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Using PISA Data in Performance Audit: Schooling of Immigrant Students in Finland

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1 Background for the audit

Immigrant students and the effectiveness of basic education in Finland

There has been a steady rise in the number of immigrant students in basic education in the 2000s. Positive net migration and an age structure that differs from the natives mean that this trend will continue in the coming years. Thus, there is a continuous pressure to expand support services intended for immigrant students. Providing these services makes sense from the perspective of government finances because a smoothly functioning education system that takes into account the special needs of immigrant students is perhaps the most effective way to integrate young immigrants into Finnish society.

2 Purpose of the audit

Under the Basic Education Act and the national core curriculum for basic education, students should be provided with equal learning opportunities and opportunities to continue their studies and to develop themselves. Thus, the main question asked in the audit was: How well does this overall objective apply to immigrant students? Firstly, the issue was approached by comparing the effectiveness of basic education among immigrant and native students. Effectiveness was measured using the PISA 2012 test scores of 15 year-old students. Secondly, it was examined how immigrant students have been supported in the learning of Finnish and their own mother tongue by the age of 15. Thirdly, it was examined how immigrant students prepare for upper secondary level studies. As immigrant students are not a homogeneous group, consideration was also given to the effect of their country of origin and their age of arrival.

3 PISA data and analysis of data

PISA 2012 data was used as the main data source in the audit. It provided performance information of 15 –year old students (both natives and immigrants) as well as information of their school and family.

3.1 PISA data

Programme for International Student Assessment (PISA) has been conducted since 2000 every three years by the Organisation for Economic Cooperation and Development (OECD). PISA is a standardized test administered to 15-years old students in OECD member countries and other participating countries who are enrolled in grades seven and above. Students are assessed in three domains: reading, math and science. Each of the domains is the main focus in turn. In 2012 the main focus was in mathematics, with reading, science as minor areas of assessment.

The sample in each country is drawn using a two-stage stratification design. First, schools within the country are randomly selected. Second, a random sample of students is selected from within each the school.

In addition to test results, PISA includes a student questionnaire with family and socio-economic background information and a school questionnaire with information on school type and school demographics.

The Finnish sample consisted of 311 schools. From all sampled schools, 20 or 35 students meeting the age requirements were randomly drawn. If there were less than 20 students meeting the requirements all students were included. There was an oversampling of immigrant students. In all sample schools all immigrant students were included. The final sample consisted of 8 829 students of which 1 294 had an immigrant background. There were 603 first generation immigrants and 691 second generation immigrants in the sample. First generation immigrant is a student, who was born in a foreign country and whose both parents were also born in a foreign country. Second generation immigrant is a student, who has born in the test country and whose both parents are born in a foreign country.

Missing values for student background variables are a problem in the PISA data. Dropping observations with missing values would lead to biased results. Therefore, missing values were imputed for the most important explanatory variables using the set of explanatory variables observed for all students following the study by (Wößmann;Lüdemann;Schütz;& West, 2007). Missing values were imputed based on the predicted values of regression analysis using a set of 'fundamental' explanatory variables. These variables were gender, age, grade, family structure and number of books at home. There were some missing values in the latter two variables and they were imputed by using the school mean. In international comparisons missing values in school questionnaire data were imputed using the national mean of each country.

The problem with imputation is that it also may cause bias to estimated coefficients so that the coefficients of explanatory variables are not statistically significant. This bias was controlled by adding dummy variables for all variables having imputed missing values. These dummy variables also control for systematically missing values for some observations.

3.2 Statistical analysis

The data was analyzed using statistical regression techniques. The dependent variables were the PISA scores in mathematics, reading and science. The estimated models were as follows:

$$T_{is} = \alpha + \alpha_1 \left(M_{1_{is}}\right) + \alpha_2 \left(M_{2_{is}}\right) + \alpha_3 B_{is} + \varepsilon_{is}$$

where T_{is} is the dependent variable for student i in school s, $M_{1_{is}}$ is a dummy for first generation immigrant in school s, $M_{2_{is}}$ is a dummy for second generation immigrant in school s, B_{is} is a vector of student background variables for student i in school s, α is a constant and ε_{is} is a normally distributed error term. Coefficients α_1 and α_2 measure the performance gap between the native students and first and second generation immigrants after controlling for student background.

PISA data also includes a students' background questionnaire providing rich information about the students and their families. Therefore, the data also enabled the controlling of most important background factors such as gender, age and socio-economic status affecting the learning outcomes of students

For the analysis of the data STATA 13.0 was used. The estimations were run using survey options and pv-module (http://www.bc.edu/repec/bocode/p/pv.ado) programmed for the analysis of e.g. PISA data and its plausible values.

4   Main results of the audit

Basic education does not provide all immigrant students with equal opportunities

According to the audit observations, the situation among immigrant students is not in all respects identical to non-immigrant students. At the age of 15, immigrant students lag significantly behind the native students in mathematical, reading and scientific skills (see figure 1).
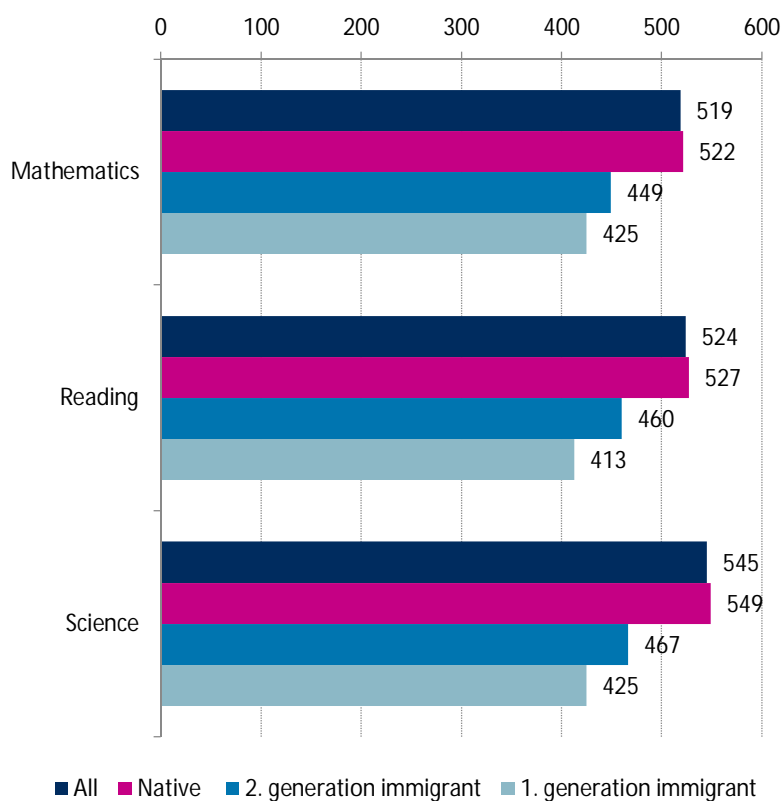

Figure 1. Average PISA scores in mathematics, reading and science for natives and first and second generation immigrants in Finland.

The background of students has an effect on performance gaps

On average, the socio-economic status of immigrant students is weaker than that of native students. When the students' grade level and gender as well as the education and occupational status of their parents are statistically controlled there is a narrowing of the native-immigrant performance gaps. The language spoken at home also has an effect, especially on reading skills. Students using languages other than Finnish or Swedish at home have weaker performance in reading. After controlling of this and the above-mentioned factors (see figure 2), the gap in mathematical and scientific skills between the natives and second-generation immigrants is equivalent to studies of slightly more than one year. In reading skills the gap is slightly less than a year. With first-generation immigrants, there is a substantial improvement in performance whereas with second-generation immigrants

the skill difference is not closing at the same rate. On average, their performance is weaker than the performance of first-generation immigrants after controlling the above-mentioned background factors.
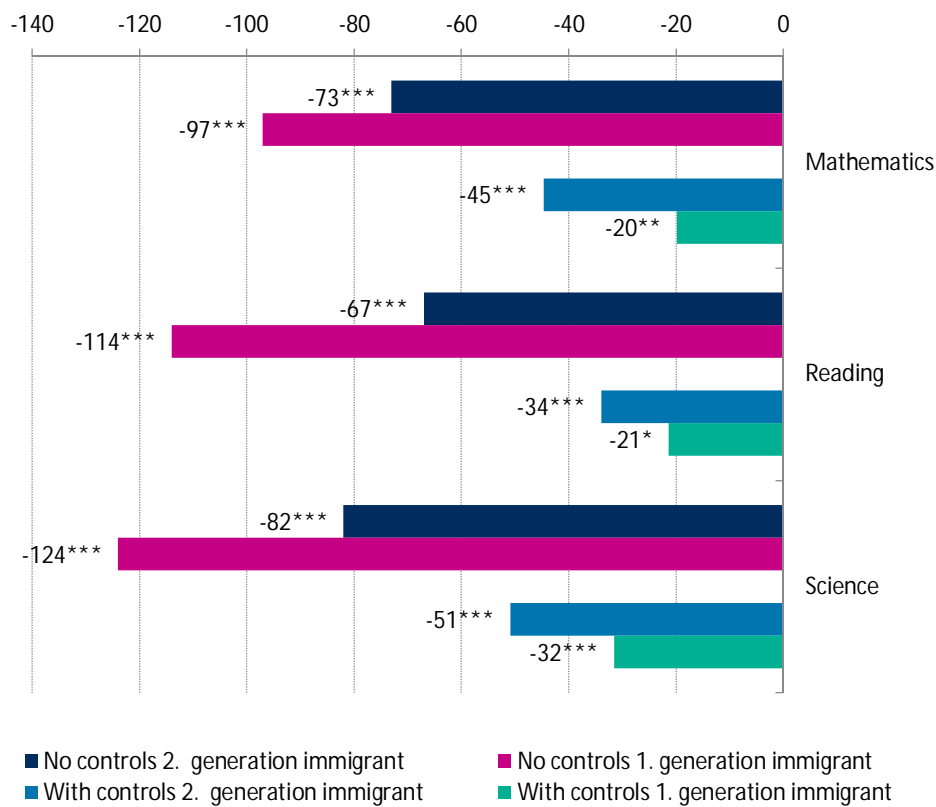

Figure 2. Performance gap without controlling and after controlling the background of students in PISA scores in mathematics, reading and science between the first and second generation immigrants and natives in Finland. Background control variables: gender, age, grade, language spoken at home, age of arrival, parents' education and highest occupational status of both parents. *** statistically significant in 1 % risk level; ** statistically significant in 5 % risk level.

The country of origin of immigrant students affects their performance

Immigrants are not a homogeneous group as they come to Finland for many different reasons and from very different countries with very different education systems. For this reason, the performance gaps were also examined in relation to the students' countries of origin. Audit observations indicate that there are wide differences in the performance depending on where the students or their parents come from.

Mathematics

Estonia or Sweden	-27** / -18
Russia	-39*** / -21
Somalia	-99*** / -63***
China or Thailand	-16 / 6
Turkey	-30 / -76***
Irak	-30* / -30
Former Yugoslavia	-40*** / -66***
Other country	-42*** / -39**

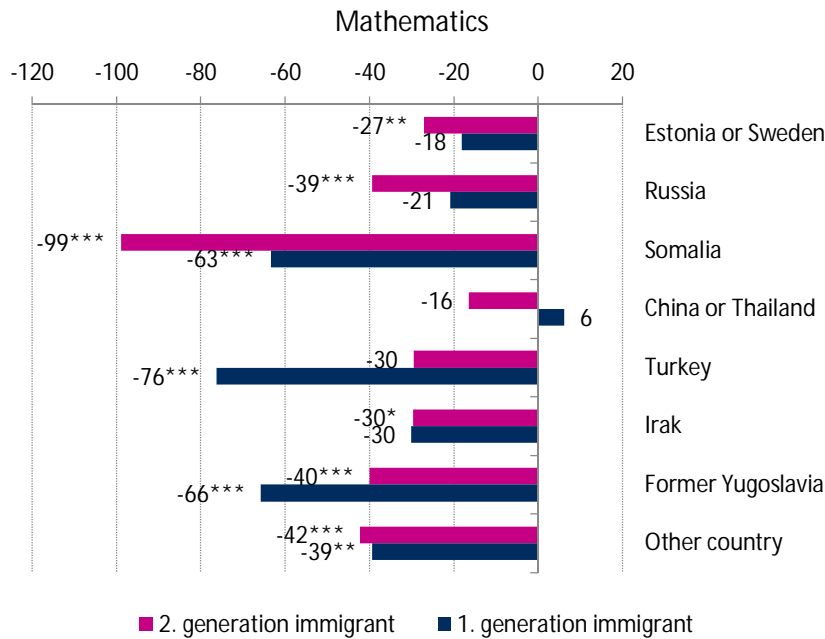■ 2. generation immigrant ■ 1. generation immigrant

Figure 3. Performance gap between the first and second generation immigrants and natives in PISA 2012 mathematics score by country of origin after controlling for student background.

Reading

Estonia or Sweden	-17 / -6
Russia	-24* / -24
Somalia	-90*** / -63**
China or Thailand	-23 / -5
Turkey	-27 / -57*
Irak	-26 / -20
Former Yugoslavia	-30** / -49**
Other country	-28*** / -33

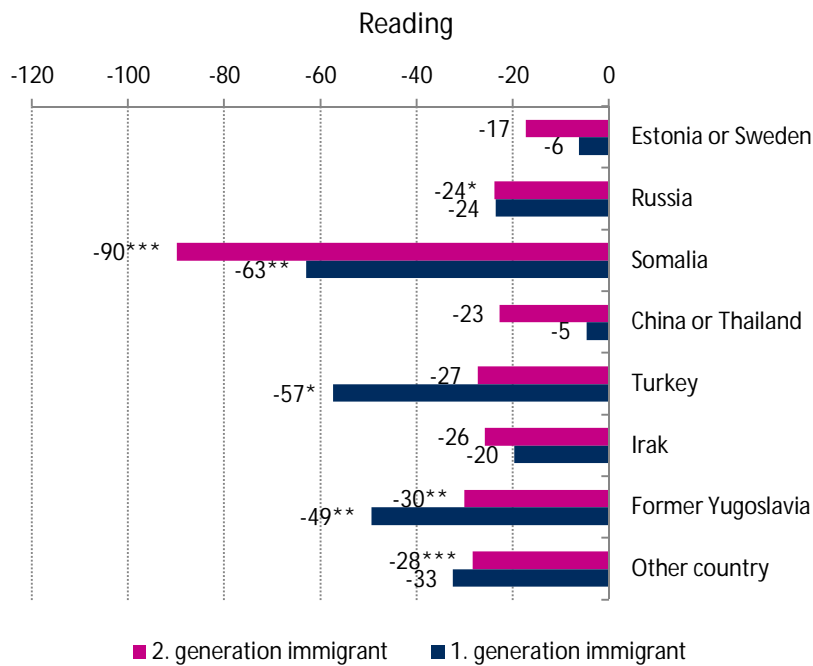■ 2. generation immigrant ■ 1. generation immigrant

Figure 4. Performance gap between the first and second generation immigrants and natives in PISA 2012 reading score by country of origin after controlling for student background.

Performance gaps between native and immigrant students are wider than elsewhere in Europe

In the audit, the gaps identified in Finland between immigrant and native students in mathematical and reading skills were compared with those in other Western European countries and a small number of countries that have traditionally taken a large number of immigrants. The results show that Finland had the widest gaps between the immigrant and native students even after the most important background factors of students and a small number of school-related factors had been statistically controlled. In international research literature such gaps are mainly interpreted as different treatment of immigrant students. In other words, in Finland the gap is fairly wide at the end of basic education and in any case wider than in the countries compared.
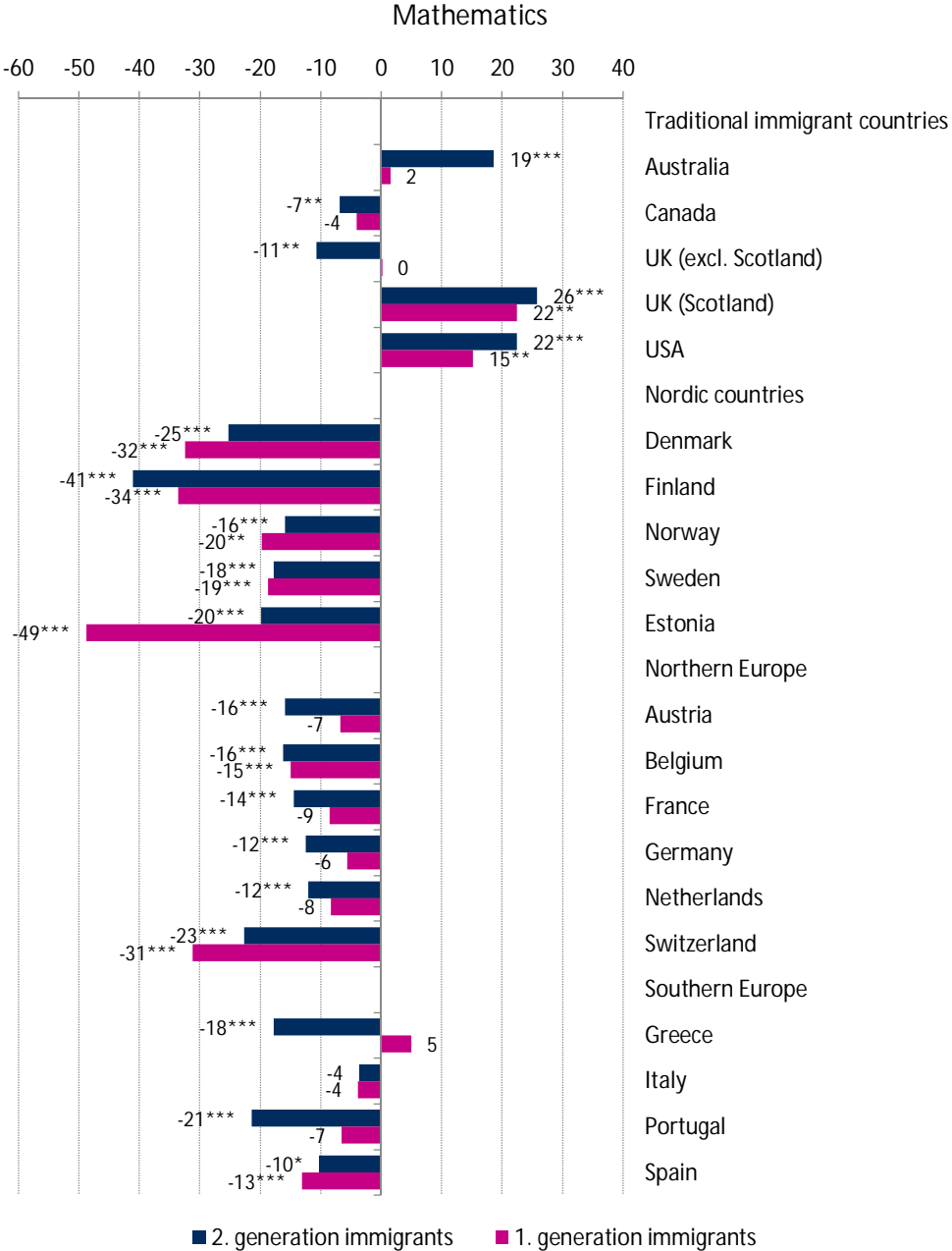

Figure 5. Performance gap between the first and second generation immigrants and natives in PISA scores in mathematics in different countries after controlling for student background and some school factors.

Immigrant students are more often on lower grades than other youngsters of the same age

According to the audit observations, immigrant students are often placed in basic education on lower grades than other youngsters of the same age. About 60 per cent of first-generation immigrants study on lower grades than other students in their age cohort (on seventh or eighth grade at the age of 15). This is partially because they attend for a year in instruction preparing for basic education before entering to normal classes. Of the second-generation immigrant students, about 24 per cent were studying on lower grades compared to 14 per cent among native students of the same age. The country of origin of the students or their parents has an effect on the grade level of students. However, it does not fully explain why immigrant students are often on lower grades than other youngsters of the same age.

After statistically controlling for the grade of the student the performance gaps in mathematical, reading and scientific skills decrease by about 40 points (especially between first-generation immigrant and native students), which roughly corresponds to one school year's studies.

Immigrant students studied their mother tongue in slightly smaller groups

According to the results of the PISA 2012 survey, there were no differences in the hours of instruction reported by immigrant and native students. Immigrant students, especially second-generation immigrants, had a slightly higher number of hours of instruction in mother tongue and literature than non-immigrant students. Immigrant students also studied mother tongue and literature in slightly smaller groups than native students at the age of 15. This is partially because many of them follow Finnish as the second language syllabus in which teaching groups are smaller.

The results of the PISA 2012 survey suggest that about half of the first-generation immigrants had studied Finnish in remedial teaching programmes. The percentage was slightly lower among second-generation immigrants. There were differences in the responses, depending on which country the students or their parents had come from. The amount of remedial teaching provided to students from Russia, Estonia and Iraq was above average, whereas the figures for students from Somalia, former Yugoslavia and Turkey were below average. The amount of support was dependent on the age of arrival so that immigrants arriving in Finland at an older age had been given more remedial teaching. About half of all immigrant students had attended classes in which they studied their own mother tongue. Here too there were differences, depending on which country the students or their parents had come from. About one third of all immigrant students had attended classes in which the teaching was in their own mother tongue.

There were only few differences in school grades in mathematics and mother tongue and literature between immigrant and native students. However, as the above results show, the PISA scores of immigrant students were significantly below those of the native students after controlling the school grading and grade levels.

Immigrant students view school more positively than the native students

The results of the PISA 2012 survey suggest that on average, immigrant students have a more positive attitude towards the school than non-immigrant students. The support provided by teachers, teacher student relations, sense of belonging to the school, attitude towards the learning activities and learning outcomes were more positively viewed by immigrant students than by native students. The disciplinary climate was the only area that immigrant students viewed more negatively than native students.

Recommendations of the National Audit Office

The National Audit Office recommends that the Ministry of Education and Culture

1. ensures that the support required by second-generation immigrants in language-learning and other learning is at adequate levels. It should especially be ensured that their skills and their ability to continue their studies are similar to non-immigrant students

2. examines whether weakest performing first- and second generation immigrant students should be provided with additional support to ensure integration and the ability to continue their studies

3. finds out why performance gaps between immigrant and native students are on average wider than in other Nordic countries and many other Northern European countries

4. ensures that assessment practices of immigrant and native students are identical in basic education and that criteria corresponding to the actual skill levels of students are applied

5 Concluding remarks

Overall, PISA 2012 data provided a good basis for the performance audit of immigrant students in Finland. In addition to evaluating immigrants in Finland, it was also possible to make comparison to other relevant countries. Since it was freely available, it saved much time and expenses compared to for example register based data. Extensive background questionnaires provided also other than performance information on immigrant students and the schools they attended.

Since PISA data is a sample based data and the sampling is a two stage sampling, it requires quite good knowledge of statistical methods. OECD provides good guides for the use and analysis of the data. Since the original PISA 2012 data comprises of some 510 000 students from 65 countries, the computational requirements has to be taken into account. Also the statistical analysis is not straightforward and requires computational power in some cases (e.g. in multilevel modelling).

References

Wößmann, L.;Lüdemann, E.;Schütz, G.;& West, M. (2007). *School accountability, autonomy, choice, and the level of student achievement: International evidence from PISA 2003.* Education working paper no. 13. OECD.