7

Immigrant background, student performance and students' attitudes towards science

This chapter examines differences in performance and attitudes towards science in PISA 2015 by students' immigrant background. It discusses recent trends in immigration in PISA-participating countries and economies, and highlights factors associated with low performance among immigrant students, including the concentration of disadvantage in the schools that many of these students attend.

A note regarding Israel

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

How school systems respond to migration can have an enormous impact on the economic and social well-being of all members of the communities they serve, whether they have an immigrant background or not.

The analysis of immigrant students' outcomes in PISA 2015 builds on the equity framework presented in Chapter 6. A first dimension of equity, inclusion, refers to the objective of ensuring that all students, particularly those from disadvantaged or traditionally marginalised groups, reach a baseline level of skills. A second dimension, fairness, relates to removing obstacles to student achievement that are rooted in circumstances over which students have no control – including an immigrant background. Minimising any potentially adverse impact of students' immigrant background on their outcomes at school is not only an imperative for achieving equity in education but also a way of enhancing social cohesion and economic outcomes in host communities. For the children of immigrants, education is a main route towards integration.

What the data tell us

- On average across OECD countries, 12.5% of students in 2015 have an immigrant background, up from 9.4% in 2006. Some 57% of immigrant students who recently arrived in their host communities have at least one parent as educated as the average parent in the host country, but 45% of second-generation and 67% of first-generation immigrant students do not speak the language of the PISA test at home.

- The average difference in science performance between immigrant and non-immigrant students with a similar socio-economic profile is 31 score points. The average difference shrinks to 19 score points after taking into account the language spoken at home.

- On average across OECD countries, and after taking their socio-economic status into account, immigrant students are more than twice as likely as their non-immigrant peers to perform below proficiency Level 2 in science. Yet 24% of socio-economically disadvantaged immigrant students are considered resilient – meaning that they manage to score among the top quarter of all students in PISA.

- On average across countries with relatively large immigrant student populations, attending a school with a high concentration of immigrant students is not associated with lower student performance after accounting for the school's socio-economic intake.

- The average difference in science performance between immigrant and non-immigrant students with similar socio-economic status and familiarity with the test language narrowed by 6 score points between 2006 and 2015.

However, in many countries and economies, no matter their level of achievement as an education system, students with an immigrant background continue to have poorer outcomes in schools than students without an immigrant background (see Box I.7.1 for the definition of immigrant background in PISA). PISA shows that, in most school systems, first-generation immigrant students who have spent more time in the country of destination tend to perform better than those who have spent less time in the country; that second-generation immigrant students tend to perform better than first-generation immigrant students but still worse than their non-immigrant peers; and that the most vulnerable immigrant students tend to be those who arrive at a late age, who have limited mastery of the language of assessment in the host country, and who come from a country where education standards are weaker (OECD, 2015a; OECD, 2013; OECD, 2012). Yet these relationships differ widely across countries.

INCLUSIVE AND FAIR EDUCATION FOR IMMIGRANT STUDENTS

Since PISA 2012, many OECD countries, especially in Europe, have seen a sharp increase in the number of immigrants entering their territories – including unprecedented numbers of asylum-seekers and children. An estimated 5 million permanent migrants arrived to OECD countries in 2015, an increase of about 20% relative to 2014, with family reunification and free movement accounting each for about a third of these permanent entries (OECD, 2016; OECD, 2015b). The recent wave of migration has reinforced a long and steady upward trend in the share of the immigrant population in OECD countries, which has grown by more than 30% and has become increasingly diverse since 2000 (OECD/EU, 2015). Over this period, many former OECD emigration countries, such as Ireland, Italy and Spain, became destination countries; before the global economic crisis, immigration rates in these countries were sometimes as large as those of traditional OECD immigration countries (OECD, 2015b).
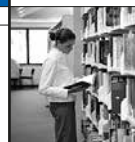
Box I.7.1. **Definition of immigrant students in PISA**

PISA classifies students into several categories according to their immigrant background and that of their parents:

Non-immigrant students are students whose mother or father (or both) was/were born in the country or economy where they sat the PISA test, regardless of whether the student himself or herself was born in that country or economy. In this chapter, these students are also referred to as "**students without an immigrant background**".

Immigrant students are students whose mother and father were both born in a country/economy other than that where the student sat the PISA test. In this chapter, they are also referred to as "**students with an immigrant background**". Among immigrant students, a distinction is made between those born in the country/economy of assessment and those born abroad:

- **First-generation immigrant students** are foreign-born students whose parents are also both foreign-born.
- **Second-generation immigrant students** are students born in the country/economy where they sat the PISA test and whose parents are both foreign-born.

In some analyses, these two groups of immigrant students are, for the purpose of comparison, considered along with non-immigrant students. In other cases, the outcomes of first- and second-generation immigrant students are examined separately. PISA also provides information on other factors related to students' immigrant background, including the main language spoken at home (i.e. whether students usually speak, at home, the language in which they were assessed in PISA or another language, which could also be an official language of the host country/economy) or, for first-generation immigrant students, the number of years since the student arrived in the country where he or she sat the PISA test.

Migration puts enormous strains on both host communities and immigrants themselves; but it can also provide new opportunities for countries that face ageing native-born populations and the threat of labour and skill shortages. A lesson from the history of many OECD countries is that successful integration can promote social cohesion and economic and social development in host countries. How education systems respond to immigration has a major impact both on the opportunities offered to immigrants and on immigrants' ability to participate in the labour markets of host countries and to feel part of their communities. In other words, countries' success in integrating immigrant children into society bears a strong connection with the efficacy of social policy in general and education policy in particular. This chapter sheds light on the success of school systems in addressing the challenges of diversity and helping students with an immigrant background develop their skills.

When looking at the outcomes of immigrant students, it is important to highlight that, both within and across countries, immigrant students are a much more diverse than homogeneous population. Students with an immigrant background can differ widely in their country of origin, cultural and language traditions, socio-economic status and the length of time spent in the host country. They also bring a wide range of skills, knowledge and motivations to their schools. While in most OECD countries students with an immigrant background tend to perform worse in PISA than non-immigrant students, in a number of countries the opposite is true. Cross-country variations in the performance of immigrant students, which persists even after accounting for students' socio-economic status, clearly suggests that policy has an important role to play in narrowing those differences.

Research indicates that the education outcomes of immigrant students are shaped by different resources and circumstances associated with both the families and immigrant communities they come from, and the social and education policies, and attitudes towards immigrants, in the countries of destination. In this light, any (dis)advantage that accrues to immigrant students is best understood when compared with the outcomes of non-immigrant youth of similar socio-economic status. In addition, immigrant students' education outcomes are affected by institutional features of the host-country education systems, including early stratification practices (Buchman and Parrado, 2006; Heath and Brinbaum, 2014). More generally, performance differences among immigrant students across countries need to be seen in light of the selectivity of host-country immigration policies and the relative cultural and linguistic similarity between countries of origin and destination. Immigration policies vary widely across PISA-participating countries/economies, contributing to the highly diverse profiles of immigrant student populations and their families (Box I.7.2).

Immigrant students often face the double disadvantage of coming from immigrant and disadvantaged backgrounds. That is, in many cases immigrant students have to overcome cultural and social barriers that compound the effects of socio-economic deprivation, including attending schools with fewer resources and higher concentrations of other disadvantaged students. In addition, immigrant students are, in general, more likely than their non-immigrant peers to be delayed in their progression through school grades and to be enrolled in vocational programmes, which, in turn, can lead to less exposure to some academic content (OECD, 2015a). Looking at how multiple forms of disadvantage influence student performance is also a way of highlighting the resilience of immigrant students and how, despite poverty and unfamiliarity with the prevailing culture, many immigrant 15-year-olds still manage to perform above expectations – and thus boost their potential to make exceptional contributions to their host countries.

Box I.7.2. **The impact of immigration policies on the immigrant student population**

In most PISA-participating countries/economies, immigrant students perform below their non-immigrant peers. However, these performance differences must be interpreted in the context of the profile of the immigrant student population, which is shaped by the immigration policies in each country/economy. For example, immigration is a relatively new phenomenon in some countries, while it has been a feature of other countries for decades. In these latter countries, many immigrant students may be second- or third-generation immigrants, and there may be more mechanisms in place to integrate immigrants than found in countries that have only recently started receiving immigrants.

The criteria used for admitting immigrants into countries vary considerably. Some countries give preferential admission to the highly educated, while others accept a greater share of low-skilled immigrants or humanitarian migrants, refugees and asylum-seekers. Parents who are more educated might value education more for their own children and may be better placed to assist with homework or navigate the host country's education system, facilitating their children's academic success. In addition, countries/economies differ markedly in the composition of their immigrant populations. Migrants often choose destinations that have colonial, linguistic or cultural links with their home country or where there is a large community of their compatriots; some may choose to move to countries closer to home.

Across most countries and economies, immigrant populations are far from homogeneous. The diversity of immigrants' geographic and cultural origins is usually mirrored in linguistic diversity: large numbers of immigrant students speak at home a language different from the language of instruction in the host community's schools. OECD countries (and several partner countries and economies) can be grouped into a few categories according to the characteristics of their immigrant populations. Among countries with large immigrant populations, five such groups can be identified:

1. **Settlement countries** where immigration has contributed to the country's development and is considered to be part of its heritage and history. Approximately one in two people is either foreign-born or has at least one foreign-born parent, and there are large proportions of highly educated immigrants. These countries include Australia, Canada, Israel and New Zealand.

2. **Long-standing destination countries with many recent and highly educated immigrants**. These countries include Luxembourg, Switzerland and the United Kingdom, where many recent immigrants arrived through free movement in the EU/EFTA for labour purposes. The United States can also be included in this group of countries, although its more recent arrivals include large numbers of low-educated immigrants from Latin America.

3. **Long-standing destination countries with many settled, low-educated migrants**. Guest workers came to these countries after World War II for what were often supposed to be temporary stays; but many settled permanently. There are many second- and third-generation immigrant children and relatively fewer numbers of new immigrants. Immigrant adults have relatively poor employment rates and are socially disadvantaged compared to the native population. This group of countries includes Austria, Belgium, France, Germany and the Netherlands.

...

4. **Countries with large populations of recent and humanitarian immigrants**. Much of the immigrant population arrived after 2000 and the vast majority did not speak the language of the destination country upon arrival. Immigrants in these countries tend to be disadvantaged compared to the non-immigrant population; but these host countries have strong integration policies. These countries include Denmark, Finland, Norway and Sweden.

5. **New destination countries with large populations of low-educated immigrants**. These migrants came to fill low-skilled, manual labour jobs and arrived in significant numbers in the early 2000s. Most of them are either young and childless or have left their children in their home countries. The immigrant children who have grown up in these destination countries tend to have poorer outcomes than their native-born peers. Greece, Italy, Portugal and Spain are included in this group.

Among countries with smaller numbers of immigrants, relative to the native-born population, another three groups can be distinguished:

6. **New destination countries with many recent, highly educated immigrants**. These countries have received increasing numbers of labour migrants, especially in the past decade, many of whom are highly skilled and come from high-income countries. Overall integration outcomes tend to be good relative to other new destination countries, although many highly educated immigrants are considered to be overqualified in the labour market. These countries include Iceland, Ireland and Malta.

7. **Countries with an immigrant population shaped by border changes and/or by national minorities**, where the majority of the foreign-born population came to be considered so as a result of border changes or nation-building in the late 20th century, mainly in Central and Eastern Europe. This immigrant population is an ageing group with social and economic outcomes that are often similar to, if not better than, those of their native-born peers. Countries in this group include Croatia, the Czech Republic, Estonia, Hungary, Latvia, Lithuania, Poland, the Slovak Republic and Slovenia.

8. **Emerging destination countries with small immigrant populations.** This group of countries is made up of OECD countries where less than 2% of the population is foreign-born, but where the share of foreign-born residents has more than doubled since 2000 and where integration outcomes vary widely. Countries in this group include Bulgaria, Chile, Japan, Korea, Mexico, Romania and Turkey.

Even within groups of countries in similar circumstances, there are wide disparities in integration outcomes. This suggests that policies have a key role to play. Integration policies, and extra support targeted towards immigrant families and children, can make a significant difference in how immigrant students fare in their host communities.

Sources: OECD/European Union (2015).

A PROFILE OF IMMIGRANT STUDENTS IN PISA 2015

Global migration flows are profoundly changing the typical classroom in many PISA-participating countries and economies. But immigration is not affecting all countries the same way, neither in its overall magnitude nor in the share of first- and second-generation immigrant students.[1] Figure I.7.1 shows that the percentage of 15-year-olds students with an immigrant background grew from 9.4% to 12.5% between 2006 and 2015, on average across OECD countries. About two-thirds of this growth comes from the increase in the percentage of second-generation immigrant students, from 5.0% to 7.1%, while the share of first-generation immigrant students grew more modestly from 4.5% to 5.4% of the total number of students in OECD countries. This represents a continuation of the upward trend in the number of immigrant students observed in previous PISA assessments.

However, the overall percentage of immigrant students and its growth between 2006 and 2015 vary considerably across countries and economies, as does the composition of immigrant populations. In PISA 2015, more than one in two students in Luxembourg, Macao (China), Qatar and the United Arab Emirates had an immigrant background, as did close to one in three students in Canada, Hong Kong (China) and Switzerland. By contrast, in 38 countries and economies that participated in PISA 2015, the proportion of immigrant students remains below 6.25%, or less than half of the average percentage in OECD countries (12.5%) (Table I.7.1). In the remainder of the chapter, this threshold is used to identify countries with greater challenges and opportunities associated with the presence of immigrant students in their school systems.

Figure I.7.1 ■ **Change between 2006 and 2015 in the percentage of second- and first-generation immigrant students**

◆ 2006   ▢ 2015
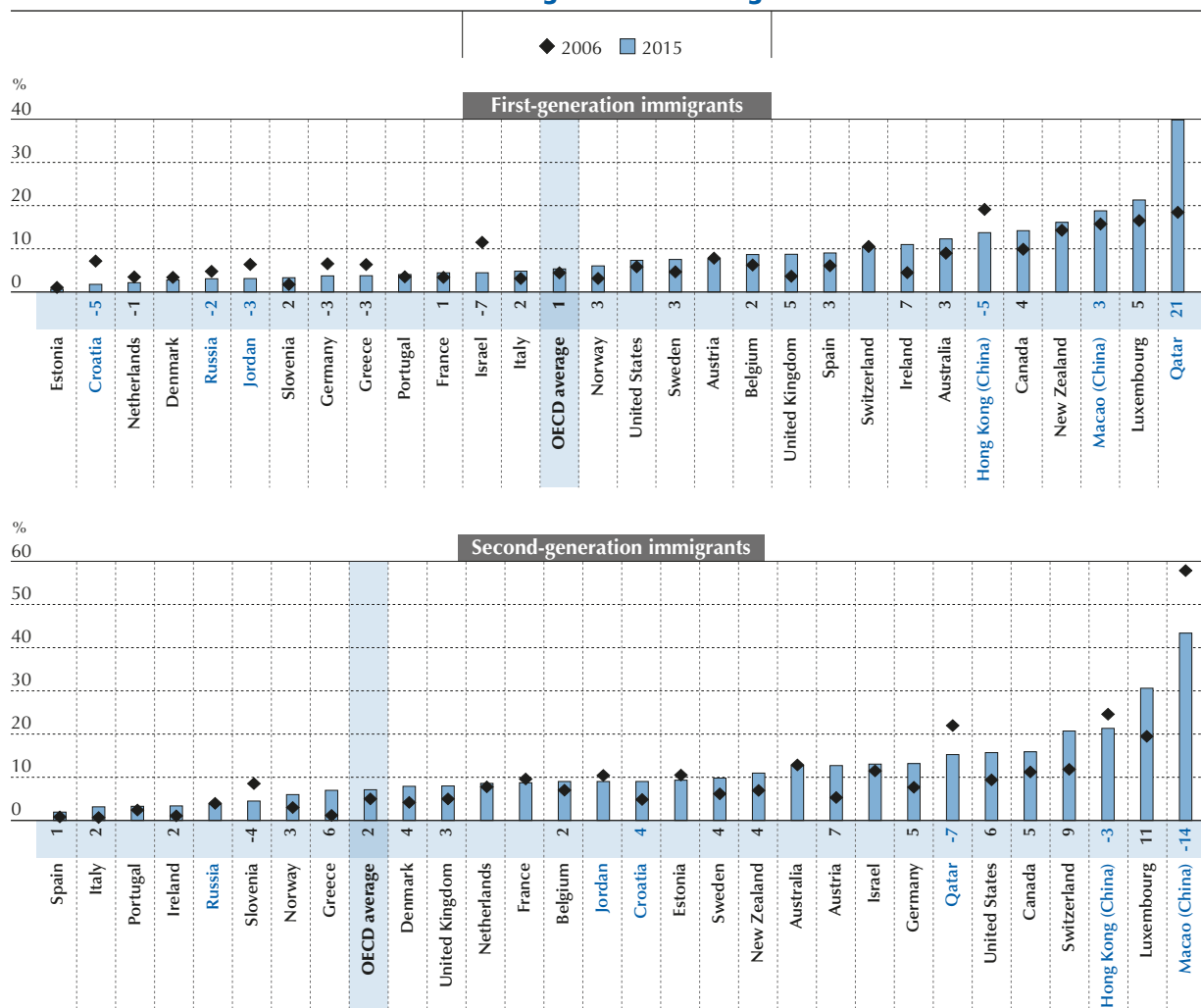
Notes: Only countries where the percentage of immigrant students is higher than 6.25% in 2015 are shown.

Results for Germany should be interpreted with caution due to missing rates on the student immigrant background and language spoken at home variables (see Tables A1.3 and A5.10).

The percentage-point difference between 2006 and 2015 in the share of students with an immigrant background is shown next to the country/economy name. Only statistically significant differences are shown (see Annex A3).

For each figure, countries and economies are ranked in ascending order of the percentage of students in 2015.

Source: OECD, PISA 2015 Database, Table I.7.1.

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Hereafter, countries where more than 6.25% of 15-year-old students have an immigrant background are referred to as "countries with relatively large immigrant student populations". Most of the analyses presented in this chapter are related to these countries and economies.

Between 2006 and 2015, the percentage of immigrant students increased by more than 10 percentage points in Luxembourg and Qatar, and by between 5 and 10 percentage points in Austria, Canada, Ireland, New Zealand, Norway, Sweden, Switzerland,[2] United Kingdom and the United States. Over the same period, the proportion of immigrant students decreased in 12 countries, including by more than 5 percentage points in high-immigration countries/economies Hong Kong (China), Israel and Macao (China) (Table I.7.1).

When examining the association between immigration and academic performance at either the system or student level, it is important to do so in the context of the changing composition of student populations over time. This allows for an assessment of how variation in performance is related to differences in the socio-economic status of immigrant students across countries, and to differences in the ways that education systems cater to the needs of immigrant students.

Migrants' decision to relocate to another country is commonly associated with a desire to improve their living standards. But as a result of displacement and during adjustment periods in their host countries, immigrants often endure economic hardship and precarious living conditions. This helps explain why, on average across OECD countries, students with an immigrant background tend to be more disadvantaged than non-immigrant students, as reflected in the lower values on the PISA index of economic, social and cultural status (ESCS) of both second- and first-generation immigrant students, on average across OECD countries, and in most partner countries and economies (Table I.7.2). Nonetheless, the mobility of high-skilled workers and their families also plays an important role in international migration, and in a small number of PISA-participating countries, immigrant students tend to have similar or higher socio-economic status than their non-immigrant peers. In PISA 2015, this is the case in Estonia, Ireland, Latvia, Malta, Montenegro, Singapore and the United Arab Emirates.

Despite being more disadvantaged than non-immigrants, on average, many immigrants bring valuable skills to their host countries. Figure I.7.2 reveals a positive trend in the education backgrounds of recent entrants into OECD countries, as reflected in the educational attainment of the parents of first-generation immigrant students who sat the PISA test in 2006 and 2015. On average across OECD countries, 57.3% of first-generation immigrant students in 2015 have at least one parent who attended school for as many years as the average parent in the host country, an increase of 1.4 percentage points from 2006 for countries with available data. Among countries with relatively large immigrant student populations, this increase is most apparent in Belgium, Croatia, Denmark, Ireland and Luxembourg, where the percentage of first-generation immigrant students with educated parents increased by 10 percentage points or more over this period. By contrast, in Israel, Italy, Jordan, Macao (China), Norway, Sweden and Spain, the share of first-generation immigrant students sitting the PISA test and having highly educated parents shrank by more than 10 percentage points between 2006 and 2015 (Table I.7.2).

Figure I.7.2 ■ **Change between 2006 and 2015 in the percentage of first-generation immigrant students with educated parents[1]**
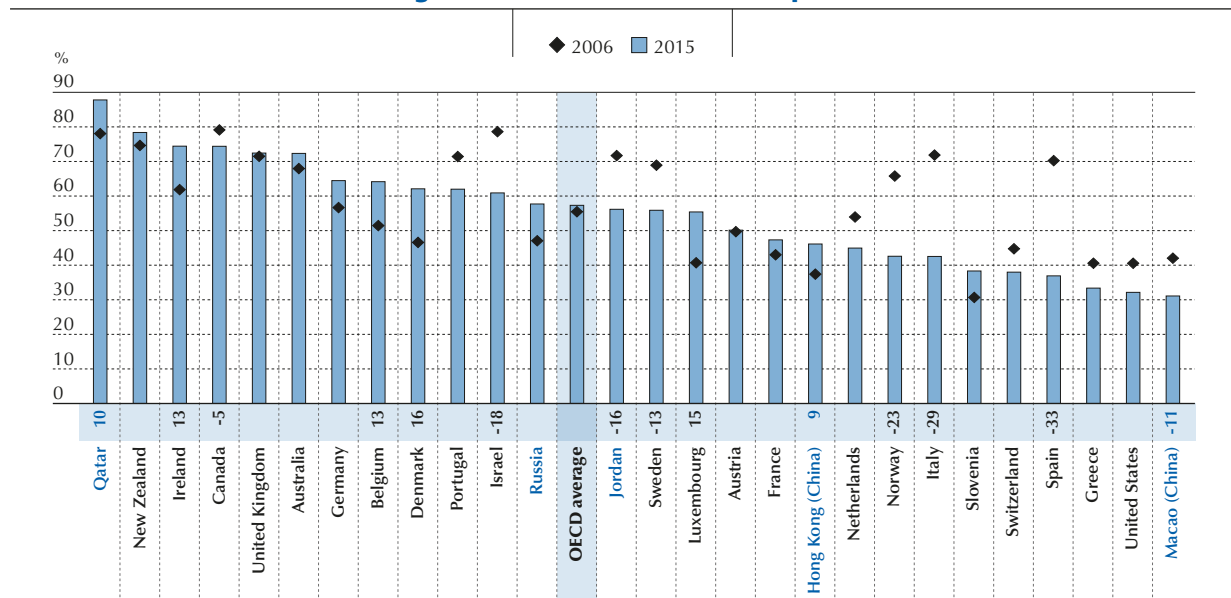
1. "Educated parents" are those who are as educated as the average parent in the host country.
Notes: Only countries where the percentage of immigrant students is higher than 6.25% are shown.
The percentage-point difference between 2006 and 2015 in the share of first-generation immigrant students with educated parents is shown next to the country/economy name. Only statistically significant differences are shown (see Annex A3).
Countries and economies are ranked in descending order of the percentage of first-generation immigrant students with educated parents in 2015.
Source: OECD, PISA 2015 Database, Table I.7.2.

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While trends in the percentage of immigrant students with educated parents reflect improvements in the education outcomes in many countries of origin, growing migration flows are also translating into greater linguistic diversity in receiving countries. On average across OECD countries, the percentage of 15-year-olds who do not speak the language of the PISA assessment at home increased by four percentage points among both first- and second-generation immigrant students between 2006 and 2015 in countries with available data. This means that, in PISA 2015, two in

three first-generation immigrant students and almost one in two second-generation immigrant students were assessed in a language different from the one they normally use at home. In Belgium, Germany,[3] Greece, Ireland, Qatar and Slovenia, the share of immigrant students born abroad who mainly speak a language different from that of the PISA test increased by between 10 and 35 percentage points (Table I.7.2). In Israel, Italy and Qatar, the growth in the percentage of second-generation students speaking mainly another language at home was between 10 and 20 percentage points (Table I.7.2). These two trends – a growing number of recent migrants from linguistically distant countries, and a greater use of heritage languages within immigrant families whose offspring were born in host countries – indicate that students with an immigrant background were, on average, less familiar with the language of assessment in PISA 2015 than in PISA 2006. This suggests that many school systems are facing greater challenges to integrate linguistically heterogeneous student populations.

IMMIGRATION AND PERFORMANCE IN HOST COUNTRIES

Despite the growing numbers and greater linguistic diversity of immigrant students in PISA-participating countries, results from PISA 2015 provide no basis for the claim that larger proportions of students with an immigrant background are related to poorer education standards in host communities. Figure I.7.3 shows that there is no significant association between the share of immigrant students and the performance of a school system, as measured by the mean score on the PISA science assessment. In fact, the percentage of students with an immigrant background and a school system's mean performance are positively but weakly correlated, as indicated by the upward slope of the line in the upper panel of the figure.

Obviously, the composition of immigrant populations can vary greatly across countries, and this can have a significant impact on the average achievement of immigrant students. However, the conclusion that the share of students with an immigrant background is not necessarily related to mean science performance at the country/economy level holds even after accounting for the socio-economic status of immigrant 15-year-olds. This is reflected in the lower panel of Figure I.7.3, which shows a weak correlation between a school system's mean performance and the percentage of immigrant students who are socio-economically disadvantaged, expressed as a part of the total student population within each country.

Differences between immigrant and non-immigrant students in science performance and science-related attitudes

Figure I.7.4 compares the science performance of immigrant and non-immigrant students across the school systems that participated in PISA 2015. Results show how, in most countries, both first- and second-generation immigrant students tend to perform worse than students without an immigrant background. The average science performance of foreign-born students whose parents were also born outside the host country is 447 score points, about half a standard deviation below the mean performance of non-immigrant students (500 score points), on average across OECD countries. Second-generation immigrant students perform between the two, with an average science score of 469 points.

Figure I.7.4 also shows that, although many immigrants have poorer relative performance when compared to their non-immigrant peers in their country/economy, they can perform at very high levels by international standards. Among countries with relatively large immigrant student populations, Macao (China) and Singapore are high-performing school systems where the average science scores of both first- and second-generation immigrant students are higher than those of non-immigrant students, which implies that the performance of these immigrant students contributes to raise the mean scores of these countries. Immigrant students in Australia, Canada, Estonia, Hong Kong (China), Ireland and New Zealand also score similarly to or higher than the OECD average in science (Table I.7.4a).

Figure I.7.5 shows that, on average across OECD countries, the average difference in science performance between immigrant and non-immigrant students — 43 score points — is reduced to 31 score points after taking students' socio-economic status into account. But these performance gaps, and the extent to which socio-economic status accounts for them, vary widely across countries and economies. Among countries with relatively large immigrant student populations, the gaps are largest in Austria, Belgium, Denmark, Germany, Slovenia, Sweden and Switzerland: more than 60 score points before accounting for socio-economic status, and between 40 and 55 score points after accounting for socio-economic status (Table I.7.4a).

By contrast, in a smaller number of these countries, immigrant students outperform their non-immigrant peers. This is the case in Macao (China), where immigrants score 22 points higher after accounting for their socio-economic status, and in Qatar and the United Arab Emirates, where they outperform their non-immigrant peers by more than 80 score points. In Australia, Canada, Ireland, Jordan, New Zealand and the Russian Federation (hereafter "Russia"), the performance differences between the two groups are negligible in the first place (Table I.7.4a).
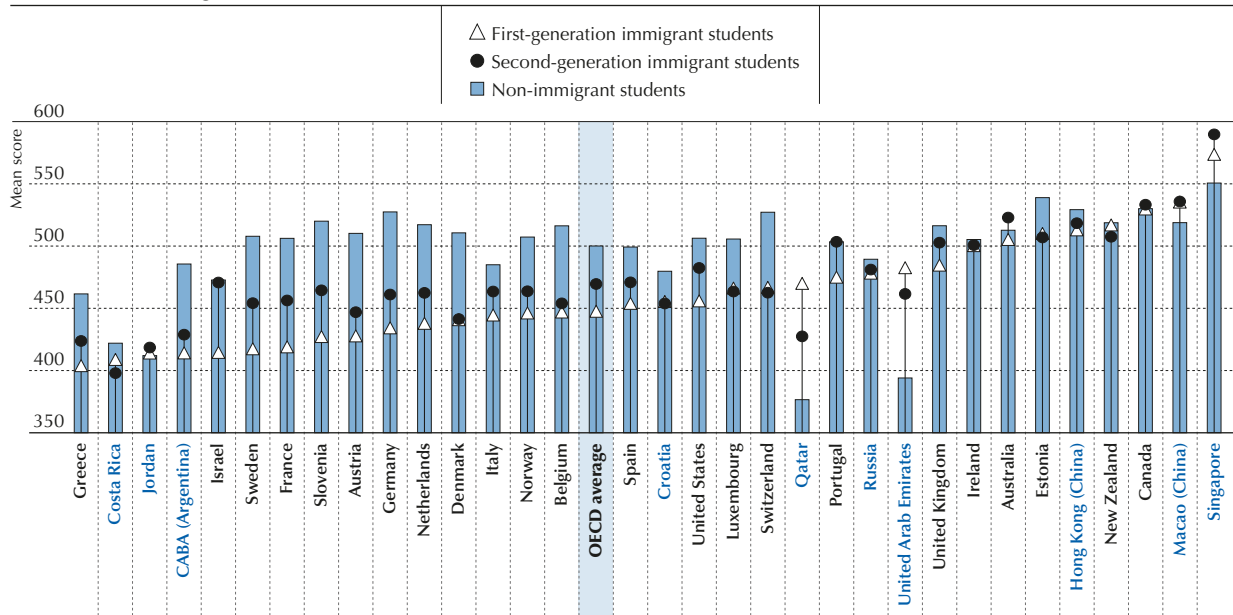
Figure I.7.3 ■ **Percentage of immigrant students and education systems'
average performance in science**

Science performance and immigrant students

Science performance and disadvantaged immigrant students
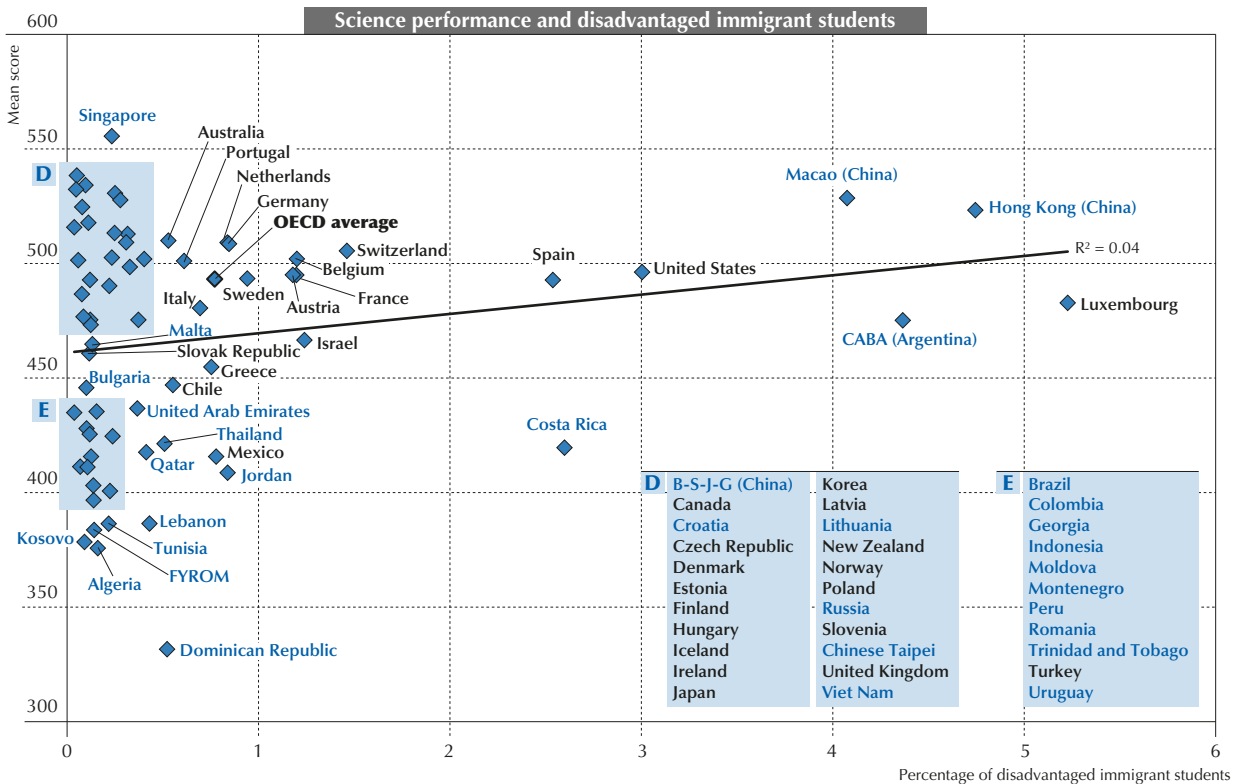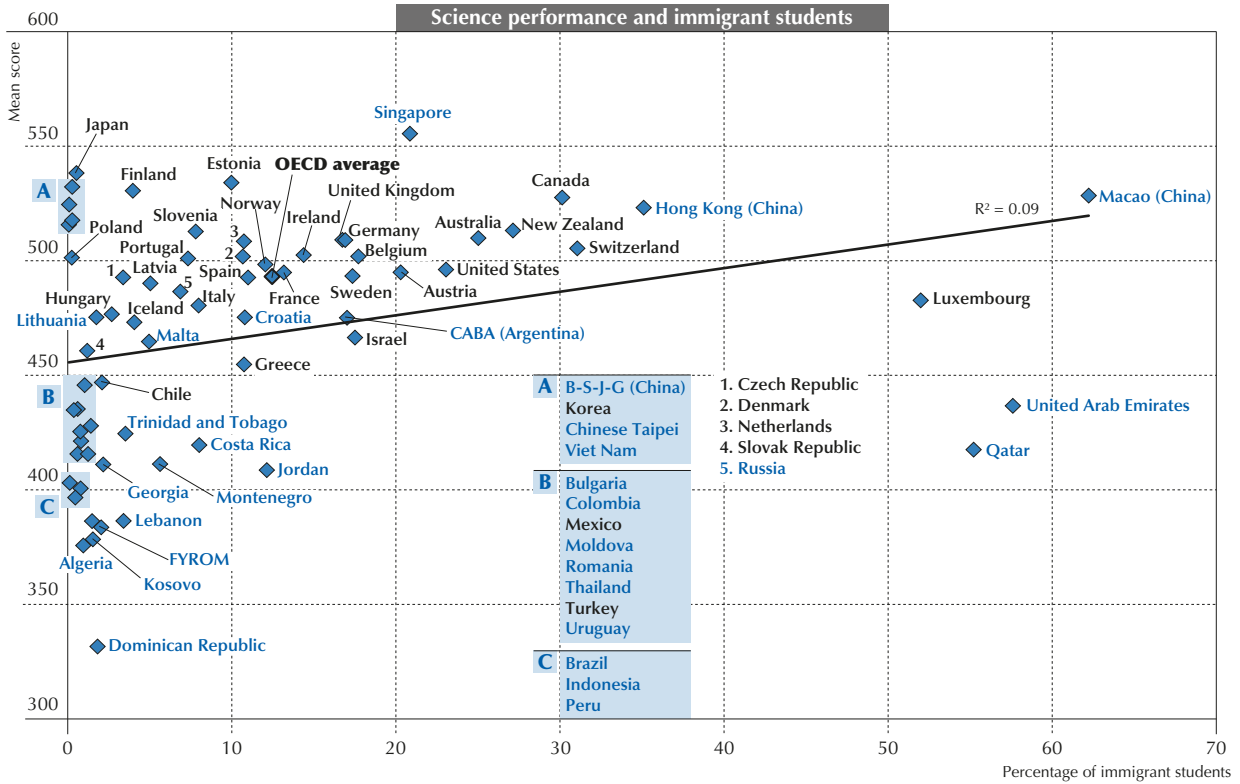
Source: OECD, PISA 2015 Database, Table I.7.3.

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Figure I.7.4 ■ **Student performance in science, by immigrant background**

Note: Only countries where the percentage of immigrant students is higher than 6.25% are shown.
Countries and economies are ranked in ascending order of the mean science score of first-generation immigrant students.
Source: OECD, PISA 2015 Databases, Table I.7.4a.

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Figure I.7.5 ■ **Differences in science performance, by immigrant background**

Score-point difference in science between immigrant and non-immigrant students,
before and after accounting for socio-economic status
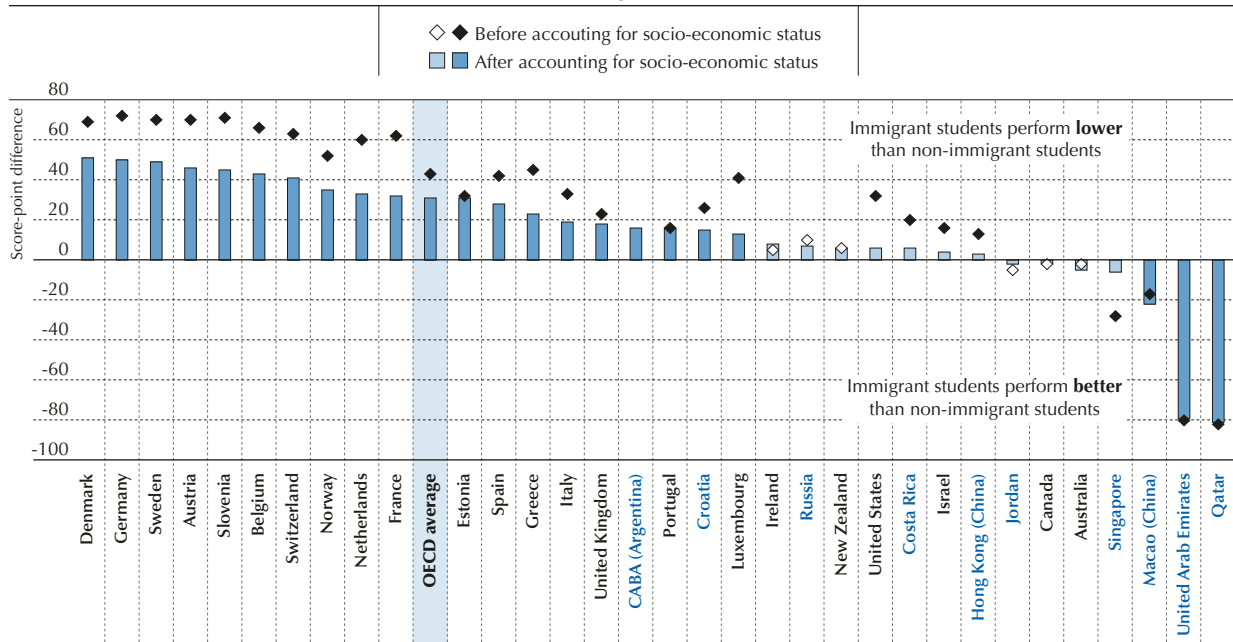
Notes: Only countries where the percentage of immigrant students is higher than 6.25% and with available PISA index of economic, social and cultural status (ESCS) data are shown.
Statistically significant differences are marked in a darker tone (see Annex A3).
Countries and economies are ranked in descending order of the gap in science performance related to immigrant background after accounting for students'
socio-economic status.
Source: OECD, PISA 2015 Databases, Table I.7.4a.

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In 22 out of the 33 countries where the overall proportion of immigrant students is larger than 6.25%, or half the OECD average proportion, performance differences between immigrant and non-immigrant students remain significant after accounting for socio-economic status. Only in five of these countries/economies – Costa Rica, Hong Kong (China), Israel, Singapore and the United States – do these differences disappear after accounting for socio-economic status. This indicates that, in most cases, socio-economic disadvantage cannot fully account for immigrant students' poorer performance.

A similar pattern of results is observed in other assessment domains. On average across OECD countries, immigrant students score 40 points lower in reading and 37 points lower in mathematics than their non-immigrant peers. When comparing students with similar socio-economic status, these differences are reduced to 29 and 26 score points, respectively (Table I.7.4b, Table I.7.4c).

Beyond differences in mean performance, a major concern for countries and economies around the world is that immigrant students are more likely than their non-immigrant peers to leave the school system without having attained a baseline level of skills – an indicator of the inclusiveness of these systems. Figure I.7.6 shows that, on average across OECD countries, as many as 39.1% of first-generation immigrant students and 29.5% of second-generation immigrant students perform below proficiency Level 2 in the PISA 2015 science assessment. By comparison, only 18.9% of students without an immigrant background are low performers in science.

Figure I.7.6 ■ **Percentage of low performers in science, by immigrant background**
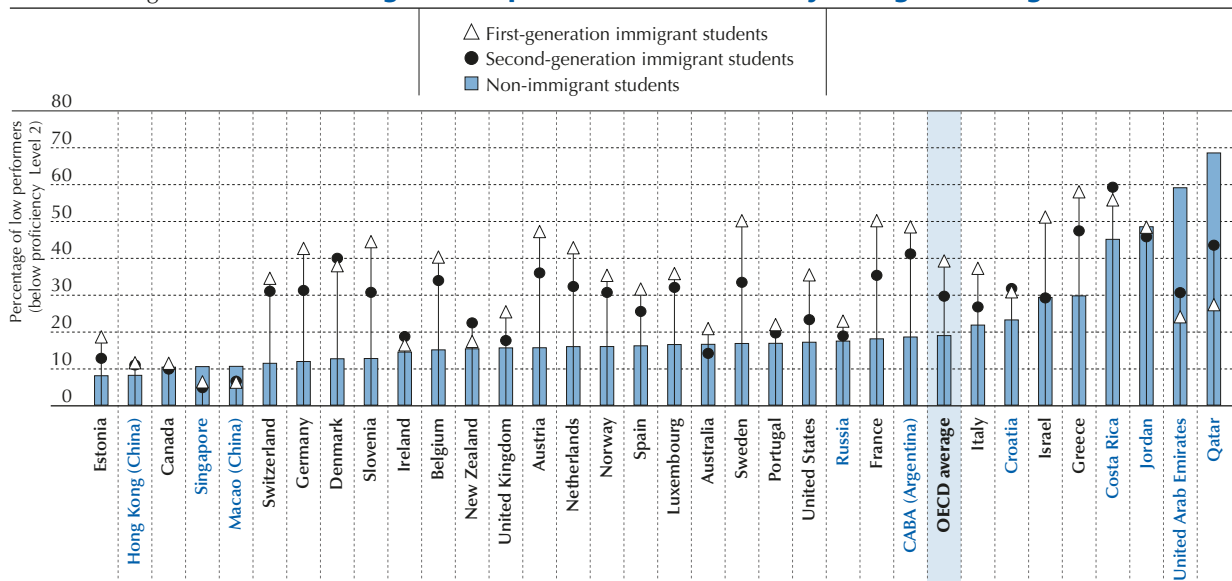
Note: Only countries where the percentage of immigrant students is higher than 6.25% are shown.
Countries and economies are ranked in ascending order of the percentage of non-immigrant students scoring below Level 2.
Source: OECD, PISA 2015 Database, Table I.7.5a.
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Among countries with relatively large immigrant student populations, in Canada, Estonia, Hong Kong (China), Ireland, Macao (China) and Singapore, less than 20% of both first- and second-generation immigrant students perform below Level 2 in science. These are all countries and economies with a mean performance above the OECD average, and where high performance standards are achieved across the board, regardless of immigrant background. By contrast, in Ciudad Autónoma de Buenos Aires (Argentina) (hereafter "CABA [Argentina]"), Costa Rica, Greece, Jordan and Qatar, more than four in ten immigrant students, both first- and second-generation, perform below proficiency Level 2 (Table I.7.5a). These are countries and economies with mean performance in science below the OECD average.

In other assessment domains, the percentage of low performers is also higher among immigrant students. Results for mathematics closely mirror those of science: on average across OECD countries, 39.7% of first-generation immigrant students and 30.5% of second-generation immigrant students score below proficiency Level 2, whereas 21.2% of their non-immigrant peers perform at that level (Table I.7.5c). In reading, the difference in the percentage of low performers is smaller between second-generation immigrant students and non-immigrant students (Table I.7.5b).

The greater likelihood that immigrant students perform below the baseline level of proficiency in science, reading and mathematics, compared with their non-immigrant peers is partly explained by differences in their socio-economic profile. Figure I.7.7 shows the change in the likelihood that immigrant students are low performers in science, before and after accounting for their socio-economic status.

On average across OECD countries, and before taking their socio-economic status into consideration, immigrant students are almost three times more likely than their non-immigrant peers to perform below proficiency Level 2 in science. After this factor is accounted for, the probability that immigrant students do not attain Level 2 is still more than twice that of non-immigrant students. In 19 of the 33 countries with relatively large immigrant student populations, immigrant students are more likely than non-immigrant students to be low performers in science; and in 11 of these countries, they are as likely as non-immigrant students to be low performers. But in Macao (China), Qatar and the United Arab Emirates, immigrant students are more likely than their non-immigrant peers to score at or above Level 2 in science.

Figure I.7.7 ■ **Likelihood of low performance in science, by immigrant background**

Likelihood that immigrant students perform below proficiency Level 2 in science, relative to non-immigrant students, after accounting for socio-economic status
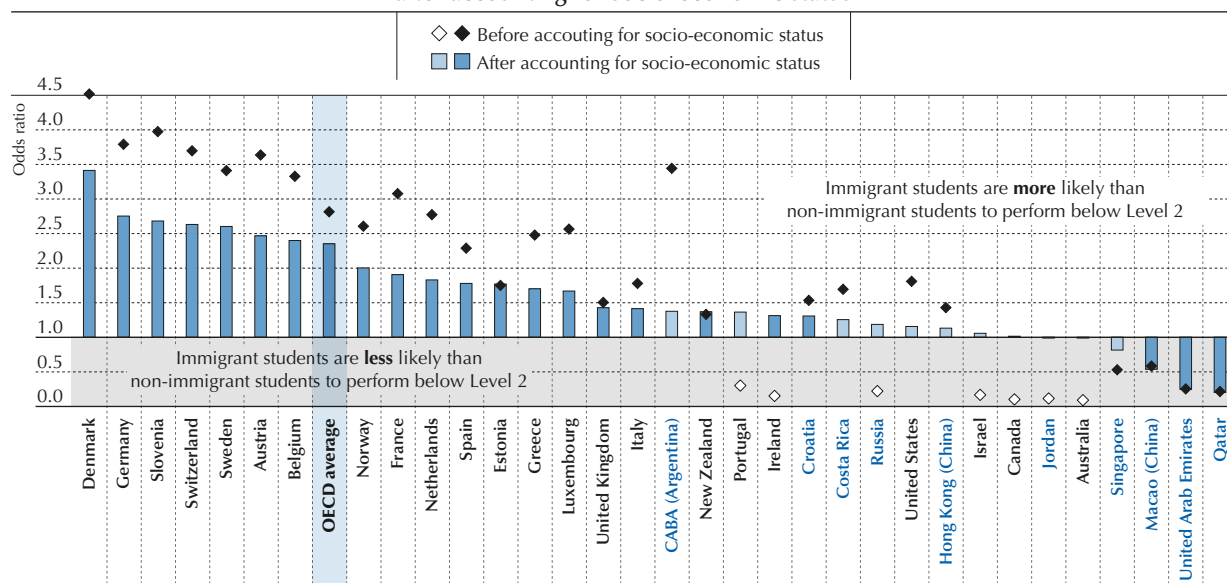
Notes: Only countries where the percentage of immigrant students is higher than 6.25% and with available PISA index of economic, social and cultural status (ESCS) data are shown.

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

Countries and economies are ranked in descending order of the likelihood of immigrant students to perform below Level 2 in science, after accounting for socio-economic status.

Source: OECD, PISA 2015 Database, Table I.7.5a.

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Results from PISA 2015 thus indicate that differences in socio-economic status can only partly explain why many immigrant students perform worse than non-immigrant students. This suggests that strong and responsive welfare systems can only go so far in helping immigrant children succeed in school; education policies that focus specifically on immigrant students are needed to provide these students with fair opportunities to develop their skills.

Resilient immigrant students

As discussed above, immigrant students are often socio-economically disadvantaged when compared to students without an immigrant background. While the association between socio-economic status and performance is strong, PISA results provide evidence that the link is far from unbreakable. Figure I.7.8 compares the percentage of students with and without an immigrant background who, while coming from disadvantaged families, beat the odds and score among the top quarter of students in all participating countries, after accounting for socio-economic status – that is, students who are classified as "resilient".[4] On average across OECD countries, 24.0% of immigrant students are considered to be resilient, compared to 30.5% of non-immigrant students.

Figure I.7.8 ■ **Resilient students, by immigrant background**
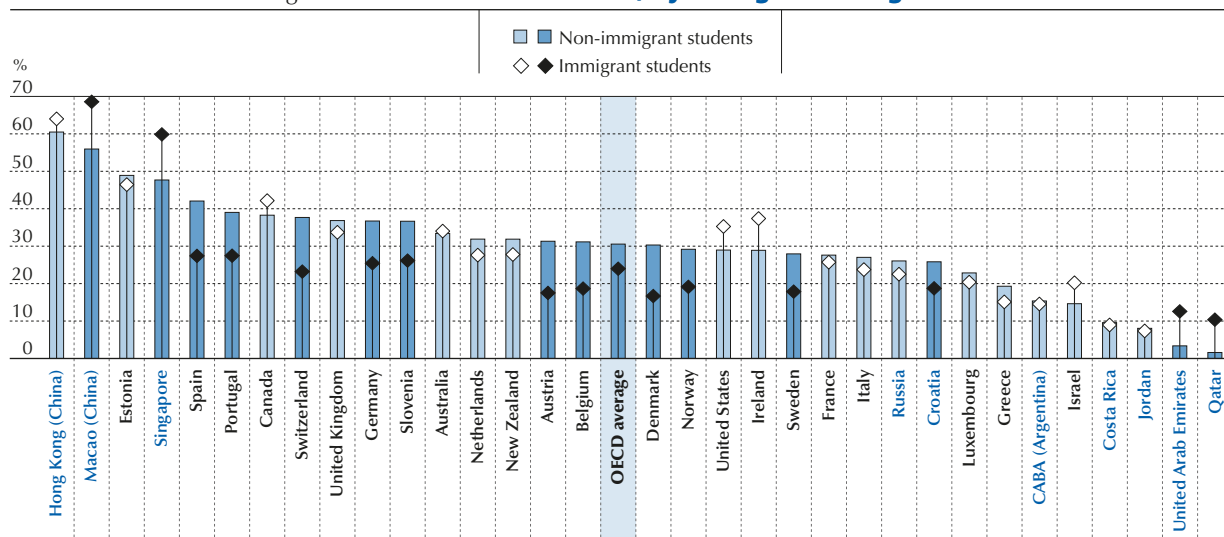
Notes: Only countries where the percentage of immigrant students is higher than 6.25% and with available PISA index of economic, social and cultural status (ESCS) data are shown.

Statistically significant differences between non-immigrant and immigrant students are marked in a darker tone (see Annex A3).

A student is classified as resilient if he or she is in the bottom quarter of the ESCS in the country/economy of assessment and performs in the top quarter of students from all countries/economies.

Countries and economies are ranked in descending order of the percentage of resilient students without an immigrant background.

Source: OECD, PISA 2015 Database, Table I.7.6.

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Among high-performing countries/economies with relatively large immigrant student populations, more than half of all disadvantaged immigrant students in Hong Kong (China), Macao (China) and Singapore are resilient, and more than one in three in Australia, Canada, Estonia, Ireland, the United Kingdom and the United States are. In both Hong Kong (China) and Singapore, the percentage of resilient students is higher among immigrant 15-year-olds than among their non-immigrant peers (Table I.7.6).

However, resilience among students with an immigrant background can vary markedly across countries with similar mean scores in science. For instance, 27.6% of disadvantaged immigrant students in the Netherlands are resilient while only 16.7% in Denmark are. These are both high-performing countries with comparable mean scores in science and a similar overall percentage of 15-year-old students with an immigrant background. Similarly, the percentage of resilient immigrant students in the United States (35.2%) is twice as large as that in Austria (17.5%) – two countries with a mean science performance around the OECD average and similar proportions of immigrant students (Table I.7.6).

These results can be read as a sign that, in some countries, large proportions of students manage to overcome the "double disadvantage" of low socio-economic status and an immigrant background. At the same time, variations across PISA-participating countries and economies in the relative success of immigrant students, whether disadvantaged or not, imply that education systems play a significant role in helping immigrant students fully develop their potential (Box I.7.3).

Box I.7.3. **Does the performance of immigrant students from the same country of origin vary across host countries?**

PISA 2015 shows that, although immigrant students tend to score lower than non-immigrant students, many perform at high levels by international standards, especially those in countries with selective immigration policies, such as Australia, Canada and New Zealand (Table I.7.4a). While this may seem to support the view that differences in the achievement of immigrant students can be explained mainly by variations in the backgrounds of immigrants across countries and economies, PISA results show that the performance of immigrant students is also strongly related to the characteristics of education systems in host countries.

…

Figure I.7.9 below illustrates this point by pooling PISA data from 2006, 2009, 2012 and 2015. The figure shows, for a selected group of countries with available information, how second- and first-generation immigrant students from the same country of origin and similar socio-economic status perform in science across various destination countries, after also accounting for the socio-economic composition of the host communities.

Results indicate that the performance of immigrant students of similar cultural and socio-economic backgrounds can vary markedly across host-country school systems. For instance, second-generation immigrant students from Arabic-speaking countries living in the Netherlands, traditionally a high-performing country in PISA, score 77 points higher in science, on average, than those who settled in Qatar – a country with a significantly lower mean performance in science – but also between 50 and 60 points higher than those who settled in Finland and Denmark – two countries that tend to have a mean performance at or above the OECD average. In addition, both second- and first-generation Albanian immigrant students attending schools in Greece tend to score about 35 points higher in science than compatriot peers attending schools in Switzerland – despite the higher mean performance of the latter country across PISA assessments.

Figure I.7.9 ■ **Immigrant students' performance in science, by country of origin and destination**
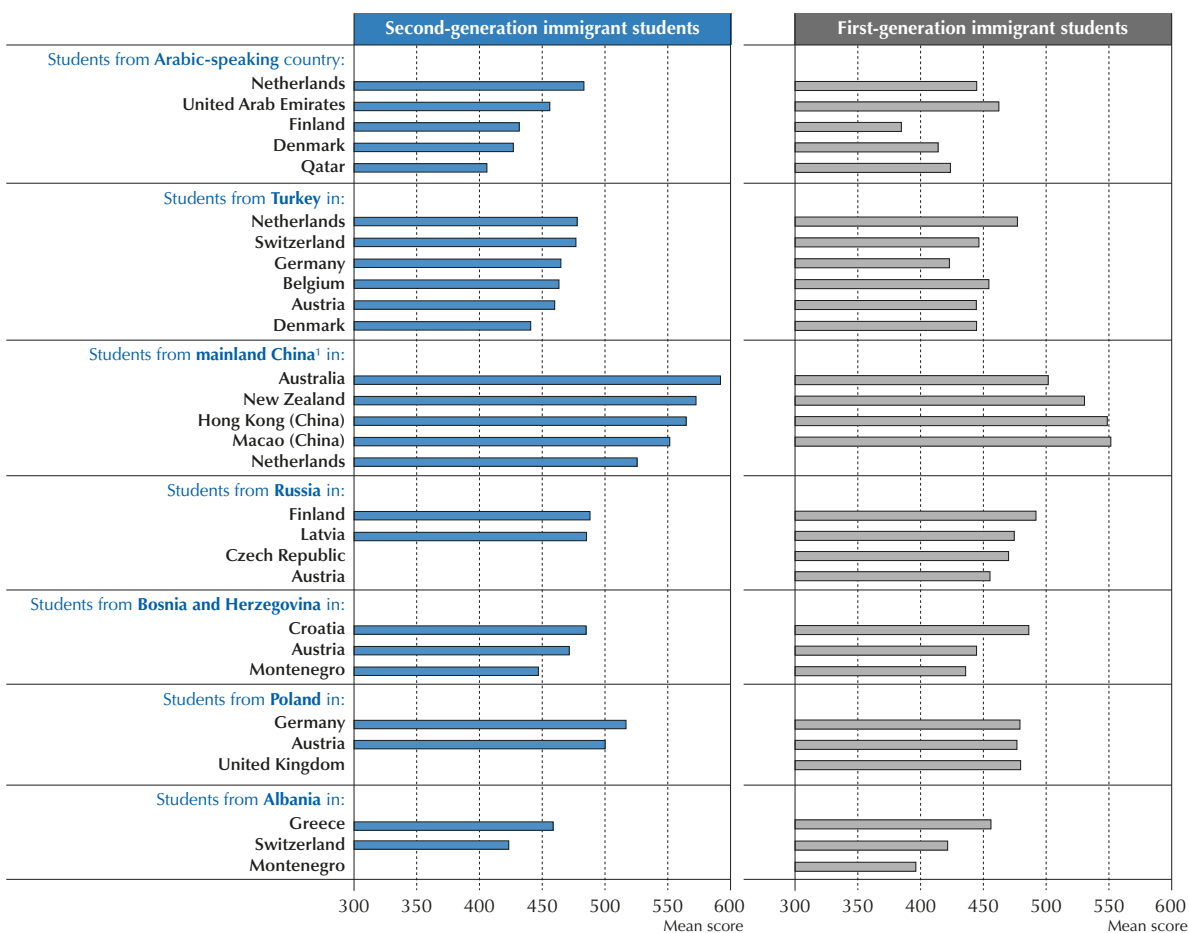
1. Mainland China excludes Hong Kong (China), Macao (China) and Chinese Taipei.
Notes: Data from multiple PISA assessments are pooled to reach the minimum number of observations required for the estimation. Results are only shown for pairs of origin and destination countries/economies with data for 30 or more first- or second-generation immigrant students. Results correspond to predicted performance if all the immigrant students from a given country of origin and all the non-immigrant students across all the destination countries/economies for immigrants of that origin had the same socio-economic status as the average student across these destination countries/economies.
Countries and economies are ranked in descending order of second-generation immigrant students' performance score in science, by country of origin.
Source: OECD, PISA 2006, 2009, 2012 and 2015 Databases.

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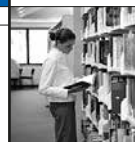
The figure also shows how the performance of students from the same country of origin can vary, in a given host country, between first- and second-generation immigrants. For example, while students born in mainland China score above the OECD average across several destination countries, they generally perform better in Hong Kong (China) and Macao (China), where they score above 550 points in science, than in Australia, where their average science score is 502 points. However, among second-generation Chinese immigrant students, this pattern is reversed, as students born to Chinese parents who settled in Australia score 592 points in science, on average, outperforming second-generation Chinese immigrant students in both Hong Kong (China) and Macao (China).

These results align with previous analyses in showing that it is not only socio-economic status and the mean performance of host countries that contribute to differences in the performance of immigrant students who come from the same country of origin but who settle in different destination countries. The findings suggest that these differences are also related to the capacity of school systems in host countries to nurture the talents of students with different cultural backgrounds. Other factors not included in this analysis might also contribute to the differences in the performance of immigrant students from the same national or cultural origin across host countries. These include students' own motivation or the support they receive from their parents, and also factors not linked to socio-economic status that can play a role in immigrant families' decision to settle in a given country, such as personal networks, historical links or parents' professional aspirations. PISA questionnaires can yield further insights into the differences in the outcomes of immigrant students across destination countries, including their sense of belonging and well-being in school.

DIFFERENCES BETWEEN IMMIGRANT AND NON-IMMIGRANT STUDENTS IN SCIENCE-RELATED CAREER EXPECTATIONS

As discussed in Chapter 3, many education systems are emphasising the affective dimensions of science learning in an effort to encourage more students to pursue careers in science and technology. Equity in access to these occupations is an additional concern for educators and policy makers, given that disadvantaged students are often under-represented in scientific fields of study. This negative selection can be related to lower average performance relative to more advantaged students, but also to differences in their attitudes towards learning science. PISA 2015 can be used to analyse whether disparities in science-related attitudes are also observed between immigrant and non-immigrant students.

PISA 2015 asked students about the occupation they expect to be working in when they are 30 years old. Their responses were grouped into major categories of science-related and non-science-related careers. On average across OECD countries, the proportion of students who expect to work in an occupation that requires further science training beyond compulsory education is slightly larger among immigrant students (27.3%) than among non-immigrant students (24.4%). Among countries with relatively large immigrant student populations, in Canada, Jordan, Qatar, the United Arab Emirates, the United Kingdom and the United States, more than four in ten immigrant students expect to pursue a science-related career (Table I.7.7).

A student's expectation to work in a science- or technology-related profession can, of course, be heavily influenced by how the student performs in science. Figure I.7.10 shows that the greater likelihood that immigrant students expect a career in science, compared with non-immigrant students, holds even after taking into account student performance in science and its potential impact in shaping this expectation. On average across OECD countries, immigrant students are 50% more likely than their non-immigrant peers who score similarly in science to expect to work in a science-related career; in Denmark, the Netherlands, Sweden and the United Kingdom, they are more than twice as likely to expect such a career. This relationship remains positive and significant in 21 out of 33 countries and economies where more than 6.25% of students have an immigrant background (Table I.7.7).

OTHER FACTORS LINKED TO LOW PERFORMANCE AMONG IMMIGRANT STUDENTS

Past PISA results have shown that, beyond its association with socio-economic status, the lower average performance of immigrant students compared with that of non-immigrant students is associated, individually or in concert, with other factors, including language barriers, the concentration of disadvantage in the schools in which many immigrant students are enrolled, and stratification policies that result in different opportunities for learning (OECD, 2015a).

Figure I.7.10 ■ **Students' expectations of pursuing a career in science,
by immigrant background**

*Likelihood that immigrant students expect a career in science, relative to non-immigrant students,
after accounting for science performance*
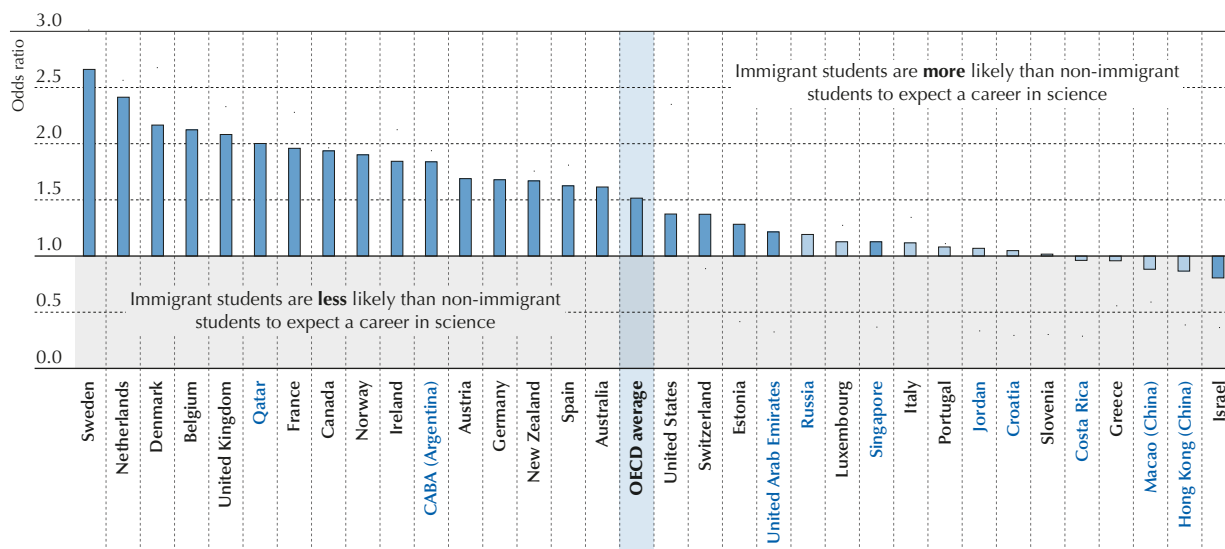
Notes: Only countries where the percentage of immigrant students is higher than 6.25% are shown.
Statistically significant values are shown in a darker tone (see Annex A3).
Countries and economies are ranked in descending order of the likelihood of immigrant students to expect a career in science, after accounting for science performance.
Source: OECD, PISA 2015 Database, Table I.7.7.
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Language spoken at home

In PISA 2015, on average across OECD countries, for 44.7% of second-generation and 67.0% first-generation immigrant students, the main language spoken at home is different from the language of assessment in their host country (Table I.7.2). Among countries with relatively large immigrant student populations, in Austria and Luxembourg, more than seven in ten second-generation immigrant students are in this situation; in Slovenia, Sweden and the United States, this is the case for more than eight in ten first-generation immigrant students. On average across OECD countries, immigrant students who speak the language of assessment at home score 31 points lower in science that non-immigrant students who speak the language of assessment at home; but immigrant students who mainly speak another language in the family context score 54 points lower than these non-immigrant students – that is, more than 20 points lower than immigrant students who have greater familiarity with the test language (Table I.7.8a).

This "language penalty" for immigrant students in the science assessment – understood as the difference in performance between students with an immigrant background who speak the language of assessment as their main language at home and those who do not – is largest in Hong Kong (China) and Luxembourg (between 90 and 100 score points), and in Austria, Belgium, Jordan, Macao (China), Russia and Switzerland (between 40 and 55 score points) (Table I.7.8a). Across school subjects, there is a broad similarity in the pattern of association between language spoken at home and performance in science and reading, whereas, in mathematics, immigrant students who are less familiar with the test language suffer a smaller penalty (15 score points), on average across OECD countries (Tables I.7.8b and Table I.7.8c).

## Concentration of immigrant students in schools

Low performance among immigrant students can also be partly linked to the fact that these students are often concentrated in disadvantaged schools. Immigrant students tend to be over-represented in certain schools, sometimes because they live in the same neighbourhoods, but in other cases also because school systems group them together regardless of their place of residence. The concentration of immigrant students in schools does not automatically have adverse effects on student performance or social integration. However, negative outcomes will likely follow if ethnic agglomerations become enclaves whose residents have little possibility of outward and upward mobility.

Therefore, a critical link between the concentration of immigrant students in a school and low performance is the socio-economic intake of the schools where immigrants tend to be enrolled. Immigrant students' learning will be hindered if these are disadvantaged schools that suffer from a shortage or inadequacy of educational resources, including teacher preparedness, or where the concentration of disadvantaged students results in a poorer disciplinary climate.

Measuring the concentration of immigrant students in schools in a reliable and internationally comparable way is challenging in many respects, mainly because of the variation in the percentage of immigrant students across countries, but also because of other differences across schools.[5] PISA 2015 relies on two indices to measure the concentration of students with an immigrant background in schools. The first is the index of current concentration, which represents the percentage of students, both immigrant and non-immigrant, that would have to be relocated from one school to another so that all schools would have an identical percentage of immigrant students and, consequently, an identical percentage of non-immigrant students.[6] The second measure is the index of maximum potential concentration, which represents the minimum proportion of students that would have to be moved across schools if all immigrant students were allocated to the largest schools.[7] By defining country-specific thresholds for the school-level concentration of immigrant students, these indices address some of the shortcomings of other concentration measures and provide a benchmark that reflects more accurately the relative similarity between the composition of schools and their social context.

Figure I.7.11 ▪ **Concentration of immigrant students in schools**
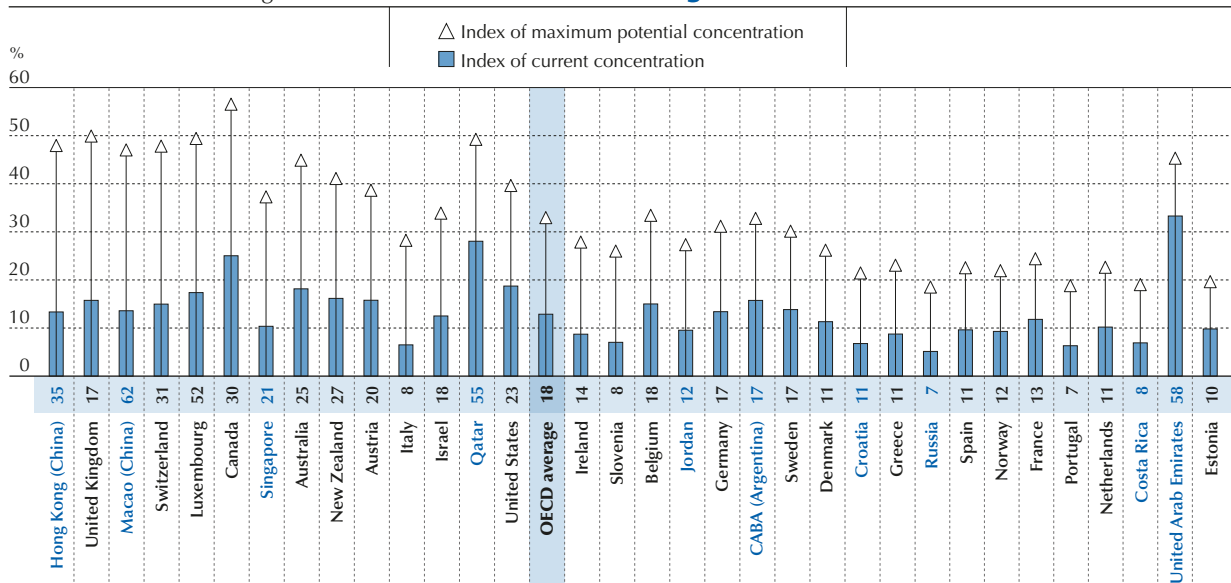
Notes: Only countries where the percentage of immigrant students is higher than 6.25% are shown.
The percentage of immigrant students is shown next to the country/economy name.
Countries and economies are ranked in descending order of the distance between current and maximum potential of concentration.
Source: OECD, PISA 2015 Database, Table I.7.9.

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The difference between the two indices indicates the distance between the current mix of immigrant and non-immigrant students in schools and the highest possible degree of segregation of immigrant students in a country/economy, given the overall percentage of immigrant students and the size of the country/economy's schools.[8] The maximum potential concentration is a hypothetical scenario where all immigrant students attend the largest schools in the country, and hence where the largest number of them can be found in the same schools and classrooms. Given this scenario, countries where the difference between the two indices is larger can be seen as having greater success in avoiding the segregation of immigrant students into particular schools. Figure I.7.11 shows how countries and economies with relatively large populations of immigrant students rank on this measure.

Current and potentially maximum levels of concentration of immigrant students differ most – by 30 percentage points or more – in Canada, Hong Kong (China), Luxembourg, Macao (China), Switzerland and the United Kingdom. In all of these countries and economies, immigrant students represent a large share of the student population, ranging from 16.7% in the United Kingdom to 62.2% in Macao (China); but the current distribution of immigrant students across

schools is far below the highest possible level of concentration. By contrast, in Costa Rica, Croatia, Denmark, Estonia, France, Greece, the Netherlands, Norway, Portugal, Russia, Spain and the United Arab Emirates, the two indices differ by less than 15 percentage points, which implies that in these countries and economies, current levels of concentration are somewhat closer to their potential ceiling (Table I.7.9).

Further comparisons can be drawn between countries with similar overall percentages of immigrant students and maximum potential levels of concentration, which indicate comparable circumstances in terms of school size, but with different levels of current concentration. For example, in Luxembourg and Qatar, more than five in ten students have an immigrant background and almost half of the student population would have to move schools if the concentration of immigrant students were to reach its maximum level. Yet, in Luxembourg immigrant students are currently less concentrated in the same schools than in Qatar, where the percentage of students who would have to move schools to reach an even distribution is ten percentage points higher. Similarly, Singapore has a current level of concentration that is eight percentage points lower than that of the United States, a country with a similar overall percentage of immigrant students and a similar maximum concentration index (Table I.7.9).

The main concern behind the concentration of immigrant students in certain schools is its potential association with poorer student outcomes. Figure I.7.12 compares the performance of students, both immigrant and non-immigrant, attending schools with different levels of concentration of immigrant students in their respective countries. In this analysis, schools are classified as being either in the bottom or the top half of the concentration distribution in their respective countries.

Figure I.7.12 ■ **Student performance in science and concentration of immigrant students in schools**

Score-point difference in science between students attending schools with low and high concentrations of immigrant students
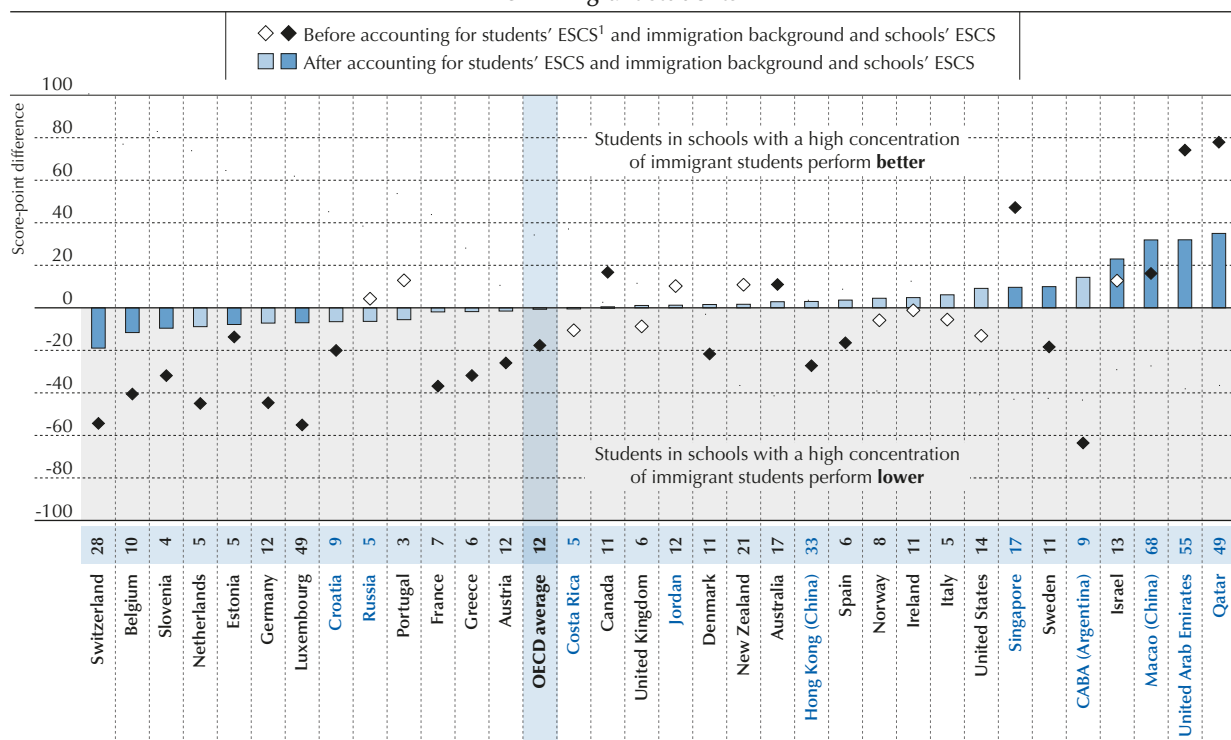
1. ESCS refers to the PISA index of economic, social and cultural status.
Notes: Only countries where the percentage of immigrant students is higher than 6.25% and with available index of economic, social and cultural status (ESCS) data are shown.
Statistically significant score-point differences are marked in a darker tone (see Annex A3).
The thresholds for defining schools with low and high concentrations of immigrant students are country-specific and shown next to country names. The threshold is the percentage of immigrant students in the school that divides the 50% of the students attending schools with the smallest percentage of immigrants, and the 50% of the students attending schools with the largest percentage of immigrants, within each country/economy.
Countries and economies are ranked in ascending order of the score-point difference between students attending schools in the top half of the concentration distribution and students attending schools in the bottom half of the distribution, after accounting for students' ESCS, immigration background and schools' ESCS.
Source: OECD, PISA 2015 Database, Table I.7.10.

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Therefore, high and low concentration thresholds are defined as country-specific rather than identical for all countries and economies. For example, in Switzerland, about one in two students attends schools where less than 28.5% of their peers are immigrants, while the other half attends schools with a larger share of immigrant students. In Germany, one in two students attends a school where less than 12.0% of his or her peers have an immigrant background, and the other half attends schools with a higher percentage of immigrant students (Table I.7.10).

The bars in Figure I.7.12 show, for each country and economy, the association between attending a school with a high concentration of immigrant students and student performance. Before taking into account students' socio-economic status and immigrant background, as well as the socio-economic intake of their school, a higher concentration of immigrant students in schools is associated with a 18-point lower score in science, on average across OECD countries. However, once background factors are accounted for, this negative association with performance disappears entirely.

In 24 out of the 34 countries/economies for which results can be computed, the score-point difference is no longer significant when high- and low-concentration schools with similar socio-economic intakes are compared. Among the five countries where a negative association persists, the size of the difference tends to be substantially reduced. For example, in Luxembourg, the difference shrinks from 55 score points to 7 score points; in Belgium, it drops from 41 score points to 12 score points. In addition, in a number of countries/economies – Israel, Macao (China), Qatar, Singapore, Sweden and the United Arab Emirates – attending a school with a high concentration of immigrant students is positively associated with student performance, after taking into account students' own socio-economic status and immigrant background, and the average socio-economic status of the school's intake. Overall, PISA results mirror previous evidence that suggests that it is the concentration of disadvantage, and not the concentration of immigrants per se, that has detrimental effects on learning (Table I.7.10).

Differences in access to educational resources, stratification practices and opportunity to learn related to immigrant background

Disparities in learning outcomes between students of different backgrounds might be related to a number of factors. These include the distribution of educational resources across schools, and stratification policies and practices that may result in differences in opportunity to learn. Chapter 6 shows that many of these factors affect advantaged and disadvantaged students differently; whether differences are observed when comparing students with and without an immigrant background can also provide important pointers for educators and policy makers.

PISA 2015 provides two summary measures of the adequacy of educational resources at the school level: the index of shortage of educational material and the index of shortage of education staff. These indices are derived from school principals' responses to questions about whether a shortage or inadequacy of resources hinders their school's capacity to provide instruction.[9] On average across OECD countries, no relationship is observed between the adequacy of the material and human resources at the school level – as measured by these indices – and the level of concentration of immigrant students in schools – as measured by country-specific concentration thresholds (Table I.7.11). Differences in resources between schools with low and high percentages of immigrant students are only found in about a third of the countries and economies with relatively large immigrant student populations; but the associations are not necessarily consistent. In CABA (Argentina), Germany, Macao (China) and Spain, principals in schools with a high concentration of immigrant students tend to perceive that their schools are less well-resourced, both in terms of equipment and staff, than principals in schools with a low concentration of 15-year-olds with an immigrant background (Table I.7.11). The opposite is true in Estonia and the United Arab Emirates, two countries where few immigrant students come from disadvantaged backgrounds.

If an immigrant background were related to the likelihood that students are sorted into different programmes or schools, education opportunities would likely differ for immigrant and non-immigrant students. A common stratification policy is grade repetition, the practice of retaining struggling students at a given grade with the aim of giving them more time to master the curriculum. On average across OECD countries, 19.9% of immigrant students had repeated a grade by the time they sat the PISA 2015 test, compared to 10.9% of their non-immigrant peers. Among countries with relatively large populations of immigrant students, a slightly smaller difference in the incidence of grade repetition between these two groups of students is observed: 19.3% of immigrant students and 12.8% of non-immigrant students had repeated a grade in these countries (Table I.7.12).

While the decision to have a student repeat a grade is usually based on his or her performance, in 2015, immigrant students were about 70% more likely than their non-immigrant peers to have repeated a grade, after accounting for students' socio-economic status and their performance in the science and reading assessments. Among countries and economies where immigrant students represent more than 6.25% of the student population, a higher likelihood of grade

repetition among immigrant students, relative to non-immigrant students, is observed in 18 countries and economies, even when comparing students with similar socio-economic status and performance in science and reading considered together. After accounting for these factors, immigrant students in Singapore and Sweden are around four times more likely, and students in Greece, Slovenia and the United Kingdom are about two-and-a-half times more likely than non-immigrant students to have repeated a grade (Table I.7.12).

By contrast, after accounting for students' socio-economic status and performance in science, there are no significant differences, on average across OECD countries, between immigrant and non-immigrant students in the likelihood of being enrolled in vocational rather than academic programmes, another common form of sorting students in secondary education (Table I.7.13). Indeed, in up to 13 countries and economies with relatively large populations of immigrant students, these students are less likely to be enrolled in a vocational track, after socio-economic status and performance in science have been taken into account (Table I.7.13).

Similarly, PISA results suggest that there are no significant differences, on average across OECD countries, in the amount of science instruction to which immigrant and non-immigrant students are exposed at school. This is measured by the percentage of students taking at least one science lesson per week at school and by the average time spent per week in regular science lessons (Table I.7.14).

Overall, and in light of the results presented in Chapter 6, it appears that disparities in educational resources and opportunity to learn are less pronounced between immigrant and non-immigrant students than between students of different socio-economic status. These results are encouraging, in that they suggest a relatively minor impact of immigrant background on students' opportunity to learn, once students' academic performance and socio-economic status have been taken into account. Volume II examines in greater detail the association between student performance and school-level resources, learning environments and stratification policies and practices, and how they reflect the level of equity in a system.

TRENDS IN PERFORMANCE DIFFERENCES BETWEEN IMMIGRANT AND NON-IMMIGRANT STUDENTS

Figure I.7.13 shows changes between 2006 and 2015 in the differences in science performance between immigrant and non-immigrant students. In 2006, 9.4% of students across OECD countries had an immigrant background. They scored, on average, 50 points lower in science than their non-immigrant peers. When students with similar socio-economic status and familiarity with the language of assessment were compared, the performance gap between immigrant and non-immigrant students was cut by more than half, to 23 score points, a smaller but still significant margin.

By 2015, the share of immigrant students across OECD countries had increased to 12.5%. In turn, the average difference in science performance in favour of non-immigrant students is 43 score points, before accounting for students' socio-economic status and language spoken at home, while the gap after accounting for these background factors is 19 score points, again a smaller but significant difference. As a result, in 2015, on average across OECD countries, immigrant students continue to perform worse in science than their non-immigrant peers, even after accounting for socio-economic status and language spoken at home, although the performance difference narrowed slightly since 2006.

However, in a number of countries, notably OECD countries Belgium, Italy, Portugal, Spain and Switzerland, the differences in performance between immigrant and non-immigrant students shrank by 20 score points or more over the period, after accounting for socio-economic status and familiarity with the language of assessment; in Canada and Luxembourg, these differences narrowed by between 10 and 20 score points. In some of these countries, the difference shrank mainly because of improvements in immigrant students' performance rather than because of poorer performance among their non-immigrant peers. For instance, between 2006 and 2015, immigrant students in Portugal improved their science performance by 64 score points while non-immigrant students improved by 25 points. During the same period, immigrant students in Italy improved their scores in science by 31 points and immigrant students in Spain improved by 23 points, while in both countries the performance of students without an immigrant background remained stable (Table I.7.15a). In neither of the three countries can compositional changes in the immigrant population account for these improvements; in both Italy and Spain, for example, the percentage of immigrant students with educated parents was about 30 percentage points lower in 2015 than in 2006 (Table I.7.2).

Trends in reading and mathematics performance mirror those observed in science, suggesting that, across OECD countries, performance differences between immigrant and non-immigrant students decreased modestly between 2006 and 2015, once students' socio-economic status and familiarity with the language of assessment are taken into account (Tables I.7.15b and I.7.15c).

Figure I.7.13 ■ **Change between 2006 and 2015 in the science performance difference between immigrant and non-immigrant students**

Score-point difference in science between immigrant and non-immigrant students, before and after accounting for socio-economic status and language spoken at home

◇◆ Before accounting for socio-economic status and language spoken at home

□■ After accounting for socio-economic status and language spoken at home
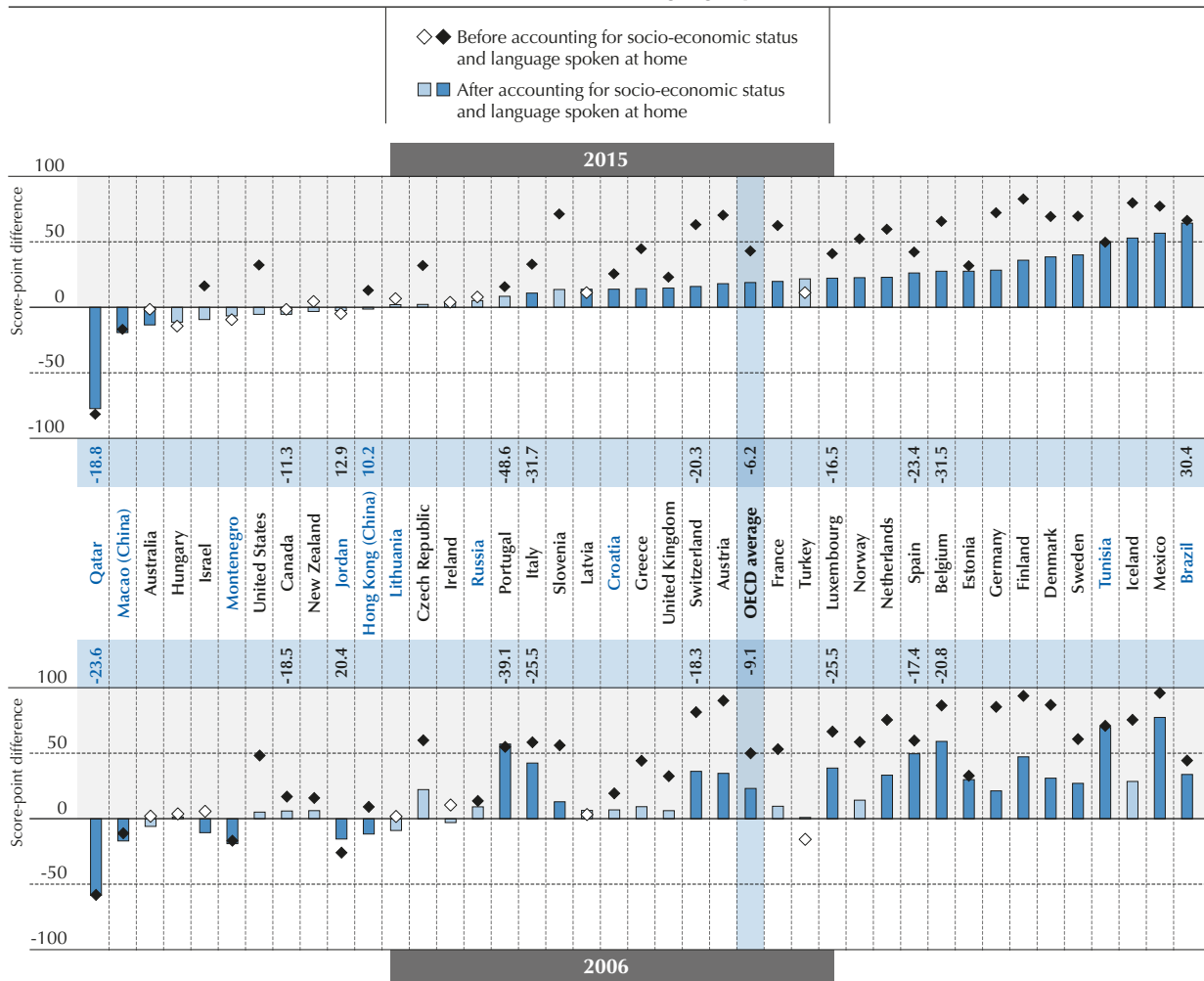
Notes: Only countries/economies that participated in both 2006 and 2015 PISA assessments are shown.

Statistically significant differences in science performance between students with and without an immigrant background are marked in a darker tone (see Annex A3).

The change between 2006 and 2015 in the score-point difference in science between students with and without an immigrant background before accounting for students' socio-economic status is shown below the country/economy name. The change between 2006 and 2015 in the score-point difference after accounting for students' socio-economic status is shown above the country/economy name. Only statistically significant changes are shown.

Countries and economies are ranked in ascending order of the score-point difference in science between students with and without an immigrant background in 2015, after accounting for socio-economic status and language spoken at home.

Source: OECD, PISA 2015 Database, Table I.7.15a.
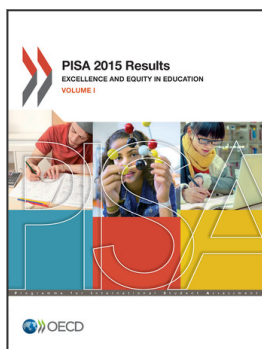
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Notes

1. Consistent with the definition of immigration status in Box I.7.1, the treatment of migration in this chapter is restricted to international (i.e. cross-border) migration.

2. Note by Switzerland: In Switzerland, the increase in the weighted share of students with an immigrant background between previous rounds of PISA and PISA 2015 samples is larger than the corresponding shift in the target population according to official statistics.

3. Information on immigrant background is missing for 13.4% of the students included in Germany's PISA 2015 sample, the highest percentage among all participating countries/economies, while information on language spoken at home is missing for 11.7% of students (Table A1.3). The percentage of missing data on the student immigrant background variable in Germany has been high across PISA assessments (Table A5.10). For these reasons, results for Germany should be interpreted with caution.

4. In PISA, a student is classified as resilient if he or she is in the bottom quarter of the PISA index of economic, social and cultural status (ESCS) in the country/economy of assessment and performs in the top quarter of residual scores among students from all countries/economies, after accounting for socio-economic status. For details on the estimation procedure, see Chapter 6.

5. On the one hand, variation across countries in the overall percentage of immigrant students makes it difficult to establish a "concentration threshold" that is equally meaningful for all countries. For instance, if the threshold defines high-concentration schools as those where more than 30% of the students have an immigrant background, it is unlikely that a country where only 5% of students are immigrants would have many schools reaching that threshold. Inversely, for a country where half the students are immigrants, such a threshold would not imply an over-representation of immigrant students, but rather a reflection of the demographic makeup of its student population. On the other hand, variation in school size (and in the within-school sample size) across PISA-participating countries and economies means that, among countries with a similar proportion of immigrant students, those with a greater number of small schools would tend to have a higher percentage of schools above a given concentration threshold.

6. The concentration index has been derived from the segregation index developed by Gorard and Taylor (2002). A description of the index can be found in Annex A3.

7. A description of the index can be found in Annex A3.

8. A desirable property of this measure – the difference between the maximum and the current indices of concentration– is to correlate moderately with the overall percentage of immigrant students in the country/economy. This correlation is $r=.55$ for countries with relatively large immigrant student populations (i.e. those with more than 6.25% of immigrant students). For reference, among the same group of countries, the correlation between the overall percentage of immigrant students in the country/economy and another concentration measure, the percentage of immigrant students attending schools where more than 25% of the students have an immigrant background, is $r=.87$.

9. The indices are constructed to have a mean of zero and a standard deviation of one across OECD countries. Positive values on the indices mean that principals view the amount and/or quality of resources in their schools as an obstacle to provide instruction for their students to a greater extent than the OECD average; inversely, negative values reflect that school principals perceive the lack or inadequacy of resources as an obstacle to instruction to a lesser extent than the OECD average (for more details, see Chapter 6 in Volume II).

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