Schooling Institutions and the Influence of Parental and Immigrant Background on Academic Performance

Educational equity can be viewed as a key indicator of a country's social equity in general. In most countries, however, educational success varies widely across socio-economic groups. Furthermore, immigrant children often lag behind their native peers, even after accounting for socio-economic characteristics (OECD 2012). Thus, examining and identifying educational disparities between social strata can motivate institutional changes that contribute to social cohesion.

The international student assessment PISA distinguishes between participation and fairness in educational equity. Educational equity with regard to fairness is defined as granting all students equal opportunities to benefit from education, regardless of gender or family background. This should then be reflected in a lower correlation between family characteristics and academic success (OECD 2012).

Schooling performance in the PISA assessment is measured in three main categories: mathematics, reading and science. We will focus our analysis on performance in the PISA mathematics section.[1]

The effect of socio-economic background on academic performance

To measure socio-economic and cultural background, PISA 2012 employs the Index of Economic, Social and Cultural Status (ESCS). The ESCS-Index includes three components: employment and occupation of parents, parental education level and cultural possessions in the household. The latter serves as a proxy for cultural resources. Specifically, the proxy indicates whether the household possesses objects of cultural value; such as the number of books at home, literary classics, stationary and learning equipment, as well as IT-related items. Furthermore, the ESCS is constructed so that zero constitutes the OECD-mean and standard deviation across OECD countries is normalised to one (Ehmke and Siegle 2005).

Figure 1 indicates the average difference in mathematics scores associated with a variation of one standard deviation in the ESCS-Index. On average, European OECD members exhibit a decrease in mathematics scores of 39 points, due to a one standard-deviation decrease in the ESCS-Index across all OECD-countries. This difference corresponds to roughly one year of schooling (OECD 2013).

This gap is highest in the Slovak Republic (-54), France (-52), the Czech Republic (-51), Belgium (-49) and Hungary (-47). Conversely, a student's family background is least associated with academic performance in Estonia (-29), Italy (-30), Iceland (-31), Norway (-32) and Finland (-32).

This pattern is robust to alternative measurements of the score-gap. The numbers in Figure 1 are stated in absolute score gaps associated with a one standard-deviation decrease in the ECSC-Index. However, to take the overall performance level of the country into account, the score-difference can be expressed in percentages of the average country score. The ranking of high and low gap countries nevertheless remains the same with this alternative scaling of the score-gap.

Recent literature suggests that schooling institutions are an important factor in achieving educational equity. More specifically, sorting students into different tracks with distinct curricula can intensify the role of family background due to the cancelled benefits of spillovers from better performing to disadvantaged students (Hanushek and Wößmann 2006). Hanushek and Wößmann (2006) find a negative association between early tracking and performance equity.

Indeed, the PISA 2012 results confirm this relationship. In Figure 1, the age of first tracking is stated for each country in parentheses. In countries with the highest score-differences (except for France), first tracking takes place at a young age of 10 to 12 years. Czech children, for instance, are sorted into five different school tracks after five years of primary school at age 11, according to academic performance. Better performing students are admitted to tracks that prepare students for academic tertiary education. Lower achieving students, on the other hand, receive vocational training.

[1] For immigration and its influence on reading scores, see Klosowiak (2012).

However, countries exhibiting the most equitable educational outcomes sort students at a later age. In Norway, students attend the same track until the age of 16 and can pursue vocational or academic education thereafter.

Thus, schooling institutions with later tracking seem to reduce the influence of socio-economic background on academic achievement. Similarly, one can also examine whether this also holds for the influence of an immigrant background on educational performance.

Influence of immigrant background on academic performance

Figure 2 depicts the gaps in mathematics scores between native and immigrant students. Here, 'immigrant students' include both first and second generation immigrants. First generation immigrants are defined as children born in the country of origin, while second generation immigrants are born in the destination country.

For almost every European OECD country, PISA 2012 results indicate that immigrant children attain lower scores in mathematics than native children. On average, the penalty for immigrant children is 34 PISA points, which corresponds to a deficit of around one year of schooling. However, socio-economic characteristics may account for a large fraction of this variation, as immigrant cohorts often differ from the native population in socio-economic status. After controlling for socio-economic background, the gap reduces to 22 points at mean. However, this effect varies between different countries.

In Belgium, for instance, the discrepancy between migrants and natives is the largest among European OECD members, with 75 points being almost two years of schooling. The data indicate a similar picture for Sweden, Denmark and Austria. After controlling for socio-economic background, this pattern seems to persist, but to different degrees.

By contrast, immigrant students lag only little behind natives in Ireland and the UK. After accounting for socio-economic background, the penalty ranges from about five to ten points for this group of countries.

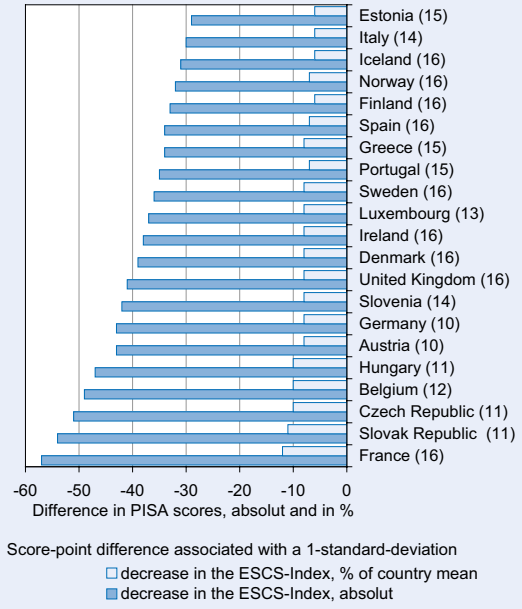
Interestingly, a 'premium' in mathematics scores can be observed in Hungary and the Slovak Republic. However, this finding may be largely due to the composition of immigrant cohorts in these countries. For instance, only ten percent of immigrants in the Slovak Republic speak a language other than Slovak at home. Furthermore, the PISA assessment in mathematics is text-intensive, requiring numerous word problems. The PISA mathematics assessment is therefore affected by literacy skills to some extent. Hence in the Slovak Republic, language barriers can be assumed to be no issue for the majority of immigrants when sitting the test.

There does not appear to be a strong relationship between the immigrant-native gap and tracking ages. Finnish students, for instance, are not tracked until the age of 16, but the penalty for immigrant students is the highest in the sample. Germany tracks children at age ten and the penalty is only half the Finnish difference. Ireland first tracks students at the same age, but indicates a low penalty of four points.

Ruhose and Schwerdt (2015) assess the influence of early tracking on migrant-native gaps in mathematics score. They exploit a natural experiment in Germany and employ a difference-in-difference approach. Consistent with our descriptive statistics, the authors find no overall effect of early sorting on differences in performance between natives and immigrants, controlling for socio-economic status.

Figure 1

Average difference in mathematics scores associated with a variation of one standard deviation in the ESCS-Index

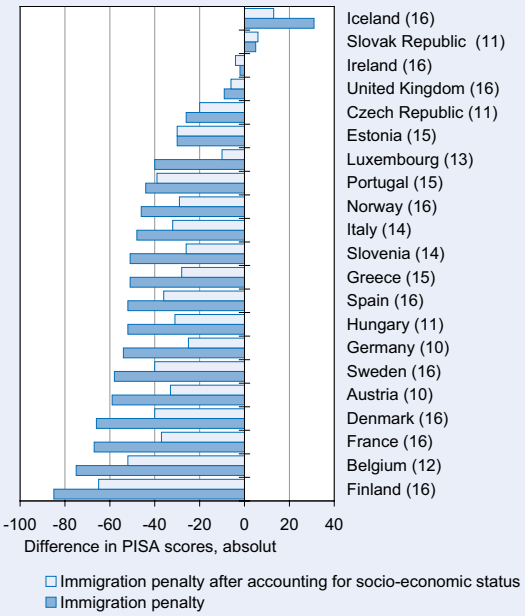


Note: Age at first tracking given in parentheses.

Source: OECD 2014.

Figure 2

Gaps in mathematics scores between native and immigrant students



Note: Age at first tracking given in parentheses.
Source: OECD 2014.

Conclusion

Most of the variation in PISA scores can be attributed to the interaction between socio-economic characteristics and schooling institutions. Early tracking aggravates the educational disadvantages of the socially deprived, regardless of whether they are native or immigrant children. The PISA 2012 results once again highlight the importance of institutional frameworks to educational and social equity. Table 1 summarises the data used in this database article. The table also includes average mathematics scores for all children and for immigrant children.

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Table 1

PISA 2012: Mean mathematics scores by country, penalty in mathematics scores for immigrants, age of first tracking

	Mean score in mathematics	Total explained variance in mathematics performance by socio-economic background	Score-point difference in mathematics associated with a one-unit decrease in the ESCS-Index	Score-point difference in mathematics associated with a one-unit decrease in the ESCS-Index, % of country mean in mathematics scores	Penalty for immigrant children in math scores	Penalty for immigrant children after accounting for socio-economic status	Percentage of immigrant students	Age at first tracking
Austria	506	23	-43	-8	-59	-33	16	10
Belgium	515	24	-49	-10	-75	-52	15	12
Czech Republic	499	25	-51	-10	-26	-20	3	11
Denmark	500	22	-39	-8	-66	-40	9	16
Estonia	521	18	-29	-6	-30	-30	8	15
Finland	519	16	-33	-6	-85	-65	3	16
France	495	30	-57	-12	-67	-37	15	16
Germany	514	23	-43	-8	-54	-25	13	10
Greece	453	20	-34	-8	-51	-28	11	15
Hungary	477	31	-47	-10	31	13	2	11
Ireland	501	22	-38	-8	-2	-4	10	16
Italy	485	17	-30	-6	-48	-32	7	14
Luxembourg	490	29	-37	-8	-40	-10	46	13
Netherlands	523	19			-57	-35	11	12
Portugal	487	24	-35	-7	-44	-39	7	15
Slovak Republic	482	32	-54	-11	5	6	1	11
Slovenia	501	22	-42	-8	-51	-26	9	14
Spain	484	23	-34	-7	-52	-36	10	16
Sweden	478	18	-36	-8	-58	-40	15	16
United Kingdom	494	23	-41	-8	-9	-6	13	16
Iceland	493	15	-31	-6	-52	-31	3	16
Norway	489	17	-32	-7	-46	-29	9	16
Switzerland	531	20			-63	-42	24	12
Turkey	448	18	-32	-7	3	-5	1	11

Note: Empty cells: No data available.

Source: OECD 2014.