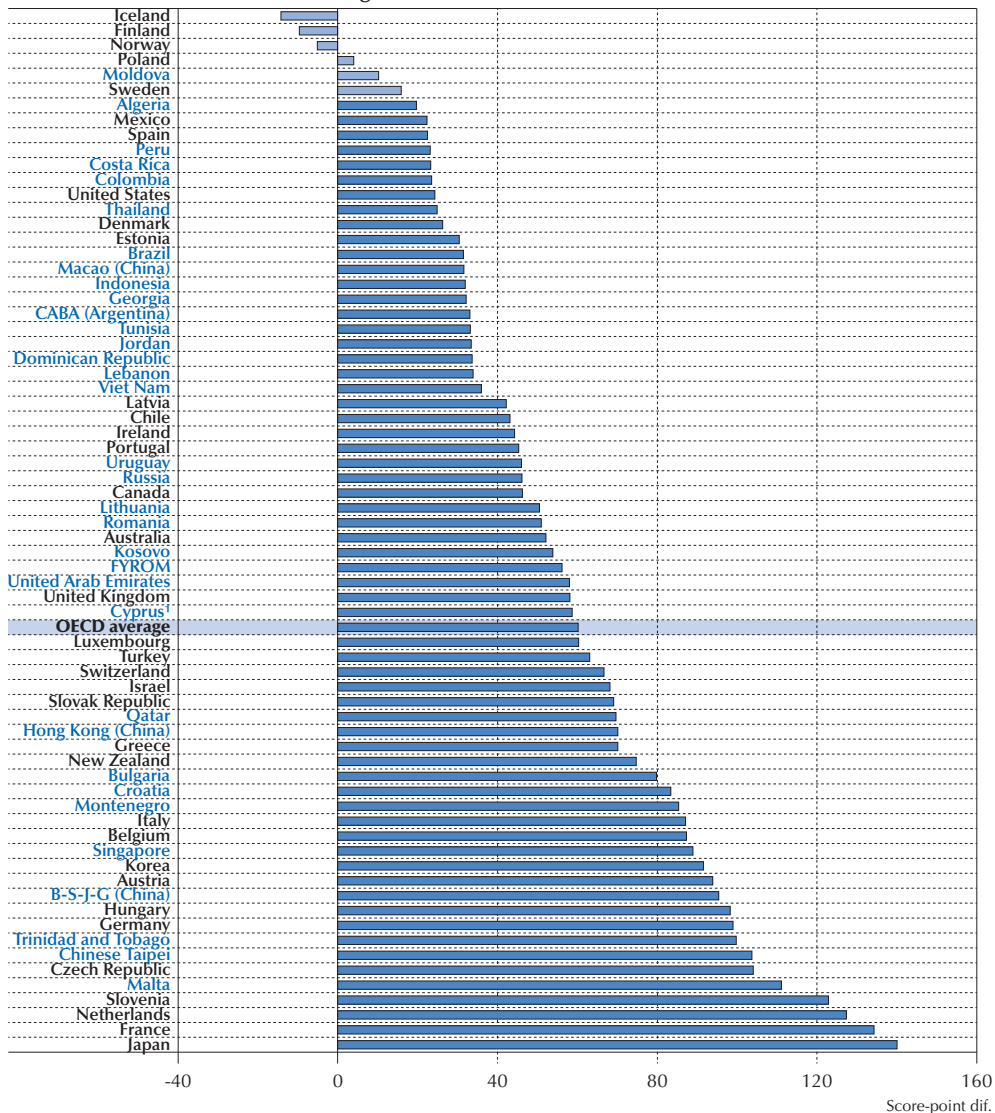
1. See notes at the beginning of this chapter.

Note: Statistically significant score-point differences are shown in a darker tone.

Countries and economies are ranked in ascending order of the change in performance associated with school socio-economic profile.

Source: OECD, PISA 2015 Database, Table 4.6b.

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The relationship between disadvantaged students' performance and school-level socio-economic profile is significant, even after accounting for students' socio-economic status, in 64 out of the 70 countries and economies that participated in PISA 2015. In Finland, Iceland, Moldova, Norway, Poland and Sweden, there is no significant difference in the performance of disadvantaged students, regardless of whether they attend advantaged or disadvantaged schools, once students' socio-economic status is taken into account.

Student and school socio-economic profiles combined account for about 13% of the variation in student performance among disadvantaged students, on average across OECD countries (Table 4.6b). The socio-economic profile of schools and students has the strongest relationship with performance in France, Hungary and Slovenia, where over 25% of the performance variation is so explained. In Algeria, Colombia, Estonia, Macao (China), Poland and Thailand, student and school socio-economic profiles combined explain less than 3% of the variation in the performance of disadvantaged students (Table 4.6b).

Factors that may mediate the relationship between school socio-economic profile and performance among disadvantaged students

The literature suggests a variety of reasons why students attending schools with a more advantaged socio-economic profile tend to perform better than their peers attending more disadvantaged schools (Perry and Mcconney, 2010[22]). For example, schools that are more advantaged might provide a better learning environment, whether because of a more favourable disciplinary climate, pedagogical methods or available resources. This type of environment may be more conducive to learning and to achieving better academic outcomes.

PISA 2015 Results (Volume II) (OECD, 2016[21]) identifies factors that are related to student performance and to school socio-economic profile, on average across all students in OECD countries. These factors include school policies and practices, aspects of the school environment, student behaviours and student progress through education. Could these factors mediate the relationship between school socio-economic profile and student performance, particularly for disadvantaged students? As it is not possible to determine causal relationships with PISA data, this section can only provide hypotheses.

As shown in Figure 4.5, four school-level factors – science-specific resources available at school, the availability of science competitions, the extent to which student behaviour hinders student learning (as judged by principals), and average class size – are found to potentially mediate the relationship between school socio-economic profile and the performance of disadvantaged students, on average across OECD countries.

However, mediation at the system level is less commonly observed. Both class size and student behaviour hindering learning are found to be potential mediating factors in only 14 out of 69 education systems. The availability of science competitions is a potential mediating factor in 12 out of 69 education systems, and science-specific resources available at school is a potential mediating factor in just 5 out of 67 education systems.

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Figure 4.5 [1/2] ▪ School policies, practices and characteristics, and the impact of socio-economic status on science performance

Disadvantaged students

	Potential mediation (blue)	Missing information (grey)

| Country/Economy | Is there evidence that the following can mediate the relationship between student and school socio-economic profile, and science performance? | | | |
	Science-specific resources at school	Student behaviour hindering learning	Science competitions at school	Class size
OECD average	█			
Australia		█		
Austria		█		
Belgium		█		
Canada		█		█
Chile		█		
Czech Republic				█
Denmark				
Estonia				
Finland				
France	▒		█	█
Germany				
Greece			█	
Hungary				
Iceland				
Ireland				
Israel				
Italy	▒			
Japan				
Korea		█	█	
Latvia				
Luxembourg				
Mexico				
Netherlands	█		█	█
New Zealand				
Norway				
Poland				
Portugal				
Slovak Republic		█		█
Slovenia			█	
Spain				
Sweden				
Switzerland				
Turkey		█		
United Kingdom				
United States		█		

(OECD countries)

1. See notes at the beginning of this chapter.

Note: These factors were deemed to potentially mediate the relationship between student and school socio-economic profile and student performance if and only if three conditions were fulfilled. First, there must have been a significant relationship between the variable and either student or school socio-economic profile. Second, there must have been a significant relationship between student performance and the variable, after accounting for student and school socio-economic profile. Finally, there must have been a significant change in the relationship between student performance and either student or school socio-economic profile (as measured by regression coefficients) upon the addition of the variable as an explanatory factor in the regression, and this change must have been biased towards zero. In other words, the relationship between student performance and either student or school socio-economic profile must have been significantly smaller in magnitude upon addition of the potentially mediating variable.

Source: OECD, PISA 2015 Database, Tables 4.7a-d.

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Figure 4.5 [2/2] ■ **School policies, practices and characteristics, and the impact of socio-economic status on science performance**

Disadvantaged students

■ Potential mediation   ▓ Missing information

Country/Economy	Is there evidence that the following can mediate the relationship between student and school socio-economic profile, and science performance?			
	Science-specific resources at school	Student behaviour hindering learning	Science competitions at school	Class size
OECD average	■	■	■	■
Albania	▓	▓	▓	▓
Algeria				
Brazil	■			
B-S-J-G (China)				
Bulgaria	■		■	
CABA (Argentina)				
Colombia				
Costa Rica				
Croatia		■		■
Cyprus[1]				■
Dominican Republic				
FYROM				
Georgia				
Hong Kong (China)				■
Indonesia				
Jordan				
Kosovo				■
Lebanon				
Lithuania				
Macao (China)		■		
Malta	■			
Moldova				
Montenegro		■		
Peru				
Qatar			■	
Romania				
Russia				
Singapore				
Chinese Taipei	■		■	
Thailand				
Trinidad and Tobago		■	■	■
Tunisia				
United Arab Emirates				
Uruguay			■	
Viet Nam				
Number of countries where there is a potential mediation effect due to these variables	5	14	12	14
Total number of countries with available data	67	69	69	69

Partners

1. See notes at the beginning of this chapter.

Note: These factors were deemed to potentially mediate the relationship between student and school socio-economic profile and student performance if and only if three conditions were fulfilled. First, there must have been a significant relationship between the variable and either student or school socio-economic profile. Second, there must have been a significant relationship between student performance and the variable, after accounting for student and school socio-economic profile. Finally, there must have been a significant change in the relationship between student performance and either student or school socio-economic profile (as measured by regression coefficients) upon the addition of the variable as an explanatory factor in the regression, and this change must have been biased towards zero. In other words, the relationship between student performance and either student or school socio-economic profile must have been significantly smaller in magnitude upon addition of the potentially mediating variable.

Source: OECD, PISA 2015 Database, Tables 4.7a-d.

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Teaching strategies (e.g. teacher-directed science instruction, perceived feedback, adaptive instruction, and enquiry-based science instruction), the student's progress through education (e.g. grade repetition, time spent in science class and attendance at science class), and student behaviour can also mediate the influence of a school's socio-economic profile on the performance of disadvantaged students (Tables 4.8a-k). As shown in Figure 4.6, in 35 out of the 56 education systems for which data are available, skipping an entire day of school – whether by the student him/herself or by his/her classmates – is a potential mediating factor between the school's socio-economic profile and science performance. For example, students from less-advantaged backgrounds attending less-advantaged schools are more likely, on average, to play truant from school, which results in fewer opportunities to learn and lower academic achievement. Skipping some classes is a potential mediating factor in 24 out of the 56 education systems for which data are available, while arriving late for school is a potential mediating factor in 25 of these 56 education systems.

However, there is one caveat: as discussed in *PISA 2015 Results (Volume II)* (OECD, 2016[21]), teachers may adjust their teaching methods depending on their students' abilities. As a result, identifying such teaching strategies as "mediators" may be misleading; it may be student performance that actually mediates the link between a school's socio-economic profile and teaching strategies. This argument could also be made for grade repetition or arriving late for school. Unfortunately, there is no way to distinguish between these possibilities and establish the direction of causality.

The relationship between socio-economic diversity in school and student performance

How is school-level socio-economic diversity related to performance? This section does not focus exclusively on disadvantaged students because changes in the distribution of disadvantaged students across schools might have implications for the performance of more advantaged students; thus, all students are considered in the analyses below.

A first analysis directly compares students who attend socio-economically diverse schools, as measured by the standard deviation in student-level ESCS within a school. Students who attend schools in the top quarter of the standard deviation of the ESCS index (i.e. the most socio-economically diverse schools, by this metric) score 34 points lower in the PISA 2015 science assessment than students in the bottom quarter of this index, on average across OECD countries (Table 4.2). This is also true in 45 of the 67 PISA-participating education systems, with gaps of over 100 score points observed in Israel, Qatar, Singapore and the United Arab Emirates. Differences in the other direction – where students in the most socio-economically diverse schools score higher than students in the least diverse schools – are observed only in Turkey and Viet Nam.

Hence, upon first glance, it appears that socio-economic diversity at school, as measured by the standard deviation, is associated with poorer performance. However, greater socio-economic diversity at school is also associated with a less-advantaged school socio-economic profile (i.e. advantaged schools are the least socio-economically diverse) (Table 4.4). Can the performance gap described above therefore be attributed solely to socio-economic diversity in the school?

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Figure 4.6 [1/2] ■ **Student truancy and the impact of socio-economic status on science performance**
Disadvantaged students

| | Potential mediation | Missing information |

Country/Economy	Is there evidence that the following can mediate the relationship between student and school socio-economic profile, and science performance?		
	Students skipping an entire day of classes	Students skipping some classes	Students arriving late for school
OECD average	■		
Australia	■	■	■
Austria	■		■
Belgium	■	■	■
Canada	■		■
Chile			
Czech Republic	■	■	■
Denmark	■		
Estonia			
Finland			
France	■		■
Germany	■		■
Greece	■		■
Hungary	■		■
Iceland	■		■
Ireland	■		
Israel			
Italy	■	■	■
Japan	■	■	■
Korea	■	■	■
Latvia	■	■	■
Luxembourg	■	■	■
Mexico			
Netherlands			■
New Zealand		■	■
Norway	■		
Poland	■		■
Portugal	■		■
Slovak Republic	■	■	■
Slovenia			■
Spain	■		■
Sweden			
Switzerland	■	■	■
Turkey	■		
United Kingdom	■		
United States			■

1. See notes at the beginning of this chapter.

Note: These factors were deemed to potentially mediate the relationship between student and school socio-economic profile and student performance if and only if three conditions were fulfilled. First, there must have been a significant relationship between the variable (at either the student or school level) and either student or school socio-economic profile. Second, there must have been a significant relationship between student performance and the variable (at either the student or school level), after accounting for student and school socio-economic profile. Finally, there must have been a significant change in the relationship between student performance and either student or school socio-economic profile (as measured by regression coefficients) upon the addition of the variable (at both the student and school levels) as an explanatory factor in the regression, and this change must have been biased towards zero. In other words, the relationship between student performance and either student or school socio-economic profile must have been significantly smaller in magnitude upon addition of the potentially mediating variable.

Source: OECD, PISA 2015 Database, Tables 4.8a-c.

StatLink https://doi.org/10.1787/888933830709

Figure 4.6 [2/2] ■ Student truancy and the impact of socio-economic status on science performance

Disadvantaged students

Legend: ■ Potential mediation   ▒ Missing information

Country/Economy	Is there evidence that the following can mediate the relationship between student and school socio-economic profile, and science performance?		
	Students skipping an entire day of classes	Students skipping some classes	Students arriving late for school
OECD average	■	■	■
Partners			
Albania	▒	▒	
Algeria	▒	▒	▒
Brazil	▒	▒	
B-S-J-G (China)	■	■	■
Bulgaria	■	■	■
CABA (Argentina)	▒	▒	▒
Colombia			
Costa Rica	■		
Croatia	■	■	■
Cyprus[1]	■	■	
Dominican Republic	▒	▒	▒
FYROM	▒	▒	▒
Georgia	▒	▒	▒
Hong Kong (China)	■		■
Indonesia	▒	▒	▒
Jordan	▒	▒	▒
Kosovo	▒	▒	▒
Lebanon	▒	▒	▒
Lithuania	■	■	■
Macao (China)	■	■	■
Malta	▒	▒	
Moldova	■	■	■
Montenegro	▒		
Peru			
Qatar	■	■	■
Romania	▒	▒	
Russia	▒	▒	▒
Singapore	■	■	■
Chinese Taipei	■	■	
Thailand	▒	▒	
Trinidad and Tobago	▒	▒	▒
Tunisia			
United Arab Emirates			■
Uruguay	▒	▒	
Viet Nam	▒	▒	▒
Number of countries where there is a potential mediation effect due to these variables	35	24	25
Total number of countries with available data	56	56	56

1. See notes at the beginning of this chapter.

Note: These factors were deemed to potentially mediate the relationship between student and school socio-economic profile and student performance if and only if three conditions were fulfilled. First, there must have been a significant relationship between the variable (at either the student or school level) and either student or school socio-economic profile. Second, there must have been a significant relationship between student performance and the variable (at either the student or school level), after accounting for student and school socio-economic profile. Finally, there must have been a significant change in the relationship between student performance and either student or school socio-economic profile (as measured by regression coefficients) upon the addition of the variable (at both the student and school levels) as an explanatory factor in the regression, and this change must have been biased towards zero. In other words, the relationship between student performance and either student or school socio-economic profile must have been significantly smaller in magnitude upon addition of the potentially mediating variable.

Source: OECD, PISA 2015 Database, Tables 4.8a-c.

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To answer this question, student and school socio-economic profiles were used as controls in a regression of science performance over the school-level variation in socio-economic profile.

On average across OECD countries, students' science scores drop by eight points for every additional unit increase of the school-level standard deviation in socio-economic status, even after accounting for student and school socio-economic profile (Table 4.6a).[6] As shown in Figure 4.7, socio-economic diversity in school has a negative relationship with student performance in 18 out of the 70 countries and economies that participated in PISA 2015. However, in 46 countries and economies, the school-level standard deviation in ESCS is unrelated to student performance. In the remaining six countries (Kosovo, Luxembourg, Portugal, Trinidad and Tobago, Turkey and the United States), more diverse schools show better science performance, on average, after accounting for student and school socio-economic profile (Table 4.6a).[7]

In summary, on average across OECD countries, attending socio-economically diverse schools is negatively related to science performance, even after accounting for student and school socio-economic profile. However, this relationship is observed in only a quarter of PISA-participating education systems.

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Figure 4.7 ■ Socio-economic diversity in school and student performance

Relationship between the standard deviation of student socio-economic status in school and student performance

Student performance…		
… is **higher** in schools with greater school-level diversity[1]	… **has no significant association** with school-level diversity[1]	… is **lower** in schools with greater school-level diversity[1]
Kosovo	Algeria	Cyprus[2]
Luxembourg	Australia	Czech Republic
Portugal	Austria	Finland
Trinidad and Tobago	Belgium	FYROM
Turkey	Brazil	Germany
United States	B-S-J-G (China)	Israel
	Bulgaria	Jordan
	CABA (Argentina)	Latvia
	Canada	Lithuania
	Chile	Macao (China)
	Colombia	Moldova
	Costa Rica	Montenegro
	Croatia	Peru
	Denmark	Poland
	Dominican Republic	Qatar
	Estonia	Russia
	France	Singapore
	Georgia	United Arab Emirates
	Greece	
	Hong Kong (China)	
	Hungary	
	Iceland	
	Indonesia	
	Ireland	
	Italy	
	Japan	
	Korea	
	Lebanon	
	Malta	
	Mexico	
	Netherlands	
	New Zealand	
	Norway	
	Romania	
	Slovak Republic	
	Slovenia	
	Spain	
	Sweden	
	Switzerland	
	Chinese Taipei	
	Thailand	
	Tunisia	
	United Kingdom	
	Uruguay	
	Viet Nam	

1. After accounting for student and school socio-economic profile.
2. See notes at the beginning of this chapter.
Source: OECD, PISA 2015 Database, Table 4.6a.
StatLink ᐊ᠍ᏚᏓ https://doi.org/10.1787/888933830728

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Notes

1. Various indicators have been proposed in the literature to measure segregation at school (Frankel and Volij, 2011[23]), and different indicators may be more relevant for certain analyses (for instance, of the extent to which the socio-economic composition in schools mirrors that of the general population or the extent to which one group is segregated from the rest of the population). The measure used here is related to the interaction indices, such as the isolation or exposure indices, that measure the probability that one type of student interacts with other types of students (Massey and Denton, 1988[24]). As schools with lower ESCS by definition enrol a large share of disadvantaged students, a disadvantaged student in a disadvantaged school is more likely to interact more with students of low socio-economic status.

The proportion of disadvantaged students who attend disadvantaged schools is highly correlated with other measures of socio-economic segregation, including those that do not focus exclusively on disadvantaged students. One of these measures is the PISA index of social inclusion, which is the proportion of the total variance in student socio-economic status in an education system that is found within schools, as opposed to between schools. The coefficient of determination, or R^2 value, between the proportion of disadvantaged students who attend disadvantaged schools and the index of social inclusion is 0.77. This high degree of correlation indicates that this new measure, while focussing on disadvantaged students, is also informative about the segregation of students of all socio-economic backgrounds.

2. In this report, in order to obtain an accurate school-level average of student socio-economic status, only schools where at least 10 students had a valid ESCS index were retained for analysis. This is in contrast to previous PISA reports and the other chapters of this report, where all schools were retained. In a school where only one student has a valid ESCS index, the school-level ESCS would be equivalent to the ESCS index of that one student.

One reason for removing schools with a small number of student-level ESCS measurements is the inherent inaccuracy associated with calculating a mean from a small number of observations. However, the school-level mean may also be biased due to the specific way in which PISA samples students. Only 15-year-old students are sampled, and a large school may have a small number of 15-year-old students if such students are not in the modal grade but have been pushed forward or held back. In the former situation, these students are likely to perform better than the average student and therefore be of higher socio-economic status; using their average ESCS index risks overestimating the school's socio-economic profile. The reverse is true if students have been held back.

Robustness analyses show that while the students removed from the analysis generally scored lower than the students who were retained, the relationship between performance and both student- and school-level ESCS generally remained unchanged upon removing schools with fewer than 10 students participating in the PISA assessment.

3. In the most extreme situation, where an education system is completely socio-economically segregated and disadvantaged students attend schools only with other disadvantaged students, 100% of disadvantaged students would attend disadvantaged schools. At the other extreme, where an education system is completely integrated and disadvantaged (and advantaged) students are equally allocated among all schools, 25% of disadvantaged students would attend disadvantaged schools. Indeed, in this extreme situation of complete socio-economic integration, there would be no difference between disadvantaged and advantaged schools, as all schools would have an identical school-level ESCS. As disadvantaged schools are defined as comprising 25% of the total student population, 25% of disadvantaged students would also be found in disadvantaged schools. By definition, disadvantaged schools have a greater proportion of disadvantaged students than would be expected in the extreme situation where schools are completely integrated.

4. The figure also shows that the difference between doubly disadvantaged students (disadvantaged students attending disadvantaged schools) and doubly advantaged students (advantaged students attending advantaged schools) is 130 points in the PISA 2015 science assessment, on average across OECD countries. Although this comparison is not the focus of the chapter, it shows that there is an even larger disparity in performance between the two socio-economic extremes in education systems.

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5. Without considering student socio-economic status, an increase of one unit in school-level ESCS is associated with an improvement of 66 score points in the PISA 2015 science assessment. The small decrease in the strength of the association after including student-level ESCS as an explanatory variable is due to the positive relationship between student- and school-level ESCS.

6. This gap should be relativised by the fact that the standard deviation of the school-level standard deviation in socio-economic status is 0.14 across OECD countries. Moreover, the average standard deviation of ESCS in the bottom quarter of this index is 0.60, while that in the top quarter is 0.94, on average across OECD countries. In other words, a one-unit increase would be an exceptionally large increase when considering actual schools.

7. Another factor that may influence the relationship between student performance and student- and school-level socio-economic profile (including school-level socio-economic diversity) is immigration – whether a student has an immigrant background and the proportion of schoolmates who have an immigrant background. Previous PISA reports (such as *PISA 2015 Results (Volume I)* [OECD, 2016[1]]) have shown that students with an immigrant background score below non-immigrant students in most PISA-participating countries, both before and after accounting for socio-economic status. Accounting for immigrant background does not, for the most part, change the results presented in Figure 4.7. The major changes are that student performance in Austria and Macao (China) is observed to be higher in schools with greater school-level socio-economic diversity; student performance in Malta is observed to be lower in schools with greater school-level socio-economic diversity; and student performance in Finland and Germany is no longer significantly associated with school-level socio-economic diversity. On average across OECD countries, however, no significant association between school-level diversity and student performance is observed after accounting for immigrant background.

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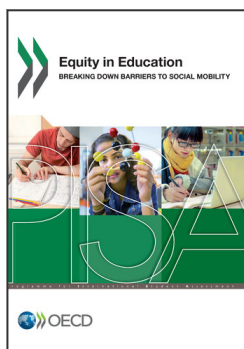
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