3

Background characteristics, mathematics performance and learning environments of immigrant students

INTRODUCTION

Chapter 2 provided a detailed description of immigrant student performance within the case countries. The results indicate that in most countries first-generation students and second-generation students tend to lag behind their native peers. The literature suggests a variety of factors that may explain immigrant students' lower performance. Some of these explanations focus on characteristics associated with the immigration histories of the students and their families. The assimilation perspective tends to stress the importance of factors such as the age at which students arrive in the receiving country or the length of time the family has lived in the country (*e.g.* Alba and Nee, 1997). Other authors emphasise the role of language skills, arguing that a lack of proficiency in the receiving country's official language is the main hurdle for integration in the school system and labour market (*e.g.* Chiswick and Miller, 2003). Still other explanations focus on cultural factors. These include differences in basic assumptions that may cause immigrants to experience acculturative stress (stress associated with assimilating to a different culture) (*e.g.* Berry, 1992) or immigrants' general attitudes towards education and motivational orientations that may support or hinder the integration process (*e.g.* Fuligni, 1997). Cultural factors have also been used to account for differences in school success between immigrant subgroups focusing particularly on the relatively high achievement levels of students from some Asian countries (*e.g.* Stevenson *et al.*, 1993; Stevenson and Stigler, 1992).

While these ideas mainly refer to factors specifically related to students' immigration and cultural experiences, others stress the role of immigrant families' educational and social status (*e.g.* Fase, 1994; Jungbluth, 1999). According to these views, the disadvantages of immigrant students can largely be accounted for by their parents' socio-economic situation or level of education, which tend to be lower than those of parents in native families. If this were the case, models of social disadvantage could fully explain immigrant students' relative levels of school success, and it would not be necessary to consider aspects specific to immigration.

In addition to effects of individual background characteristics on school performance, other approaches emphasise the role of institutional factors. These include institutional discrimination with regard to grade retention, tracking decisions, referral to special education programmes or the extent to which textbooks reflect the diversity of students' cultural and language backgrounds (*e.g.* Gomolla and Radtke, 2002; Losen and Orfield, 2002). Also, several authors argue that community effects may influence the likelihood that immigrant students will succeed in school (*e.g.* Esser, 2001; Westerbeek, 1999). According to this view, segregation or self-segregation tendencies may cause immigrant populations to become isolated and therefore hinder integration. The evidence on this hypothesis is mixed, however (*e.g.* Coradi Vellacott *et al.*, 2003; Rüesch, 1998; Portes and Hao, 2004; Stanat, 2006; Westerbeek, 1999).

These different factors influencing immigrant students' school success most likely vary across countries and immigrant populations, and it is beyond the scope of PISA to test the different explanations. PISA is a cross-sectional study, *i.e.* data are collected at one point in time. Therefore, it is only possible to observe associations between various student or school characteristics and students' performance in the assessment and not to identify specific causes underlying the performance outcomes. Despite these limitations, however, it is useful to explore the relationship between immigrant students' background and academic performance within the case countries. Examining the associations among relative performance of immigrant students, educational and socio-economic

characteristics of their families and immigrant status may have important implications for policy and educational practice. For example, if disadvantages linked to immigration status remain after accounting for parents' level of education and socio-economic status, schools may need to introduce support measures specifically geared toward immigrant students.

It is also important for analyses of differences in the outcomes of immigrant students across countries to consider the role of socio-economic and educational background factors for school success. Chapter 1 explained that countries' immigration histories and policies and therefore their immigrant populations vary considerably. In countries with selective approaches to immigration inflows, immigrants tend to be highly skilled and therefore have more education and work opportunities than in countries with less selective admission regulations. When examining performance differences between immigrant and non-immigrant student groups in an international context, it is essential to consider differences in the background characteristics of immigrant populations across countries.

PISA offers limited possibilities for taking into account immigrant population characteristics across the case countries. The data do not include information on the background of immigrant students' families at the time they entered the country. When the PISA data were collected, the immigrant students in the sample had already lived in the receiving country for some time. Therefore, their families' educational attainment, socio-economic status and other background characteristics reflect not only their situation at the time of immigration but also the extent to which they were able to adapt to their new environment. The policies and practices related to the integration of immigrants within a country should influence this adaptation process. Therefore, in countries with effective approaches to educational, social and labour-market integration, the situation of immigrant families may not only develop more favourably in terms of their children's school performance but also in terms of their economic, social and cultural status.

The effects of integration policies and practices on immigrant families' educational and socio-economic status should be most apparent in second-generation students. Their parents have already spent at least 15 years in the receiving countries, so the policies and practices in place in these countries should have had some effect and may therefore be reflected in the family characteristics. The families of first-generation students, on the other hand, have immigrated more recently, so their current socio-cultural status is more likely to reflect their situation at the time they entered the country. Accounting for families' educational and social status in analysing performance levels of first-generation students should therefore provide a rough estimate of the extent to which between-country differences can be attributed to variations in background characteristics of immigrant populations. It is important to note, however, that such an estimate is likely to be conservative as it may also absorb some of the variation associated with the effectiveness of immigration policies and practices that countries have in place.

Keeping this in mind, the first part of the chapter explores the role of immigrant students' background characteristics and their association with mathematics performance within the case countries. First, the chapter describes the level of parental education and economic, social and cultural status of immigrant and non-immigrant student populations for each of the countries included in the report. Next, the performance of these student groups in the PISA mathematics assessment is compared after accounting for parents' educational and occupational status. In addition, the analyses examine characteristics specifically associated with an immigration

background (language spoken at home and age of the student at the time of immigration).

The second part of the chapter explores performance at the school level with the aim of locating differences between immigrant and non-immigrant students within the different school systems. This section describes how performance varies between and within schools. In addition, the schools that immigrant and non-immigrant students attend are characterised. As noted earlier, PISA can observe how certain characteristics are associated with performance variations but cannot identify causes for these differences. This is also the case at the school level. School systems differ considerably in terms of structural and contextual factors, such as tracking, streaming or residential segregation, and the meaning of results at the school level therefore varies across countries. Nevertheless, it is worth considering the extent to which immigrant and non-immigrant student populations within a country are likely to attend similar or different schools, as this may have important implications for targeting interventions.

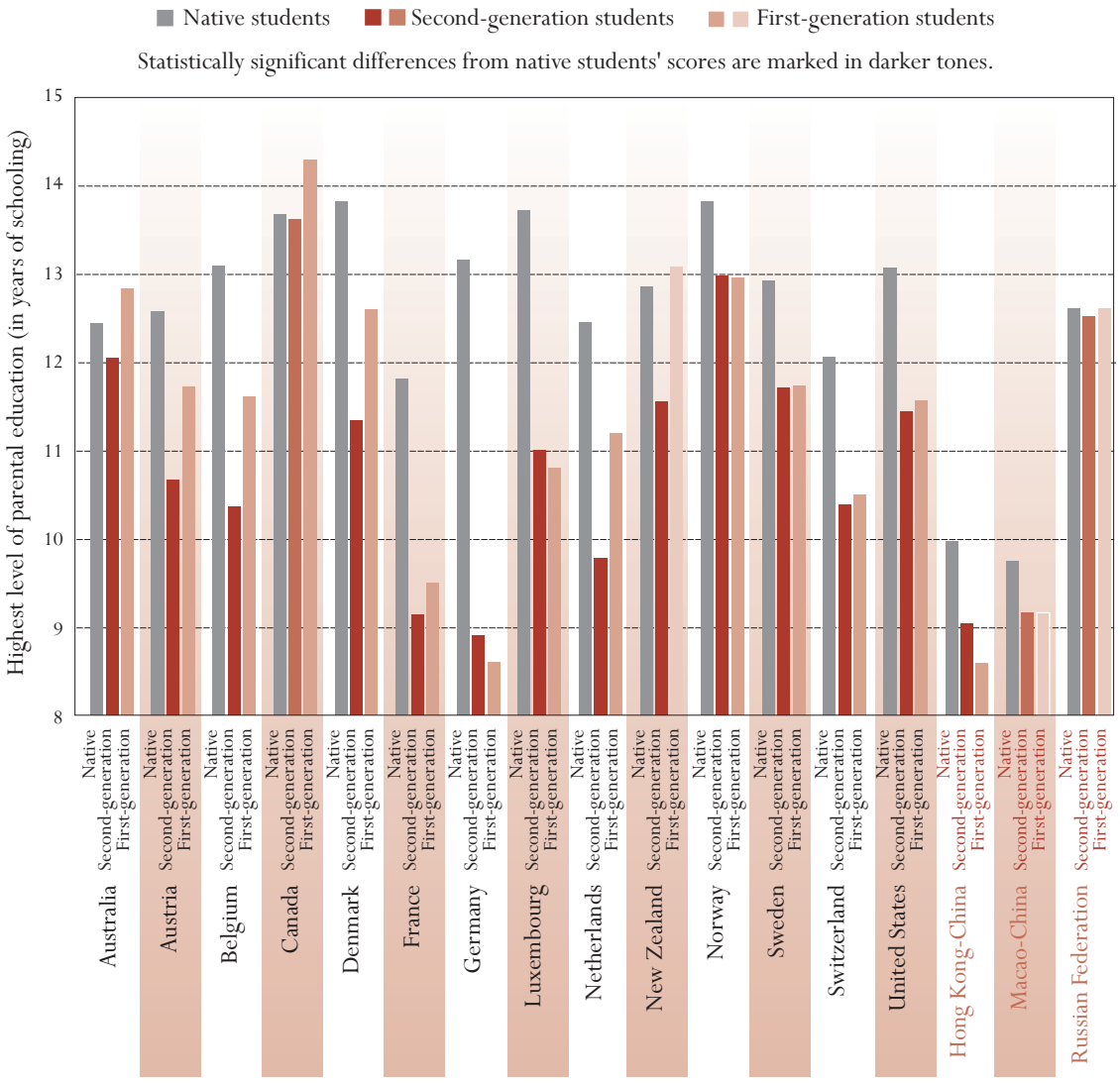
IMMIGRANT FAMILIES' EDUCATIONAL AND SOCIO-ECONOMIC BACKGROUND

Often, people move to another country in the hope of improving their standard of living. This does not necessarily mean, however, that immigrants are among the most disadvantaged in the population of their native country. In fact, Chiswick (1999, 2000), Chiquiar and Hanson (2005) and others (for an overview see Chiswick, 2000) suggest that individuals who decide to settle in a new country tend to be a self-selected high-skilled group[1]. This was also shown in a recent international study of 22 countries (Liebig and Sousa-Poza, 2004).

Compared to the native populations in receiving countries, however, immigrants tend to be at a disadvantage in terms of their levels of skill and position within the social and economic hierarchy. Again, this depends partly on countries' immigration histories and the selectiveness of their immigration policies and practices. Countries requiring a certain level of education and training before issuing entry admissions should have more highly skilled immigrant populations than countries without such policies. Another consideration is the extent to which a country experiences an influx of illegal work migration, which is often associated with lower education and skill levels (*e.g.* Burgers, 1998; Rivera-Batiz, 1999). Indeed, countries differ considerably with regard to the level of irregular immigration and whether or not children of illegal immigrants participate in the public education system. For these reasons, large variations across countries in terms of immigrants' relative educational and social positions can be expected.

As discussed, the educational background of immigrant families should at least partially reflect their potential on entering the receiving country. This is particularly likely if the families immigrated relatively recently, as is the case for many first-generation students in PISA. Figure 3.1 displays the highest level of parental education in years of schooling by immigrant status. The bars indicate that the parents of first-generation students and of second-generation students have generally completed fewer years of formal schooling than the parents of native students. At the same time, the differences vary considerably across countries. The largest differences occur in Germany, with both the parents of first-generation and second-generation students having completed approximately five fewer years of schooling than parents of native students. In Austria, Belgium, Denmark, France, Luxembourg and the Netherlands, the educational disparities are also particularly pronounced for at least one group of immigrant students. Interestingly, the gap tends to be smaller for first-generation students than for second-generation students. This could reflect interruptions in school careers as a result

Figure 3.1 ■ **Highest level of parental education (in years of schooling) by immigrant status**

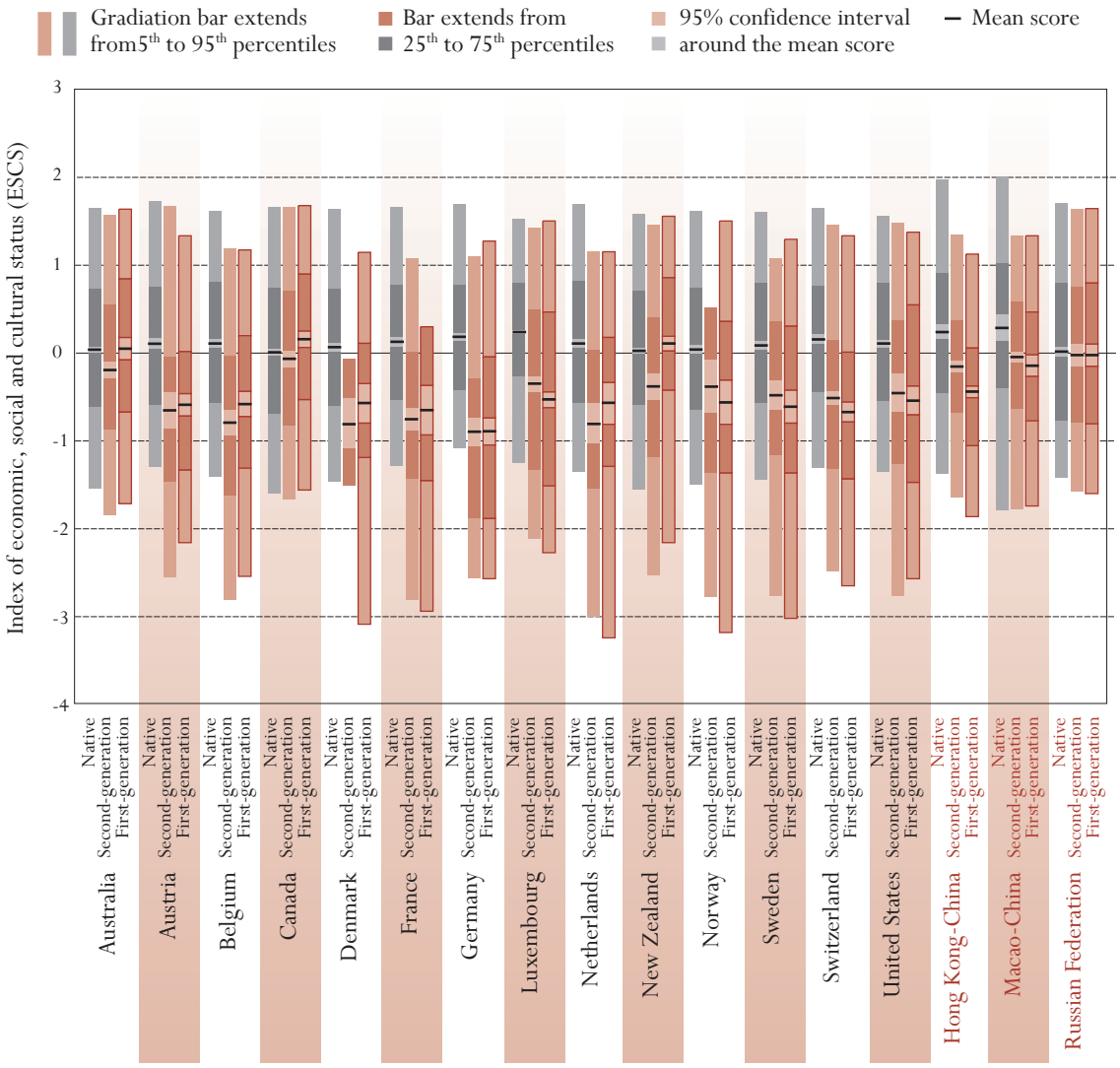


Source: OECD PISA 2003 database, Table 3.1.

of immigration. Parents of first-generation students had their child before immigrating and are likely to have completed their schooling in the country of origin. Meanwhile, parents of second-generation students immigrated before the child was born and may have left their home country when they themselves were still of school age. Although the PISA data do not contain information on the course of parents' school careers, it seems plausible that differences in the likelihood of school-career disruptions due to immigration may contribute to this surprising tendency in the patterns of parental education for first-generation and second-generation students. Additionally, as discussed in Chapter 2 these disparities could also reflect changes in the composition of the immigrant groups.

In a minority of countries, the differences in parents' level of education between the immigrant and non-immigrant groups are relatively small. In Canada, New Zealand, Macao-China and the Russian Federation, the difference in the number of years parents have attended a school is not significant for at least one subgroup of immigrant students. Moreover, the difference in parental

Figure 3.2 ■ **Distribution of the index of economic, social and cultural status (ESCS) by immigrant status (scores standardised within each country sample)**



1. Due to small sample sizes, the 5th and/or the 95th percentiles could not be computed for these groups.
Note: Scores standardised within each country sample.
Source: OECD PISA 2003 database, Table 3.2.

education is one year or less for both second-generation and first-generation students in Australia, Canada, Norway, Macao-China and the Russian Federation as well as for first-generation students in Austria and New Zealand. In fact, parents of first-generation students in Australia and Canada have significantly higher levels of education than parents of native students.

Another important aspect of immigrant students' background is the extent to which their families are integrated in terms of socio-economic status. This can be examined by looking at the mean of the PISA index of economic, social and cultural status (ESCS) for both immigrant and native students (see Figure 3.2). Again, the differences between the groups

vary considerably across countries. In most countries, immigrant families have, on average, lower economic, social and cultural status than native families. Generally in line with the results for parental level of education, notable exceptions to this trend are Australia, Canada, New Zealand and the Russian Federation. In Canada and the Russian Federation, neither first-generation nor second-generation students differ significantly from native students; in Australia and New Zealand only the families of second-generation students have a significantly lower socio-economic status than the families of native students.

With the exceptions cited above, immigrant students in most countries have more disadvantaged family backgrounds than native students. These differences can be based on varying distributions, however. For example, it might be that fewer immigrant students than native students come from the most advantaged socio-economic backgrounds or that more immigrant students than native students come from the least advantaged socio-economic backgrounds. To explore these patterns, Figure 3.2 presents the distribution of students (in terms of percentiles) on the index of economic, social and cultural status (ESCS). Focusing on the higher (most advantaged) and lower (least advantaged) ends of the ESCS distribution, it can be seen that immigrant populations in the case countries differ considerably in this regard. Three basic patterns emerge:

1. ***Homogeneity among immigrant and non-immigrant student groups across the ESCS distribution***. In a small number of countries, the social situation of immigrant students is comparable to that of native students across the ESCS distribution. These countries include Canada and the Russian Federation. In addition, Australia shows a similar tendency. Although there are significant differences between second-generation and native students at some levels of the ESCS distribution within Australia, these are relatively small.
2. ***Less favourable situation of immigrant students at the lower end of the ESCS distribution***. A more common pattern is that immigrant students at the lower end of the ESCS distribution are particularly disadvantaged compared to even the least advantaged native students while, at the same time, immigrant students at the top end of the distribution have similar levels of ESCS as their native counterparts. This pattern occurs most distinctly in Luxembourg, New Zealand, Switzerland and the United States.
3. ***Less favourable situation of immigrant students at both ends of the ESCS distribution***. Most frequently, immigrant students have lower levels of economic, social and cultural status than native students at both ends of the ESCS distribution. This pattern is most pronounced in Belgium, Germany, the Netherlands and Sweden. It is also apparent in Austria, Denmark, France and Norway, although the group differences in these countries are not significant for all levels of the ESCS distribution.

In short, the differences in parental level of education and socio-economic status between immigrant and non-immigrant students vary widely across the case countries. In a few countries, all three subgroups have similar background characteristics. These include three of the settlement countries that were founded on the basis of immigration, namely Australia, Canada and (less consistently) New Zealand. In addition, a similar pattern emerges for the immigrant populations in the Russian Federation where immigrants come mainly from the former Soviet Republics. In the majority of countries, however, immigrant students are at a significant disadvantage compared to their native peers. The differences between immigrant and non-immigrant families tend to be particularly pronounced for students at the lower end of the ESCS distribution. In most cases, the pattern is

similar for the families of both first-generation and second-generation students or even slightly less favourable for the latter group. Although this could indicate a lack of upward mobility, conclusions about developments across generations should be drawn with caution. Differences between families of first-generation and second-generation students may not only reflect upward or downward social mobility but also changes in the composition of immigrant groups that can be caused by fluctuations in immigrant inflow and admission patterns over time.

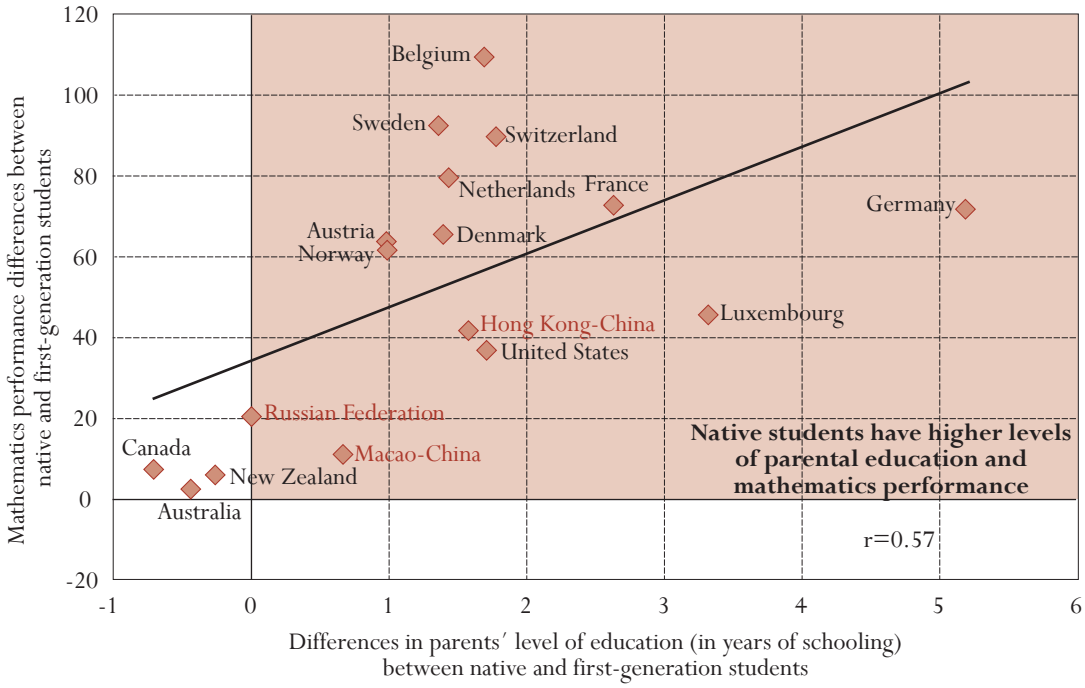
The findings show that immigrant and non-immigrant students differ in terms of their parents' level of education and socio-economic situation in most countries. Previous research indicates that these background factors are strongly associated with school success (*e.g.* Shavit and Blossfeld, 1993). Therefore, one might expect an association between immigrant and non-immigrant student group differences in terms of performance levels and educational and socio-economic background. The next section of the chapter will explore these relationships.

RELATIONSHIPS BETWEEN PERFORMANCE DIFFERENCES AND DIFFERENCES IN EDUCATIONAL AND SOCIO-ECONOMIC BACKGROUND AMONG IMMIGRANT AND NON-IMMIGRANT STUDENT GROUPS

Figures 3.3a and 3.3b show the association between differences in mathematics performance and parental education among immigrant and non-immigrant students for each country. The horizontal axis in the graphs represents mean differences between students from native families and students from either first-generation or second-generation immigrant families for parental education in years of schooling. The vertical axis represents mean differences between the two student groups in mathematics performance. On both axes, positive scores reflect an advantage for native students and negative scores represent an advantage for immigrant students. The gaps between the student groups for parental education and mathematics performance are clearly related: In countries where immigrant students perform at lower levels than their native peers the level of parental education in immigrant families also tends to be lower. With correlations of $r = .57$ ($p < .001$) for first-generation students and $r = .83$ ($p < .001$) for second-generation students the associations are moderate to strong. A similar pattern also emerges when considering differences in mathematics performance and families' economic, social and cultural status (see Figures 3.4a and 3.4b). Again, the correlations between the disadvantages of immigrant students in terms of performance and in terms of social background are quite strong (first-generation students: $r = .75$, $p < .001$; second-generation students: $r = .86$, $p < .001$). In Australia, Canada, New Zealand, the Russian Federation and Macao-China the gaps between native and first-generation students in terms of both performance and socio-economic status are particularly small. The distinct pattern for this group of countries anchors the regression line in Figure 3.4a.

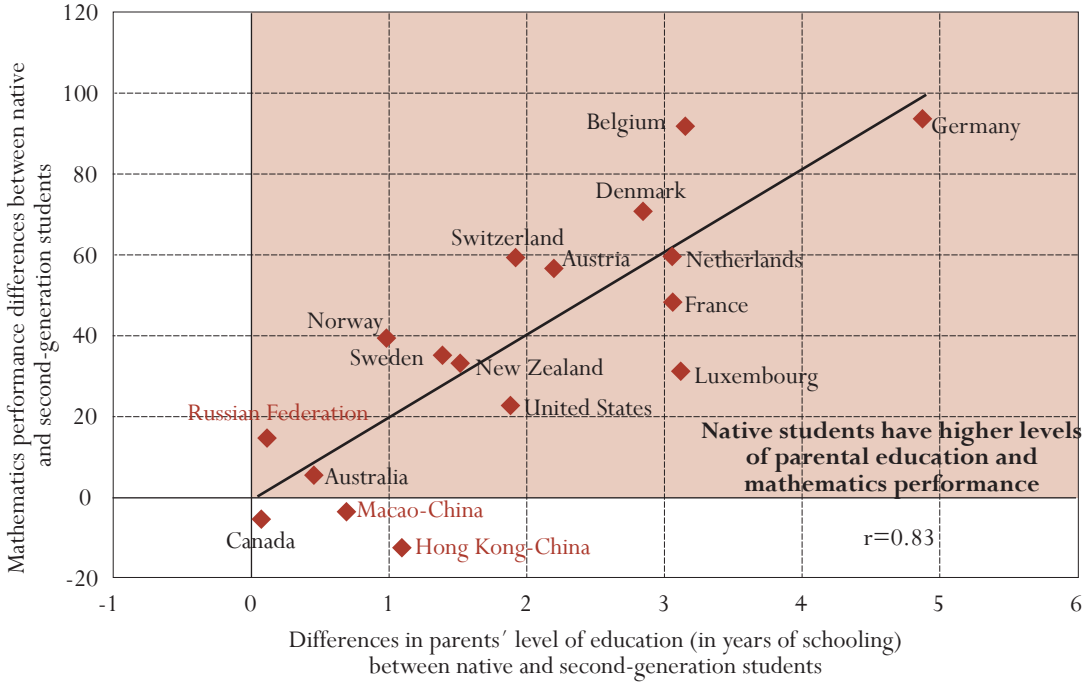
The relationships depicted in Figures 3.3a to 3.4b suggest that international variations in performance differences between immigrant and non-immigrant students are related to similar variations in economic, social and cultural differences. This association should to some extent represent between-country differences in immigrant populations. At the same time, it may also reflect the effectiveness of integration policies and practices which can affect both the relative performance levels and the relative socio-economic status of immigrants. Again, among the countries with distinct patterns of disparities in terms of background and performance are Australia, Canada and, less consistently, New Zealand. In these settlement countries the differences between immigrant

Figure 3.3a ■ **Differences between native and first-generation students in mathematics performance and parental education**



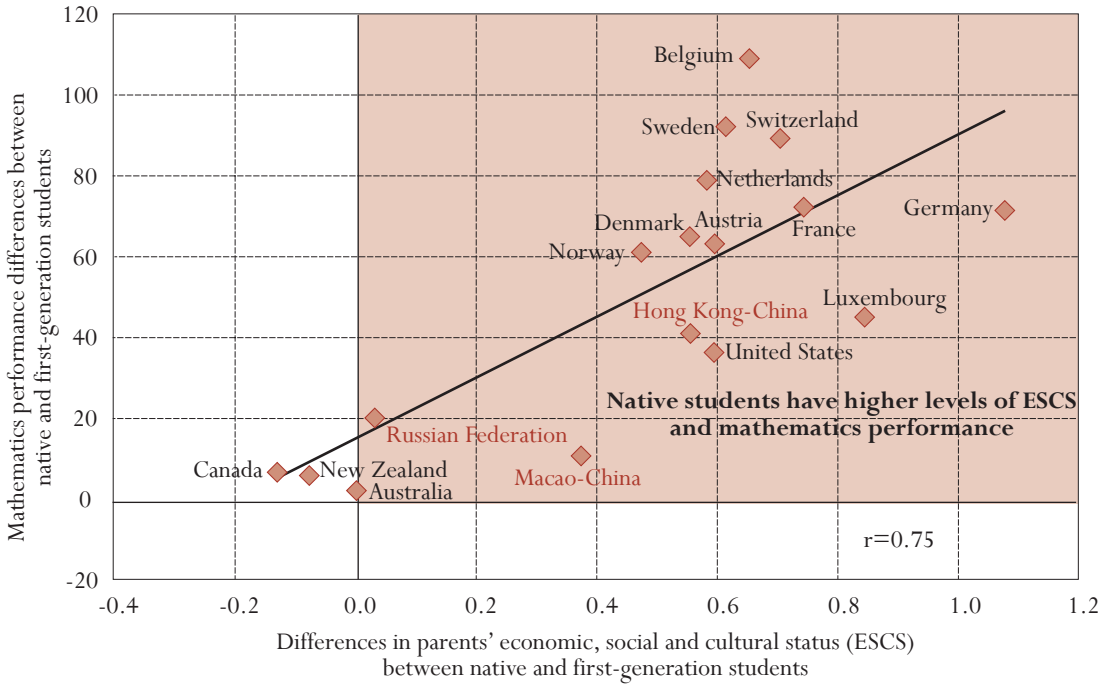
Source: OECD PISA 2003 database, Table 3.3.

Figure 3.3b ■ **Differences between native and second-generation students in mathematics performance and parental education**



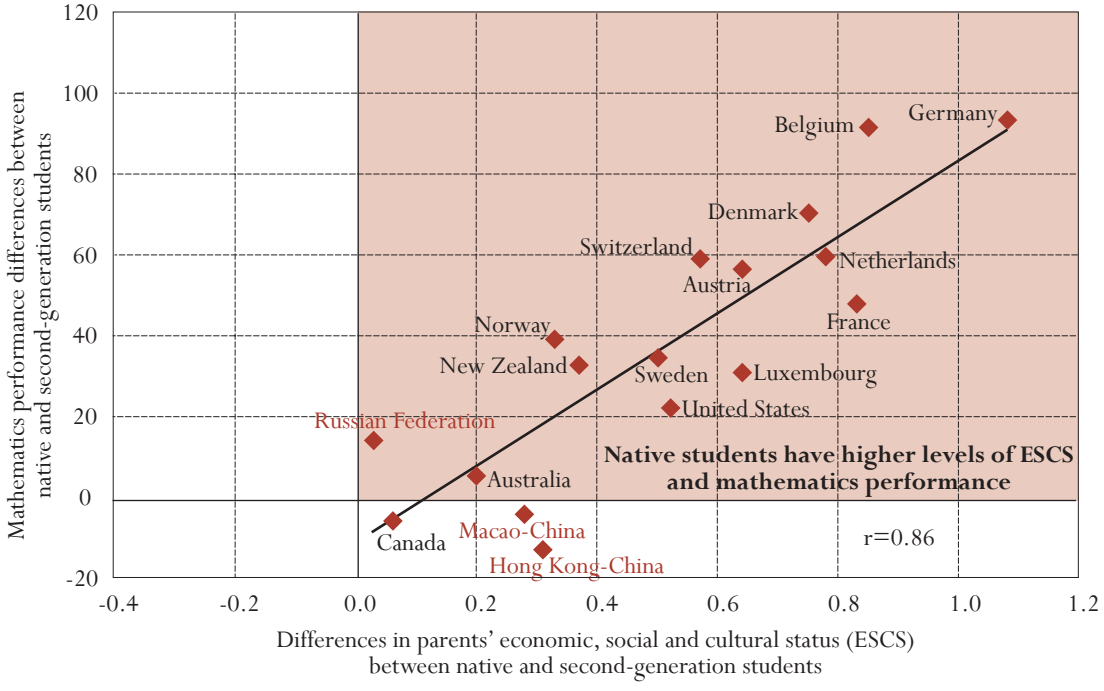
Source: OECD PISA 2003 database, Table 3.3.

Figure 3.4a ■ **Differences between native and first-generation students in mathematics performance and parents' economic, social and cultural status (ESCS)**



Source: OECD PISA 2003 database, Table 3.4.

Figure 3.4b ■ **Differences between native and second-generation students in mathematics performance and parents' economic, social and cultural status (ESCS)**



Source: OECD PISA 2003 database, Table 3.4.

and non-immigrant students for both performance and economic, social and cultural status are small. Another traditional immigration country, the United States, deviates from this pattern. Here, the disparities in performance and economic, social and cultural status are larger, although not quite as large as in some of the European countries included in the analyses. In the Russian Federation and Macao-China, finally, differences between immigrant and non-immigrant students are also small, which is most likely due to the unique composition of the immigrant populations in these countries (see description of immigrant populations in Chapter 1).

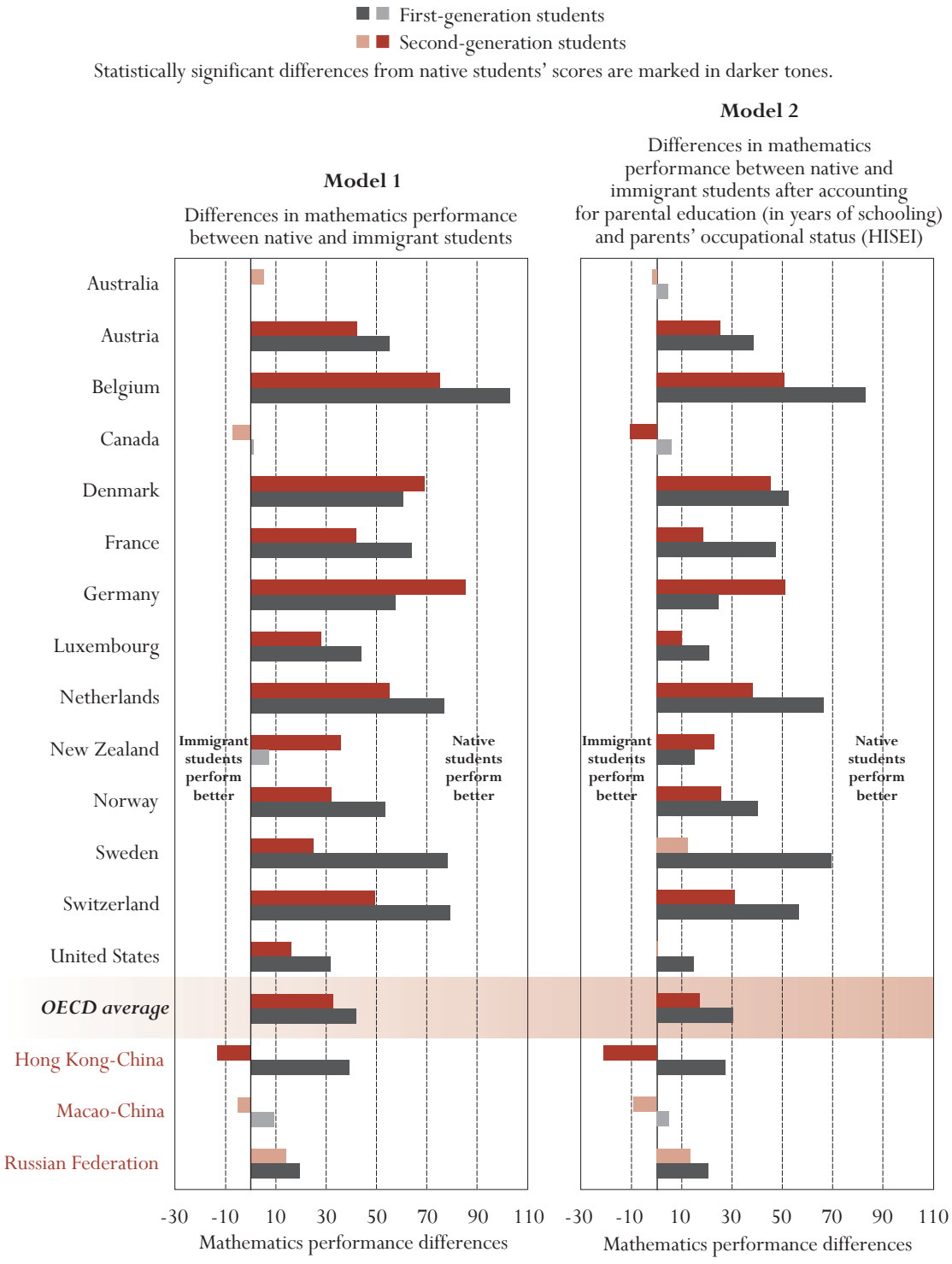
The relationships at the country level shown in Figures 3.3a to 3.4b, however, do not necessarily imply that the performance gaps between immigrant and non-immigrant students within countries can or should be attributed to these background factors alone.[2] That is, even after accounting for parental education and socio-economic status, immigrants may still be at a disadvantage with regard to performance. To explore this possibility, a series of regression analyses examines the extent to which parents' educational and socio-economic background account for performance differences between immigrant students and native students (see Table 3.5[3]). Instead of the composite index of economic, social and cultural status (ESCS), however, the indicator for parents' occupational status was used in the analyses. This was done to estimate the relative contribution of educational and occupational status separately (as they represent two distinct aspects of human capital) and to reduce collinearity. Not all students provided the necessary background information and they are therefore deleted from this part of the analysis (listwise deletion).[4] The proportion of missing background information varies across countries which reduces the comparability of the results of the regression analyses. In particular, results should be interpreted cautiously for those countries with high proportions of missing values (see Table 3.5 for details).

Model 1 in the series of regression analyses estimates the association of students' immigrant status and their performance in mathematics without taking into account any other background characteristics (see Table 3.5). Therefore, the coefficients indicate the extent to which the performance of immigrant students differs from the performance of their native peers. As shown in Chapter 2, the performance differences are significant for first-generation and second-generation students in most countries. However, neither group of immigrant students in Australia, Canada and Macao-China exhibits significant performance differences compared to their native peers. Similarly, first-generation students in New Zealand and second-generation students in the Russian Federation do not differ significantly from native students in mathematics performance.

The second model accounts for the parents' level of education, after having already accounted for the students' immigrant status. This decreases the size of the performance gap for immigrant students considerably in the majority of countries. It declines by 20 score points or more for second-generation and first-generation students in Germany, as well as for second-generation students in Belgium, Denmark and France. In several other comparisons, the reduction in the performance differences ranges between approximately 15 and 20 score points (first-generation and second-generation students in Luxembourg; first-generation students in Belgium, France and Switzerland; and second-generation students in Austria and the Netherlands).

Taking account of the parents' occupational status in addition to parents' educational level does not lead to large changes in the performance gap for immigrant students (see Model 3). This is likely due to the strong correlation between parents' educational levels and their occupations. Nevertheless,

Figure 3.5 ■ **Differences in mathematics performance between native and immigrant students before and after accounting for parental education and parents' occupational status (HISEI)**



Source: OECD PISA 2003 database, Table 3.5.

an additional decrease of 5 to 10 score points in the coefficient for the immigrant students results in several countries: for first-generation students in Austria, Belgium, Luxembourg, Norway, the United States and Hong Kong-China; for second-generation students in Germany; and for both first-generation and second-generation students in Sweden and Switzerland.

Despite the decreases in coefficients for immigrant students that occur after accounting for parents' educational and occupational background, the between-country differences in the performance gap remain substantial. Figure 3.5 shows the regression coefficients for immigrant students from Models 1 and 3 of the regression analysis. For the purpose of consistency with previous analyses, the sign of the coefficients was reversed. Therefore, the coefficients in Figure 3.5 indicate the extent to which native students outperform second-generation and first-generation students within each of the countries. Keeping in mind that the comparability of the estimates in absolute terms is limited, the rank order of countries with regard to the estimated differences in Model 3 is almost identical to that of Model 1. This pattern for the first-generation group in particular suggests that the cross-national differences in the mathematics performance gaps between native students and immigrant students cannot be explained solely on the basis of the educational or occupational status of their immigrant populations.

The findings from the regression analyses therefore indicate that the large performance differences in some of the European case countries are not just due to the lower human capital potential of their immigrants. In fact, the differences specifically associated with students' immigrant status rather than with their families' educational or occupational background are considerable in many countries.[5] This indicates a need for these countries to increase their efforts specifically aimed at the integration of immigrant students.

Again, a small group of countries does not show substantial differences in mathematics performance between immigrant and native students even before accounting for any background characteristics. This includes two of the settlement countries, Australia and Canada, as well as Macao-China and (for first-generation students) the Russian Federation. For these countries, it is unclear whether the small performance differences are due to the composition of their immigrant populations or to the effectiveness of their approaches to integration. Chapter 5 indicates that relatively structured and comprehensive second-language support programmes may contribute to this pattern in some countries.

As noted in Chapter 2, in a few countries second-generation students perform significantly better than first-generation students. This is the case in Canada, Luxembourg, Sweden, Switzerland and Hong Kong-China. Although the differences between the two immigrant groups may be partly due to cohort effects (*i.e.* more recent immigrants to the countries concerned having lower skill levels than earlier immigrants), this pattern may also suggest that these countries have particularly effective integration policies and practices. Chapter 5 explores policies and practices related to second-language support in some detail.

DISPARITIES SPECIFICALLY RELATED TO STUDENTS' IMMIGRANT STATUS

The section above indicates that performance differences between immigrant and non-immigrant students persist in many countries even after accounting for parents' level of education and occupational status. This suggests that these performance differences are, in part, specifically associated with students' immigrant background. As mentioned above, it is beyond the scope of PISA

to explore the various explanations researchers have suggested to account for these disadvantages. Nonetheless, the international database allows for the analyses of two potentially important factors: language spoken at home and the age at which first-generation students arrived in the respective country.

Chapter 2 suggests that the language spoken at home plays a substantial role in mathematics performance. The following analysis considers the relationship between language use and mathematics performance while accounting for parents' educational and occupational background. Model 4 in Table 3.5 shows the results of introducing the language spoken at home as an additional factor in the regression analysis described before. This results in a heterogeneous pattern. In a number of countries, performance is strongly related to the language spoken at home even after accounting for parents' educational and occupational status. In the United States, students who do not speak the language of instruction at home score about 20 points lower than students who speak the language of instruction at home. In Belgium, Germany, Hong Kong-China, Macao-China and the Russian Federation, the performance disadvantage associated with not speaking the language of instruction at home is larger than 30 score points. The only other country for which the language spoken at home shows a significant negative association with mathematics performance is Canada (12 score points).

Adding the language spoken at home to the model tends to decrease the negative coefficients for immigrant students. In several countries, however, they remain significant. This includes the coefficients for both first-generation and second-generation students in Austria, Belgium, Denmark, France, the Netherlands and Switzerland; for first-generation students in Luxembourg, Norway, Sweden, Hong Kong-China and the Russian Federation and for second-generation students in Germany and New Zealand.[6] The decrease in the coefficients from Model 3 to Model 4 is largest for first-generation and second-generation students in Germany as well as first-generation students in the United States (15 score points). Changes of between 10 and 15 score points occur in Belgium (first-generation and second-generation students) as well as in the Netherlands and in Sweden (first-generation students).

The language spoken at home is therefore associated with substantial performance disadvantages in several countries. Whether or not immigrant families speak the host countries' official language at home may, to some extent, reflect their general level of integration. At the same time, however, the pattern does not necessarily imply that immigrant families should be encouraged to abandon their native languages. In fact, the literature on bilingualism clearly shows that it is possible for children to reach high levels of proficiency in more than one language (*e.g.* Bialystok, 2001). In line with this finding, immigrant students in some countries perform at similar levels as native students when they do not speak the language of instruction at home. Large disadvantages associated with the language spoken at home may suggest that students do not have sufficient opportunities to learn the language of instruction. Therefore, countries with substantial negative coefficients for students who speak a language at home that is different from the language of instruction in Model 4 may want to consider strengthening the language support measures available within their school systems.

Model 5 in Table 3.5, finally, includes all background characteristics from the previous analyses and adds the age at which students arrived in the receiving country. This factor is only relevant for the first-generation group.[7] The findings indicate that students who arrived in the receiving country at an older age tend to lag further behind their native peers in mathematics performance. In some

countries, the relationship of students' age at immigration with performance is quite strong, and including this factor reduces the negative coefficient for first-generation students making it non-significant. This is the case for Denmark, France, Luxembourg, Norway, Hong Kong-China and the Russian Federation. In these countries, the negative coefficient for first-generation students decreases by 7 to 37 score points. In addition, the performance disadvantages for first-generation students are reduced by at least 15 score points in Belgium (48 score points), Germany (23 score points), the Netherlands (18 score points) and Switzerland (17 score points). This pattern reveals the important role of students' age at the time of immigration. Not surprisingly, there seems to be a strong tendency for immigrant students to reach higher levels of performance the longer they have spent in the receiving country's school system.

The results for age of immigration, however, do not imply that children from immigrant families who have completed all of their schooling in the host country will reach comparable performance levels to their native peers. As the coefficients for the second-generation group in the regression models indicate, immigrant students often lag behind their native peers even when they were born in the receiving country. This indicates that time alone cannot be expected to resolve the challenges associated with an immigrant status. Instead, targeted support measures seem necessary to help immigrant students succeed at school (see Chapter 5).

DIFFERENCES BETWEEN IMMIGRANT AND NATIVE STUDENTS WITHIN AND BETWEEN SCHOOLS

The next part of this chapter analyses the situation of immigrant students at the school level. First, it describes the extent to which performance differences between immigrant students and students from native families occur within schools or between schools. In addition, it examines the extent to which immigrant students attend schools with high proportions of students whose families have immigrated as well. Subsequently, this section provides information on resource and climate characteristics in the schools that immigrant and non-immigrant students attend. Again, in interpreting the findings, it is important to keep in mind that the results of the school-level analyses reflect the structures of the different school systems. In tracked systems, low achieving immigrant students will typically attend schools within the lower tracks. As a result, it is inherent in the systems of these countries that schools will show variations in immigrant students' performance levels. Such a pattern does not necessarily imply that the lower performance of immigrant students is caused by their concentration in certain schools, although this may be the case under some conditions. It is not possible to identify the effects of selection processes (such as tracking or residential segregation) and the effects of student body composition based on the PISA data (at least not without longitudinal data or alternative estimates of students' prior knowledge (Baumert, Stanat and Watermann, 2006; Schümer, 2004; Stanat, 2004, 2006). Keeping this in mind, however, it is useful to consider where the disadvantages of immigrant students are located within a school system, as this may provide some guidance for policy makers and practitioners in identifying target points for interventions.

Figure 3.6 displays the extent to which performance differences between immigrant students and non-immigrant students occur between schools or within schools. The length of the bars to the left of the central line shows the differences between schools that are attributable to students' immigrant status. The length of the bars to the right of the central line shows the differences within schools that are attributable to students' immigrant status. In addition, the columns to the left and

Figure 3.6 ■ **Variance in student performance in mathematics explained by immigrant status between schools and within schools**

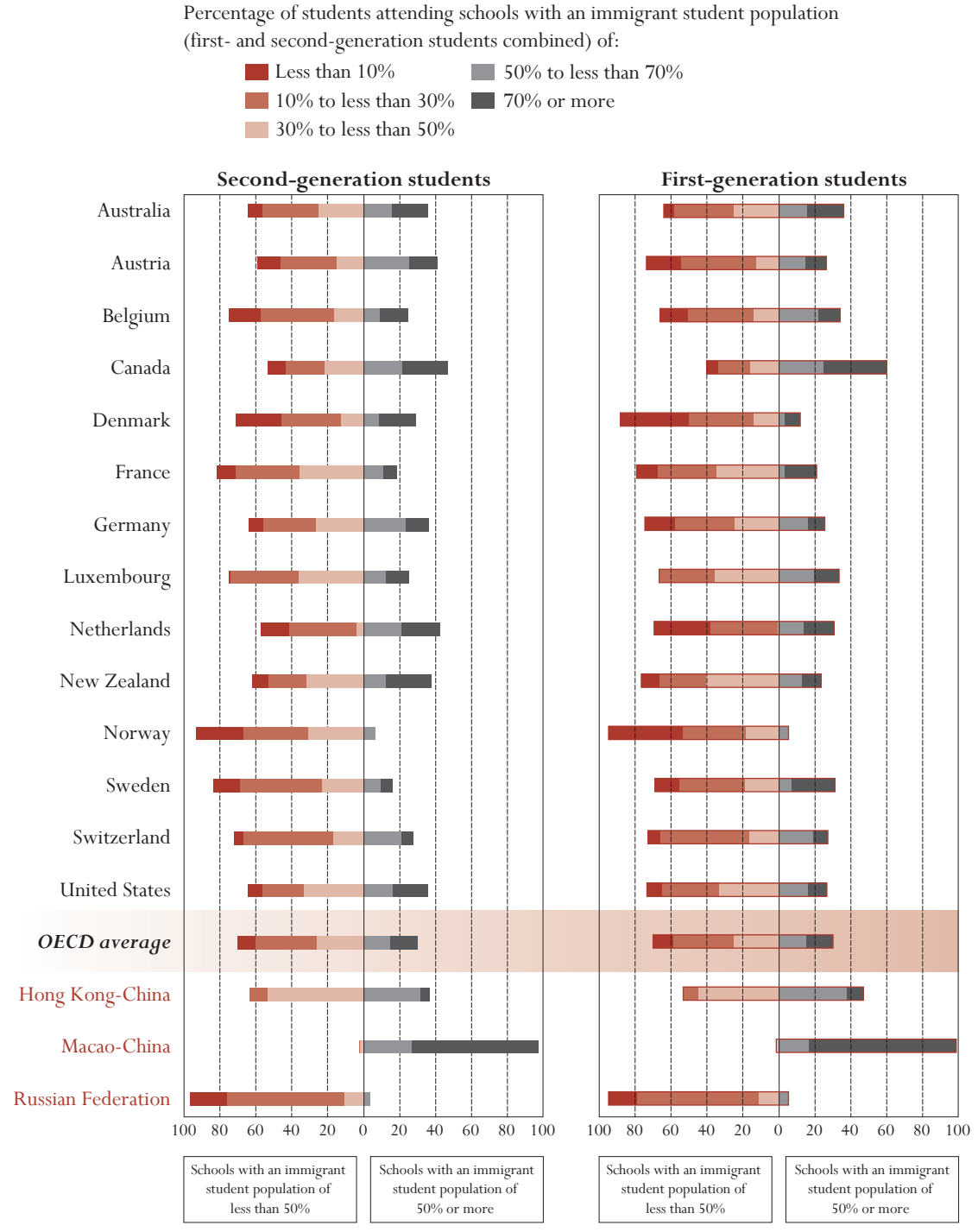
1. Accounting for immigrant student status slightly increases the school-level variance in Canada, resulting in a negative estimate for explained between-school variance.
Source: OECD PISA 2003 database, Table 3.6.

to the right of the graph indicate the degree to which student performance varies between schools and within schools overall. In the Netherlands, for example, 58% of the total variation in student performance is between schools and 42% within schools. Of the 58% variation between schools, approximately 7% is attributable to students' immigrant status, and of the 42% variation within schools, approximately 3% is attributable to immigrant status.

Overall, the results in Figure 3.6 indicate that students' immigrant status explains only a small proportion of the total variation in student performance. Within schools, it is below 4% in all countries except Switzerland where immigrant status accounts for 7% of the performance variation. The extent to which schools differ in terms of disparities between immigrant and native students varies across countries, however. The between-school variation due to students' immigrant background is comparatively high in some of the tracked education systems, including Switzerland (17%), Germany (11%) and Belgium (10%). This reflects the comparatively lower performance of immigrant students in these countries and the fact that low performing students are grouped in schools within the lower tracks. Yet, the proportion of between-school variation associated with students' immigrant status is also quite high in some comprehensive school systems. This is most notable in Sweden where more than 28% of the between-school variation is explained by students' immigrant status, followed by Denmark with 11%. At the same time, however, the overall variation in student performance between schools is much lower in these countries, with 11% in Sweden and 14% in Denmark, compared to more than 50% in the tracked education systems of Belgium and Germany and 34% in Switzerland. In absolute terms, therefore, the proportion of between-school variation in student performance in mathematics explained by immigrant status has different meanings in these two groups of countries. For example, in Sweden, immigrant status accounts for about 3% of the total variation in students' mathematics performance, while in Germany the proportion is 5.5% (see last two columns in Table 3.6).

The extent to which immigrant status explains variation within and between schools depends on the overall size of the performance differences between students from immigrant and native families and on the level of segregation in terms of the schools the two student groups attend. Chapter 2 and the previous section of this chapter described the size of the performance differences in detail. Figure 3.7 provides information on the degree to which immigrant students are grouped together within schools. More specifically, the bars in the first panel represent the percentages of second-generation students and the bars in the second panel represent the percentages of first-generation students in schools that are attended by varying proportions of immigrant students overall (both first-generation and second-generation). For both panels of Figure 3.7 the length of the bars to the left of the central line represents the percentage of students attending schools where less than half of the student population has an immigrant status. The length of the bar to the right of the central line shows the percentage of students in schools where at least half of the student population has an immigrant status. The findings indicate that, in several countries, many immigrant students attend schools with high proportions of first-generation or second-generation students. The most pronounced clustering occurs in Macao-China where almost all second-generation students and first-generation students attend schools with an immigrant student population of 50% or higher.[8] Due to the relatively large immigrant population in Macao-China, however, the majority of native students also attend schools with 50% or more immigrant students (see Table 3.7c). In Austria, Canada and the Netherlands, more than 40% of second-generation students are in schools where at least half of the students are immigrants and more than 30% of second-generation students in

Figure 3.7 ■ **Percentages of second-generation and first-generation students attending schools with different proportions of immigrant students**

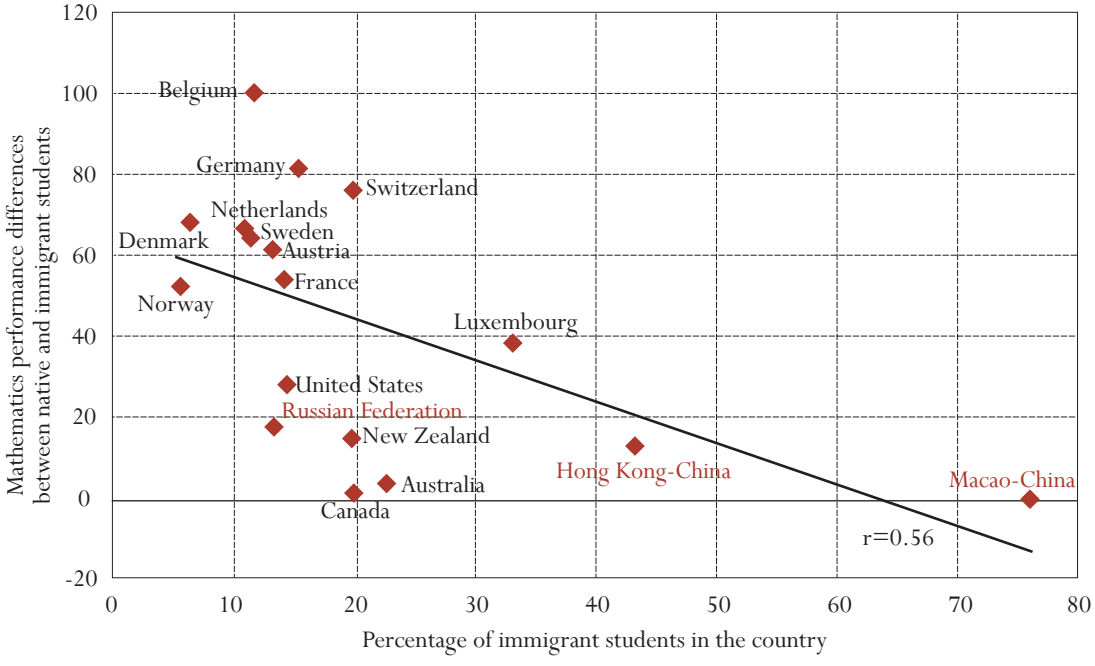


Source: OECD PISA 2003 database, Tables 3.7a and 3.7b.

Box 3.1 ■ Do high levels of immigration impair integration?

People often assume that high levels of immigration will impair integration processes. In terms of student performance, however, this does not necessarily seem to be the case. Figure 3.8 shows the relationship between the proportion of immigrant students overall (second-generation and first-generation) within each country and the extent to which these students perform less well in mathematics compared to their native peers. If anything, this association is negative (OECD countries only: r = -.48, p = .086).[1] That is, the performance gap tends to be smaller in countries with higher proportions of immigrants. This pattern is likely to be due to a number of factors, such as between-country differences in the composition of immigrant populations. Some of the countries with high levels of immigration also have extensive support measures for immigrant students in place (see Chapter 5) which may contribute to the relative success of this group.

Figure 3.8 ■ **Differences in mathematics performance between native and immigrant students and percentage of immigrant students within countries**



Source: OECD PISA 2003 database, Table 3.8.

1. The equivalent figure for all countries within this report is r = -.56, p = .020.

Australia, Germany, New Zealand, the United States and Hong Kong-China. Among first-generation students, the level of clustering is less pronounced. Nevertheless, more than 30% of first-generation students attend schools where at least half of the student population has an immigrant background in Australia, Belgium, Canada, Luxembourg, the Netherlands, Sweden, Hong Kong-China and Macao-China.

The pattern of findings for the extent to which immigrant students are grouped together within schools suggests that uneven distributions are not necessarily associated with lower relative performance levels for this group. In fact, some systems with high degrees of clustering have comparatively small performance differences between immigrant and native students. These include Australia, Canada and Macao-China. Accordingly, there is no significant relationship at the country level between the proportion of first-generation or second-generation students attending schools with 50% or more immigrant students and the size of the performance differences for these groups compared to their native peers (first-generation students, OECD countries: $r = .33$, $p = .256$; second-generation students, OECD countries: $r = .16$, $p = .583$).[9] Therefore, the distribution of immigrant students across schools does not seem to account for international variations in performance gaps between immigrant and native students. Within countries, however, high proportions of immigrants in schools may be related to performance levels, although the evidence on such contextual effects is not consistent (*e.g.* Coradi Vellacott *et al.*, 2003; Rüesch, 1998; Portes and Hao, 2004; Stanat, 2006; Westerbeek, 1999).

Characteristics of schools attended by immigrant and native students

The final set of analyses in this chapter explores differences between characteristics of schools attended by immigrant students and native students (the school-level variables selected for this analysis are presented in Box 3.2 and full descriptions are included in Annex A1). Figure 3.9 shows the mean index of economic, social and cultural status (ESCS) of students within schools. Clearly

Box 3.2 ■ **Measures of selected school characteristics in PISA**

Chapter 3 presents information on selected school characteristics that were collected in PISA 2003 either directly from the students or from the school principals. Annex A1 includes full descriptions for each of the measures listed below:

Mean economic, social and cultural status of students within schools

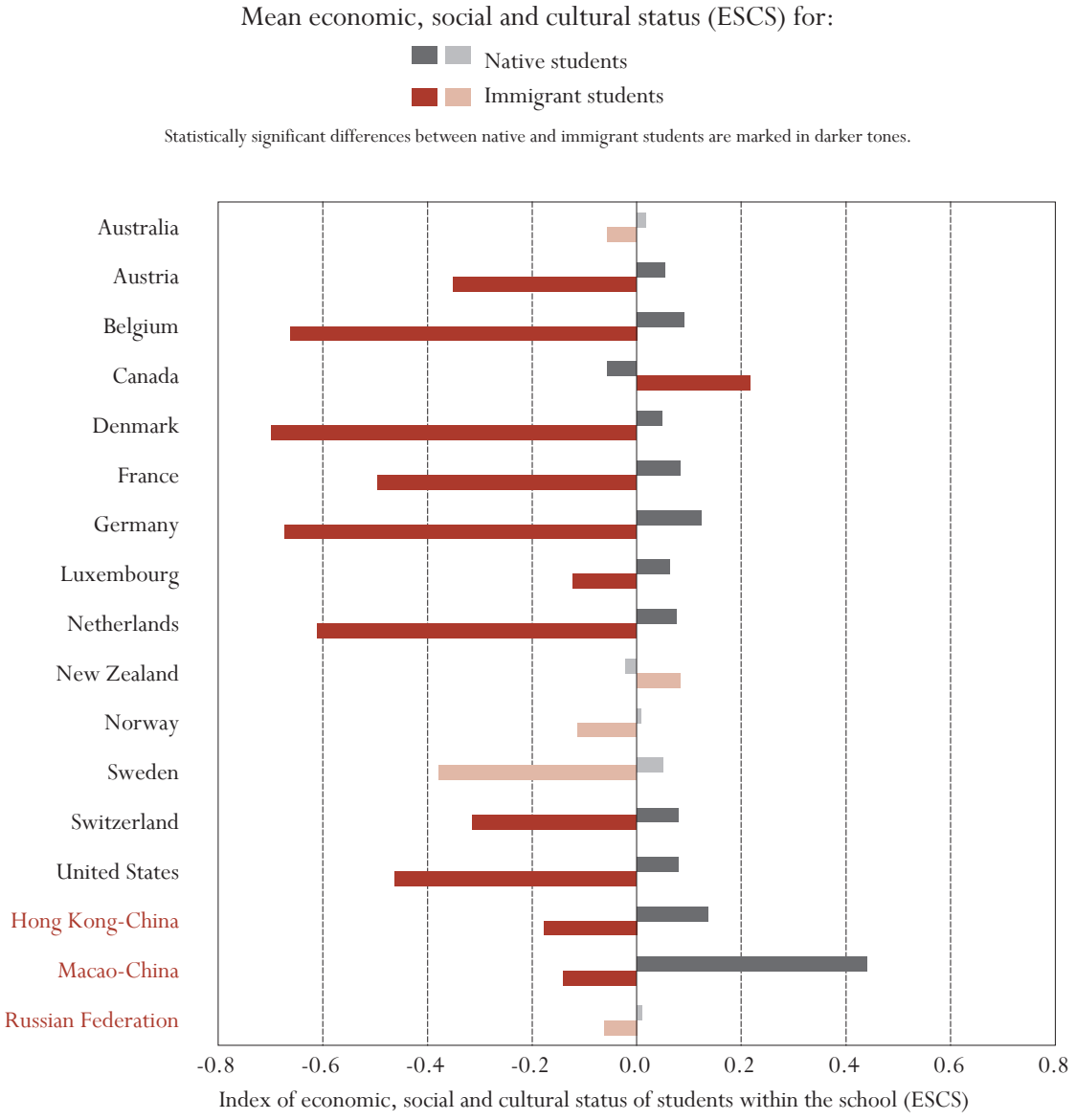
Human resources
- Teacher/student ratio
- Teacher shortage

Physical and educational resources
- Quality of the school's physical infrastructure
- Quality of the school's educational resources

Students' perceptions of classroom climate
- Teacher support
- Disciplinary climate

Principals' perceptions of school climate
- Student-related factors affecting school climate
- Teacher-related factors affecting school climate
- Teacher morale and commitment

Figure 3.9 ■ **Mean economic, social and cultural status of students in schools attended by native students and immigrant students (scores standardised within each country sample)**



Source: OECD PISA 2003 database, Table 3.9.

immigrant students in most countries attend schools with less socio-economically advantaged student populations. The differences between the two student groups are significant in all countries except Australia, New Zealand, Norway, Sweden and the Russian Federation. In several European countries, such as Belgium, Denmark, France, Germany and the Netherlands, the differences are large. In some of these countries (Belgium, Germany and the Netherlands), the pattern probably reflects tracking effects within the education system. In Canada, the difference between the two student groups is also significant, but in the opposite direction. Therefore, immigrant students in Canada seem to attend schools with relatively advantaged student populations.

In terms of human, physical and educational resources, the differences between schools attended by immigrant and native students are smaller (see Table 3.9). For the student-teacher ratio, for example, there are only a few countries with significant differences. In three of the five countries where there are differences, immigrant students are in a less favourable position than native students. Compared to their native peers, immigrant students in Luxembourg, New Zealand and the United States tend to be in schools with higher numbers of students per teacher. In contrast, the student-teacher ratio in Belgium and (to a lesser extent) in Macao-China tends to be more favourable for immigrant students. This may reflect an attempt to improve performance by providing schools with high proportions of immigrant students with additional teachers. At the same time, however, immigrant students in Belgium are more likely than native students to attend schools where the principals perceive shortages of qualified and experienced teachers to be a problem (see Table 3.9).

Differences in the quality of physical infrastructure and educational resources between schools attended by immigrant and native students tend to be small (see Table 3.9). Similarly, Table 3.9 shows that there are only a few differences in the various aspects of teacher behaviour (students' perceptions of teacher support and principals' perceptions of teacher-related factors affecting school climate and teacher morale). In Luxembourg and Macao-China, immigrant students tend to experience more favourable conditions in terms of teacher support in their mathematics lessons. In addition, teacher morale in Luxembourg is relatively high in schools attended by immigrant students. In Belgium, however, the opposite is true. Here, immigrant students tend to attend schools with lower teacher morale and with less positive teacher-related factors affecting school climate (see Table 3.9).

With regard to student-perceived disciplinary climate in mathematics classes and principal-perceived student behaviour affecting school climate, a different picture emerges (see Table 3.9). In several countries, immigrant students experience less favourable school environments compared to native students. The differences are significant for both disciplinary climate and student behaviour in Austria, Belgium and Luxembourg; for student behaviour in the Netherlands and Sweden; and for disciplinary climate in Germany.

Overall, the findings for school characteristics indicate that immigrant and native students typically attend schools with similar resources. In Luxembourg, New Zealand and the United States, however, the number of students per teacher seems to be higher in the schools attended by immigrant students. The opposite is true for Belgium where schools attended by immigrant students tend to have lower student-teacher ratios. Yet, in terms of teacher shortage, teacher morale and commitment, student-related factors affecting school climate and disciplinary climate, the school environment in Belgium seems to be less favourable for immigrant students than for non-immigrant students.

In most countries, immigrant students often attend schools with relatively disadvantaged student populations in terms of economic, social and cultural background. The only exceptions are three of the settlement countries, Australia, Canada and New Zealand, as well as the two Nordic countries Norway and Sweden. Here, immigrant students and native students attend schools with comparable socio-economic compositions. Finally, in several European countries, the school environment for immigrant students compared to native students is less favourable in terms of school or disciplinary climate. This is true for immigrant students in Austria, Belgium and Luxembourg and, to a lesser extent, Germany, the Netherlands and Sweden.

SUMMARY AND CONCLUSIONS

The first part of this chapter described background characteristics of second-generation and first-generation students and examined their relationship with performance. The analyses provided estimates for the extent to which performance differences between immigrant and non-immigrant students persist after accounting for aspects of their families' economic, social and cultural status. The chapter also explored characteristics specifically related to students' immigrant status, including the role of students' and parents' country of birth, the language spoken at home and the age of students at the time of immigration.

The second part of the chapter focused on schools. It analysed the extent to which differences between immigrant and native students occur within and between schools and described the schools that the two student groups attend within the countries. A number of key findings emerged:

(a) In the majority of countries, parents of immigrant students have completed fewer years of schooling and show lower levels of economic, social and cultural status than parents of native students. At the same time, there are a few countries where the two student groups do not differ substantially in terms of these background characteristics. The disadvantages of first-generation families in terms of educational and socio-economic background are pronounced in most of the European countries as well as in the United States and in Hong Kong-China. The largest and most consistent differences occur in Germany. By contrast, in three of the settlement countries, Australia, Canada and New Zealand, the differences between immigrant and non-immigrant populations in terms of parental education and socio-economic status are small or non-significant. A similar pattern emerges for Macao-China and the Russian Federation.

(b) At the country level, there is a relationship between the relative mathematics performance of immigrant students and their relative educational and socio-economic background. However, performance differences remain between immigrant and non-immigrant students in many countries after accounting for these background characteristics. This suggests that the relative performance levels of immigrant students cannot solely be attributed to the composition of immigrant populations in terms of their human capital potential. Countries differ with regard to their immigration policies and practices and the background characteristics of their immigrant populations. To explore the effectiveness of integration policies and practices within the countries in this report, it would be necessary to control for background characteristics of immigrants at the time they entered the respective country. PISA does not collect this information. Yet, assuming that the educational and socio-economic status of first-generation students' families reflects their situation at the time of immigration, accounting for these characteristics provides a rough estimate for the extent to which the lower performance of immigrant students can be attributed to the human capital potential of countries' immigrant populations. The findings indicate that in most countries with large performance gaps between immigrant and native students, these differences remain significant after accounting for parents' educational and occupational status.

(c) In several countries, students who do not speak the language of instruction at home perform significantly less well in mathematics than students who do. This suggests that some immigrant students in these countries may not have sufficient

opportunity to learn the language of instruction. After accounting for parents' educational and occupational status, the performance gap associated with the language spoken at home is significant in Belgium, Canada, Germany, the United States, Hong Kong-China, Macao-China and the Russian Federation. Countries with a strong relationship between the language students speak at home and their performance in mathematics may want to consider strengthening language support measures in schools.

(d) The proportion of variation in mathematics performance within and between schools that is due to students' immigrant status is relatively small. In some countries, the difference between immigrant and non-immigrant students is mainly found between schools. Countries with larger proportions of between-school variation due to immigrant status include three countries with tracked school systems, Belgium, Germany and Switzerland, as well as two countries with comprehensive school systems, Denmark and Sweden.

(e) In several countries, many immigrant students attend schools with relatively high proportions of students whose families have also immigrated. Higher levels of grouping – with more than 30 to 40% of first-generation or second-generation students attending schools where at least half of the student population has an immigrant background – occur in Australia, Austria, Belgium, Canada, Germany, Luxembourg, the Netherlands, New Zealand, Sweden, the United States, Hong Kong-China and Macao-China. The degree of clustering within a country, however, does not seem to be related to the size of the performance gap between immigrant and native students.

(f) Within the OECD countries, the size of the immigrant student population is not significantly associated with the size of the performance differences between immigrant and native students. In fact, there seems to be a tendency for the performance gap to be smaller in countries with higher proportions of immigrant students. This finding contradicts the assumption that high levels of immigration will necessarily hinder integration.

(g) Immigrant students in most countries often attend schools with relatively disadvantaged student populations in terms of economic, social and cultural background. In terms of resource and climate characteristics of schools, the pattern varies across countries. In three of the settlement countries, Australia, Canada and New Zealand, the characteristics of schools attended by immigrant students and non-immigrant students are similar. In Belgium, immigrant students are likely to attend schools with less favourable characteristics, although the number of students per teacher tends to be lower in their schools. A higher student-teacher ratio for immigrant students compared to native students occurs in Luxembourg, New Zealand and the United States. In addition to the economic, social and cultural background of student populations, the group differences are largest and most consistent for student factors related to school climate and disciplinary climate. Immigrant students attend schools with less favourable conditions for at least one of these factors in Austria, Belgium, Germany, Luxembourg, the Netherlands, Sweden and Macao-China.

Overall, the findings in this chapter confirm the need to provide immigrant students with targeted support in a number of countries. Chapter 5 describes countries' current policies and practices to help immigrant students learn the language of instruction. Before moving on to this description, however, Chapter 4 analyses central learning prerequisites of immigrant students that form a foundation for success at school.

Notes

1 For qualifications of this general assumption see Borjas, 1987.

2 In fact, it is generally not admissible to generalise relationships at the aggregate level to the individual level or vice versa (King, 1997; Klieme and Stanat, 2002; Robinson, 1950).

3 The pattern of findings does not change substantially in any of the countries if gender is included as an additional variable in the regression analyses.

4 As pointed out in Chapter 1, a common approach to dealing with the problem of missing values is to create a complete dataset by way of multiple imputation. Because this approach could not be employed within the OECD-PISA context, the mean substitution method suggested by Cohen and Cohen (1983) was initially used for the regression analyses. These analyses yielded findings that were almost identical to those with listwise deletion, however. Therefore, mean substitution was only used for students' age of immigration as the proportion of missing values is particularly high for this variable (see Table 3.5).

5 It should be noted, however, that all variables included in the model are measured with error. To the extent that the indicators of parents' educational and occupational status are imprecise, the results of the regression analyses should underestimate their contribution.

6 In Canada and Hong Kong-China, significant differences are also present for second-generation students but in the opposite direction, thus indicating a performance advantage for this group after accounting for the student background characteristics included in the model.

7 Due to the high proportion of missing values on this variable in many countries, they were replaced by within-country means. In addition, a dummy-variable representing whether or not the variable is missing was included in the model. Yet, the pattern of results for this analysis does not deviate substantially from the same analysis using listwise deletion.

8 It should be noted that the number of schools is quite small within the samples for Luxembourg ($N = 29$) and Macao-China ($N = 39$).

9 The equivalent figures including all countries within this report are first-generation students: $r = .36$, $p = .146$ and second-generation students: $r = .28$, $p = .267$.

READER'S GUIDE

Data underlying the figures

The data referred to in Chapters 1, 2, 3, and 4 of this report are presented in Annex B. In these tables, as well as in data tables included in Chapter 5, the following symbols are used to denote missing data:

a The category does not apply in the country concerned. Data are therefore missing.

c There are too few observations to provide reliable estimates (*i.e.* there are fewer than 3% of students for this cell or too few schools for valid inferences). However, these statistics were included in the calculation of cross-country averages.

m Data are not available. These data were collected but subsequently removed from the publication for technical reasons.

n Data are negligible *i.e.* they do not occur in any significant numbers.

w Data have been withdrawn at the request of the country concerned.

Calculation of the OECD average

An OECD average was calculated for most indicators presented in this report. The OECD average takes the OECD countries as a single entity, to which each country contributes with equal weight. The OECD average corresponds to the arithmetic mean of the respective country statistics and for this report only applies to the selection of OECD *case countries* (see definition below).

Rounding of figures

Because of rounding, some figures in tables may not exactly add up to the totals. Totals, differences and averages are always calculated on the basis of exact numbers and are rounded only after calculation. When standard errors in this publication have been rounded to one or two decimal places and the value 0.0 or 0.00 is shown, this does not imply that the standard error is zero, but that it is smaller than 0.05 or 0.005 respectively.

Reporting of student data

The report uses "15-year-olds" as shorthand for the PISA target population. In practice, this refers to students who were aged between 15 years and 3 (complete) months and 16 years and 2 (complete) months at the beginning of the assessment period and who were enrolled in an educational institution, regardless of the grade level or type of institution, and of whether they were attending full-time or part-time.

Abbreviations used in this report

The following abbreviations are used in this report:

ESCS Index of economic, social and cultural status (see Annex A1 for definition)

HISEI Highest international socio-economic index of occupational status (corresponds to the highest occupational status of either the mother or father)

ISCED International Standard Classification of Education (the ISCED levels are explained in Annex A1)

SE Standard error

SD Standard deviation

SOPEMI *Système d'Observation Permanente des Migrations* (Continuous Reporting System on Migration). This was established in 1973 by the OECD to provide its European member states a mechanism for sharing of information on international migration.

Terminology used in this report

Native students or non-immigrant students: Students with at least one parent born in the country of assessment. Students born in the country who have one foreign-born parent (children of "combined" families) are included in the native category, as previous research indicates that these students perform similarly to native students.

Immigrant students: This group includes both *first-generation students* and *second-generation students* (see definitions below).

First-generation students: Students born outside of the country of assessment whose parents are also foreign-born.

Second-generation students: Students born in the country of assessment with foreign-born parents.

Case countries: This includes the 17 countries covered in this report. Fourteen OECD countries: Australia, Austria, Belgium, Canada, Denmark, France, Germany, Luxembourg, the Netherlands, New Zealand, Norway, Sweden, Switzerland and the United States; as well as three partner countries: Hong Kong-China, Macao-China and the Russian Federation.

Further documentation

For further information on the PISA assessment instruments and the methods used in PISA, see the *PISA 2003 Technical Report* (OECD, 2005) and the PISA Web site (*www.pisa.oecd.org*).

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