

Where do you come from, where do you go? Assessing skills gaps and labour market outcomes of young adults with different immigration backgrounds

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Economic and social integration of migrants and their children is an issue that has gained traction in European policy agendas because of the alleged positive relation between successful integration and labour market performance of migrants. We use differences in skills development between natives and migrants as a proxy for integration. To understand the extent to which the development of cognitive skills of young people with immigrant backgrounds can be explained by the foreign origin of their parents, we apply an empirical framework to explain numeracy and literacy skills of migrants for two different cohorts, using PISA and PIAAC data from twelve OECD countries. The framework includes demographic, family background, and school quality variables. We utilize the Oaxaca decomposition to explore how the contributions of family and school factors evolve over time to explain the literacy and numeracy gap among first-generation immigrants, second-generation immigrants and natives. Our

results first show some convergence of the skills gap between the second generation immigrants and the natives over time. Second, the gap in literacy skills among the first-generation and natives and among first-generation and second-generation immigrants has increased over time. Our decomposition results show that demographics (gender and language) and family background contribute to the achievement gaps between different groups. We also find that school input variables, such as school autonomy and school accountability factors do contribute to skills gaps of young adults with different immigrant backgrounds, in particular to numeracy gaps. Finally, we use the PIAAC dataset to analyze the occupation in Science, Technology, Engineering, or Math (STEM) fields for different nativity groups. Whether or not a young person comes from an immigrant background does not appear to affect the chances of studying in a STEM field or working in a STEM sector.

JEL codes I24; I25

INTRODUCTION

Economic and social integration of immigrants and their children has gained traction in European policy agendas and piqued the interest of society. Policy makers and international organizations have expressed concerns about challenges associated with changing demographics and skill-profiles (Bakewell, 2012; De Haas, 2010). On the other hand, existing literature has stressed the importance of immigrants as a knowledge transmission channel and the potential role that they can play to foster innovation, productivity and growth rates in destination countries. Many researchers and policy makers are focusing on how to benefit from immigration through transnational integration policies. European governments are restructuring their policies to focus on how immigrants and their children could better integrate for the benefit of their host countries with ripple effects on the home countries (Dustmann et al., 2012).

A recent IMF policy note argues that access to education is crucial to benefit from migration; more specifically, “school systems with well-developed pre-schools, lower school segregation, and limited early tracking of students have been found to be more suitable to the educational success of immigrants’ children” (Aiyar, 2016, p.34). The educational achievement of young people with immigrant backgrounds can be seen as an indicator of how well immigrants and their decedents are positioned to take and share advantage of opportunities presented by a more mobile global society (OECD/EU, 2015). Large and persistent or growing achievement gaps between young people with and without immigrant backgrounds can indicate ineffective institutions in the host country to reduce inequalities. Governments tend to rely on education and the school system as an equalizer for young people from all kinds of different backgrounds.

The contribution of school quality as a vital element of schooling inputs has recently been highlighted as a policy relevant determinant of educational attainment and cognitive skills (García et al., 2016; Woessmann, 2016; Hanushek and Zhang, 2009). The lifecycle framework underscores the foundational early years, because as Cunha et al., (2006) put it simply: skill-begets-skill. The effects of key determinants, however, may not be the same at each stage of the lifecycle. The effect of family background, for example, on the probability to continue education weakens at higher grade levels (Cameron and Heckman, 1998). There are several inflection points along the educational lifecycle at which young people (and their caretakers) must make decisions about whether or not to continue further in education. One such inflection point is around the age of 15¹ and skills disparities at this age can have a long lasting influence on life outcomes (Borgonovi et al., 2017).

This paper addresses three questions. First, how large are the skills differences between natives and immigrants? Second, do these differences decrease the longer the immigrants live in the country? Third, what is the effect of school quality on decreasing the difference?

This paper adds three contributions to the literature. First, we apply an empirical framework that includes demographic, social and school quality variables to determine cognitive skills

¹ In many countries, 15 or 16 is the age at which school is no longer compulsory.

differences. Second, using the Oaxaca decomposition technique, we empirically explore which factors explain existing skills gaps and how these factors evolve over time. Throughout our analysis, we look for country group patterns to identify countries in which policies or institutional arrangements contribute to narrowing the gaps. Finally, we analyze educational attainment, employment and skills match, and analyze whether the area of study and occupation are in Science, Technology, Engineering, or Math (STEM) fields. The argument is that 1st generation immigrants are more likely to pursue STEM fields because of disadvantages in language skills. We find that the skills young adults possess are more important for labor market outcomes than their immigrant background status. This finding underscores the necessity of closing skills gaps through education.

COMPARING ACHIEVEMENT OF YOUNG PEOPLE WITH AND WITHOUT IMMIGRANT BACKGROUNDS: LITERATURE REVIEW

Social Background and skill acquisition

Research using cross-national data from the 2000, 2003, and 2009 PISA assessments on 15 year old pupils identify immigrant achievement gaps in literacy and numeracy ranging between 30 and 80 points relative to an OECD average of 500 points (Azzolini, Schnell & Palmer 2012; Levels, Dronkers & Kraaykamp 2008; Marks 2005; Sori, Susteric & Gaber 2011). The achievement gap with native students is more sizable for first generation immigrants (Azzolini et al. 2012; Portes & Fernandez-Kelly 2008).

The results also indicate that first generation immigrants who arrive later in their school career (i.e., arriving at secondary school age) are at a disadvantage in comparison to those that have arrived at a younger age (Smith, Brezicha, & Persson, 2014). In these studies, the primary determinants of the immigrant achievement gap are family background variables, including socio-economic status, home language², parental education, and family structure.

In a comparative study among ten OECD countries with high immigration flows, Schnepf (2007) found that socio-economic background and school segregation explained the low educational achievement of immigrant groups in continental Europe, whereas in the US and the UK, language skills were the main factor explaining why achievement scores of immigrants were lower than of the natives. In an earlier study Marks (2005), from a comparative study of twenty countries, also concluded that immigrant students' performance was dependent on socio-economic factors, while socio-cultural and school factors played just a minor role.

Flisi et al. (2016) use PISA and PIAAC data to assess skills differences of 15 year old pupils and young adults in comparison to native pupils and young adults. They conclude that parental education characteristics and socio-economic index of occupational status (ISEI) impacts the performance of different immigrant groups. Systematically across the EU, second generation

² Zinovyeva, Felgueroso and Vazquez (2014) investigate the role of language in educational achievement of students who migrate to Spain using PISA 2003-2009 finding initial gaps that decrease as they continue to live in Spain.

immigrants come from more socio-economically disadvantaged backgrounds than their native peer group. In a sub-sample of their analysis, they divided first generation immigrants into two groups by the threshold 'arrival age of 15' and found empirical evidence that first generation immigrants who arrived before the age of 15 performed better than those who arrived after the age of 15. Gaps in performance for both first and second generation immigrants persisted even after they controlled for socio-economic family background characteristics. One of their main conclusions is that education systems are an essential part of the integration process. They do not explore school quality in their analysis, but they note differences among country groups suggesting further research is needed to better understand heterogeneity in different EU countries.

Duong et. al. (2016) conduct a meta-analysis on the literature that empirically investigates the academic outcomes among immigrants' youths. The studies are limited to studies about US immigrants. They reach two interesting conclusions. First, while the second generation immigrants perform better than the first generation immigrants, the third generation immigrants performs worse than the second generation immigrants. Second, school performance of immigrants differs significantly between groups of immigrants. Asian immigrants perform in general better than black immigrants. This might be related to the difference in social economic background and implicitly, school quality as the funding of schools in the US differs between rich and poor areas.

In other studies, the focus is on the relation between socio-economic factors and labor market outcomes (European Commission, 2016; Krassel and Sorensen, 2015). These studies conclude that socio-economic background remains one of the main determinants of performance in schools. In these studies it is acknowledged that basic skills are important for young people to access the labor market and for adults to retain employment in high quality and stable jobs. However, young people in initial education and working-age adults according to PIAAC are lacking these basic skills which impede their capacity to find stable employment and participate in economic and social life.

To conclude: family background plays a major role in skills accumulation. The challenge is that family background variables leave less room for policy intervention than variables related to school quality. School quality inputs are more easily influenced by policy makers. The question is, to what extent does school quality affect skills acquisition?

School Quality and skill acquisition

Under the umbrella of school quality, there are a number of variables (i.e., quality of teacher education, school autonomy and school accountability) that explain variability in achievement assessments to a greater or lesser extent. Note however, that although they influence immigrants' educational outcomes, in general school quality variables are difficult to measure and often neglected. Many scholars use an education (or cognitive skill) production function to explain skills acquisition. This method neglects school quality. Many scholars claim this neglect to be out of date Hanushek and Zang, 2009; Hanushek et al., 2016, Pritchett and Viarengo,

2015) arguing that recent empirical results make a *'prima facie case for the relevance of school systems'* (Woessmann, 2016, pp. 15).

School quality relates to labour market performance in different ways. School quality influences the amount of education an individual can obtain and determines an immigrants' ability to find and maintain a job. Despite the logic and clear rationale for school quality as an important determinant of skills acquisition, empirical studies have not arrived at the same kind of consistency of results as have been established by family background. The results differ between studies and there is not yet as much literature on school quality. Bernal (2016) traces the role of school quality on skill production by estimating the test scores of students and comparing school quality data for public and private schools³, Kim (2011) concludes that school quality variables determine a student's future income.. In a cross-section analysis using PISA data, Cobb-Clark et al. (2012) find a significant relationship between school quality variables (such as the percentage of private schools, quality of teacher education, and ability tracking) and migrant-native achievement gaps. However, other school quality variables did not have a significant relationship with the achievement gap. Sometimes, interaction terms between school quality variables help to draw a more complete picture. For example, Woessmann (2016) finds that some school autonomy variables are negatively correlated to the achievement gap, but the interaction between external exit exams and these autonomy variables result in strong positive correlation.

The quality of the school system may also have an indirect long-term effect, to the extent that it influences parental education attainment (McEwan and Marshall, 2004) an element of family background that is consistently linked with children's educational attainment. Lack of educational resources for the immigrant parents results in low performance of second generation immigrants in comparison to their native counterparts (Schnell and Azzolini 2015). Incomes of immigrant parents are low and this determines the educational resources they can afford at home. The ability of the immigrant parent to speak at home the language the immigrant child learnt in school, also determines the reading scores of immigrant children.

Country groups and skills acquisition

Many studies suggest that the relation between acquisition of skills and labour market performance of immigrants is country-dependent. Depending on the objective of the study, European countries have been categorized into north-west European countries (Heath, ROTHON and Kilpi, 2008); Continental Europe versus English Speaking countries (Schnepf, 2007); Southern European countries (Levels et. al. 2008) and new immigration/destination countries (Azzolini, Schnell and Palmer, 2012). These studies show that immigration laws and integration policies are key factors in the educational achievement of immigrants. Countries with strict immigration regimes have less complex conditions for integrating immigrants. In particular countries with guest worker agreements make sure the better qualified adults are given the

³ Kim (2011) compares the school quality of catholic schools which in this case represent a private school and public schools. Kim uses data from the Wisconsin Longitudinal Study.

permission to enter the country and they are better integrated and have better achievements (Levels, 2008).

In a further refinement, OECD and EU countries have been grouped into seven categories along criteria such as immigrant populations size, length of residence, age, educational level, language predominant entry categories, and share coming from high income countries (OECD/EU, 2015: see page 27/28 of this paper). These classifications are significant because they have impact on immigrants' integration outcomes in the host countries. Within these groups, the size of the immigrant population does not play a significant role when it comes to immigrant integration. Education is an important determinant for immigrant integration into the labour market (OECD-EU, 2015). The unemployment gap between native-born and immigrants is estimated at 5 per cent in Europe showing an increase since 2007 (OECD-EU, 2015). In terms of school performers, the report shows that on average immigrant children have significantly less chances of being among the top 25 percent of performers in school than children of native-born parents who are relatively disadvantaged economically. This feeds back in employment prospects: "It has taken 5 to 10 years for most previous generations of family migrants and refugees to be employed in Europe and as much as 15 to 20 years for them to reach a similar level of employment as natives -if ever (OECD-EU,2015:7,)"

DEFINITIONS AND DATA

The focus of this study is on educational attainment and skills gaps of two groups of pupils with immigrant backgrounds (first and second generation immigrants), to natives. Second, we investigate whether differences in educational attainment change over time.

We define the groups of pupils as follows. We define foreign-born pupils who came to the destination country before the age 15 and spent at least some time in secondary school in the destination country as first generation immigrants. Native-born pupils with at least one immigrant parent are defined as second generation immigrants. Native-born pupils with no immigrant parents are referred to as natives and this is our reference group. These definitions link up with Flisi et al. (2016).

We use data from the OECD's Programme for International Students Assessment (PISA) and Programme for International Assessment of Adult Competencies (PIAAC) to examine the achievement and skill gaps among natives, first-generation and second-generation immigrants. Both programmes test cognitive skills in literacy and numeracy. PISA tests people at age 15 and our PIAAC sample is restricted to young adults whose age range matches the birth-cohort of PISA test takers in 2000 or 2003. To investigate how the gaps in literacy among the three groups changed over time, we compare the reading and math test scores of 15-year-olds from PISA in the 2000 and 2003 waves with the literacy and numeracy skill scores of the adults who participated in PIAAC 2011-12 and 2014-15 who belonged to the same birth cohort as the PISA test takers.^{4, 5} Thus we select the PIAAC test takers in the age range 23-28 years. To make our

⁴ PIAAC data are collected via surveys of people aged 16-65 in 33 countries. The PIAAC surveys were conducted in 2 rounds. The first round of surveys was collected in 2011 and 2012 in 24 countries. The second round was collected in 9 additional countries in 2014 and 2015. All countries in our sample, except Greece, participated in

samples as comparable as possible, our PIAAC sample only contains first generation immigrants if they migrated to the destination country before the age of 15. Second generation immigrants and natives were, by definition, educated in the destination country's school system. This means that all three groups spent at least some time in the school system of the destination country.

The connection between PISA and PIAAC tests is not a one-to-one relation. The adults that are tested by PIAAC are not necessarily the same as the pupils that were tested by PISA and this hampers the performance of a real cohort analysis. In addition, there are small differences in the set-up of the tests (see Cathles et.al (2018) for more details). Gal and Tout (2014) conclude that it is possible to compare results from PISA and PIAAC tests, but comparisons must be cautious and they recommend using age cohorts of people in PIAAC who can be matched with cohorts of students who participated in earlier PISA assessment. That is exactly our approach.

Following the recommendations of Gal and Tout (2014), we have to 'match' the cohorts from the PISA data with the cohorts from the PIAAC data in our sample. We follow the decision rules described in Table 1. For example, the PISA test given in 2000 to 15-year-old pupils, can be 'matched' with the nationally representative data from PIAAC test administered in the same country roughly 11 years later (in 2011/2012) with people who range in age from 26-28. We select three possible ages because, depending on the exact date of birth (including month) and the exact date of PIAAC assessment (including month), it is feasible that the cohort in the range of ages 26-28 corresponds with the cohort tested by PISA in 2000. A similar matching methodology for the same two datasets has recently been used by the OECD in an analysis comparing skills of teenagers and young adults (Borroni et al., 2017).

Table 1. Mapping of PISA and PIAAC sample

| PISA taken in.... by 15 yr old pupils | Age in PIAAC 2011-12 | Age in PIAAC 2014-15 (Greece only) |
|--|-------------------------|---------------------------------------|
| 2000 | 26-28 | 29-31 |
| 2003 | 23-25 | 26-28 |

Note that Greece is the only country in our sample to implement PIAAC in 2014/2015. The other 13 countries in the sample implemented PIAAC in 2011/2012.

In total there are 106,090 students who sat for the PISA test, in our sample: 91,187 natives, 4,315 first generation immigrants and 10,588 second generation immigrants. For PIAAC, there are 7,441 adults who participated in the cognitive skills assessment in our sample: 6,778 natives, 270 first generation immigrants and 693 second generation immigrants. There are fewer observations for PIAAC, because we have to restrict the age range.

Our achievement variables of interest are: cognitive skills in reading and math (PISA), cognitive skills in literacy and numeracy (PIAAC), and tertiary education attainment (PIAAC). We seek to explain whether these education outcomes differ systematically for young people with

the first round of the survey. (OECD, retrieved from <http://www.oecd.org/skills/piaac/publicdataandanalysis/#d.en.408927>).

⁵ The data did not allow us to perform a real cohort analysis, because it is not possible to identify whether adults who took the PIAAC test also took the PISA test. Table 1 shows how we have mapped the PISA en PIAAC sample.

immigrant backgrounds and how any differences in cognitive skills found at age 15 have evolved as the cohort entered adulthood. The independent variables to explain scholastic achievement and skills have to be roughly similar in the two datasets. Consequently, as an example, since PISA collects more detailed information about parental educational attainment, we had to re-scale the information to a more aggregate level to make it comparable with the PIAAC data. Second, we cannot use all the information from the databases. For example, PISA collects information on the Socio-economic background of the students who take the test, but we cannot compare that information with information from the PIAAC data. We present descriptive information about this variable, but we do not use it in any of our regressions.

Table 2 lists the variables that we have used in our research. For demographic variables we use gender, age (for PIAAC only) and whether the test language is the same as the language spoken most often at home.⁶ To proxy family background, we chose two socio-economic variables that PISA and PIAAC do have in common, parental education and the number of books in a household⁷. The number of books in the home can be a proxy for income, or for family ‘culture’ towards learning. For school quality we use a number of variables from the PISA dataset: the percentage of government funding, shortage of language (or math) teachers, percentage of full-time certified teachers, the log of school size, and the percentage of girls in school to capture resources and features of the schools. We also include a set of variables to assess school autonomy, which can be measured from our dataset in autonomy in hiring teachers, determining salaries, formulating the budget, and determining course content. Third, we use school accountability as another proxy for school quality. School accountability relates to accountability to inform parents of the child’s progress, deciding grade retention/promotion, group students, compare the school to national performance, and judge teachers’ effectiveness. All school quality variables are drawn from the PISA dataset and are observed at the school level in 2000 and 2003. For PISA, after merging the school level variables with the data for the students who took the PISA test with the appropriate weights, these can be used at the student level as any other student attribute (OECD, 2009). For PIAAC, country means for each school quality variable are calculated separately, again using the appropriate weights, and merged with the PIAAC participant data according to the mapping in Table 1.

Our employment outcomes of interest are: high-low skill employment, area of study in a STEM field, and employment in a STEM sector (PIAAC).

Since we are interested in country group patterns to identify countries in which policies or institutional arrangements may contribute to narrowing the achievement gaps, we divided the fourteen countries for which we have the common pertinent variables from PISA and PIAAC⁸

⁶ In PIAAC, this variable is derived and coded by the OECD (PIAAC documentation files).

⁷ PISA respondents were asked about the number of books in the household at age 15 and PIAAC respondents were asked about the number of books in the household at age 16 (OECD, 2016).

⁸ Austria, Canada, Germany, New Zealand, United States do not report information on the respondents’ age in PIAAC data. Chile, Cyprus, Estonia, Israel, Lithuania, Singapore, Slovak Republic, Slovenia, and Turkey did not participate in both the PISA waves (2000 and 2003) we are analyzing in this paper. For Indonesia no PIAAC information is publicly available. Japan, Korea, and Poland do not report information on the PISA respondents’ country of origin or they contain only very few individuals who are first or second generation immigrants.

into 4 country groups based on immigrant population characteristics as classified by OECD/EU, 2015. The country groupings are as follows:

1. *Long standing destinations*: United Kingdom, Belgium, France and Netherlands⁹;
2. *Significant recent migration and humanitarian countries*: Denmark, Finland, Sweden and Norway;
3. *New destinations*: Ireland, Greece, Italy and Spain;
4. *Eastern European destinations*: Czech Republic and Russian Federation.

The Country Classification used in this study is based on the immigrant population characteristics as proposed by the OECD/European Union classification on indicators of immigrant integration in 2015. This classification groups OECD/EU countries into peer country-groups that have immigrants with similar characteristics in terms of language, predominant entry categories, length of residence, share with education and from high/low income country of origin, and size of the immigrant population. So classified, the peer-country groups face similar integration challenges (OECD/EU, 2015).

DESCRIPTIVE STATISTICS

The descriptive statistics for our variables of interest, control variables and the average scores of PISA reading test and PIAAC literacy skill test are reported by immigrant group in Table 2.

Table 2 Descriptive statistics based on PISA (2000, 2003) and PIAAC (2011/12, 2014/15)

| | PISA | | | PIAAC | | |
|--|----------------|-----------------|----------------|---------|----------|----------|
| | Natives | 1st Gen. | 2nd Gen. | Natives | 1st Gen. | 2nd Gen. |
| <i>Test scores</i> | | | | | | |
| Mean Reading | 510.87 | 462.56 | 495.91 | 286.27 | 260.71 | 284.63 |
| Literacy score | (93.63) | (106.71) | (99.62) | (44.27) | (52.29) | (45.64) |
| Mean Math | 513.69 | 469.76 | 499.92 | 281.87 | 256.81 | 274.92 |
| Numeracy score | (94.31) | (101.84) | (96.61) | (48.06) | (53.99) | (51.09) |
| <i>Demographic variables</i> | | | | | | |
| Female (%) | 48.88 | 51.45 | 47.89 | 52.82 | 53.70 | 54.83 |
| Average Age (PIAAC Only) | | | | 25.68 | 25.43 | 25.52 |
| Test language same as the language at home (%) | 90.37 | 56.62 | 81.45 | 98.61 | 67.96 | 90.58 |
| <i>Family variables</i> | | | | | | |
| Parent's education: | | | | | | |
| Uncompleted secondary | 24.85% | 19.10% | 24.52% | 20.24% | 29.63% | 22.87% |
| Secondary | 31.18% | 26.63% | 27.72% | 45.48% | 26.34% | 32.42% |
| Tertiary | 43.98% | 54.28% | 47.76% | 34.28% | 44.03% | 44.71% |
| Books at home: | | | | | | |
| 10 and below | 14.86% | 29.04% | 18.28% | 9.40% | 24.81% | 10.93% |
| 11-100 | 49.35% | 45.17% | 46.85% | 42.75% | 42.48% | 42.71% |
| 101-500 | 31.96% | 22.94% | 30.42% | 38.40% | 25.19% | 35.28% |
| more than 500 | 3.83% | 2.85% | 4.45% | 9.45% | 7.52% | 11.08% |
| ESCS (SES) - PISA Only | 0.08 (0.91) | -0.08 (1.00) | 0.02 (0.98) | | | |

⁹ UK attracts mainly high-skilled immigrants, whereas the other three countries tend to attract low-skilled immigrants.

| | PISA | | | PIAAC | | |
|--|----------------|----------------------|----------------------|----------------|----------------------|----------------------|
| | Natives | 1st Gen. | 2nd Gen. | Natives | 1st Gen. | 2nd Gen. |
| <u>School inputs</u> | | | | | | |
| % of government funding | 89.87% | 90.97% | 90.56% | 91.75% | 93.14% | 91.74% |
| Short of language teachers* | 64.07% | 57.61% | 58.12% | 61.29% | 60.16% | 56.58% |
| Short of math teachers* | 59.03% | 50.96% | 51.70% | 56.92% | 56.60% | 52.39% |
| % of full-time certified teachers | 88.90% | 86.41% | 87.74% | 86.07% | 84.03% | 85.54% |
| School size (natural log) | 6.24 (0.66) | 6.23 (0.65) | 6.35 (0.65) | 6.14 (0.42) | 6.06 (0.41) | 6.23 (0.40) |
| | PISA | | | PIAAC | | |
| | Natives | 1 st Gen. | 2 nd Gen. | Natives | 1 st Gen. | 2 nd Gen. |
| % of girls in school | 49.77% | 48.89% | 50.14% | 49.45% | 49.13% | 49.48% |
| <u>School autonomy</u> | | | | | | |
| Hiring teachers | 66.44% | 70.87% | 77.85% | 69.90% | 76.49% | 70.61% |
| Determining salary increases | 26.65% | 28.41% | 33.40% | 32.00% | 29.81% | 32.17% |
| Formulating budget | 71.54% | 71.22% | 71.37% | 71.68% | 76.91% | 67.49% |
| Determining course content | 71.73% | 67.56% | 71.61% | 69.29% | 67.71% | 65.08% |
| <u>School accountability</u> | | | | | | |
| Assessment is used to: | | | | | | |
| Inform parents child's progress | 97.62% | 97.43% | 97.42% | 91.77% | 88.78% | 86.99% |
| Deciding grade Retention/promotion | 76.61% | 74.86% | 75.19% | 69.67% | 53.97% | 64.38% |
| Group students | 44.21% | 47.69% | 50.97% | 43.63% | 41.20% | 46.98% |
| Compare the school to national performance | 42.85% | 43.20% | 47.36% | 43.23% | 37.15% | 44.89% |
| Monitor school's progress | 64.08% | 61.02% | 65.62% | 61.56% | 51.95% | 60.34% |
| Judge teachers' effectiveness | 38.87% | 37.38% | 42.82% | 39.90% | 28.87% | 38.68% |
| Number of observations | 91,187 | 4,315 | 10,588 | 6,778* | 270* | 693* |

Note: Source: PISA 2000 & 2003; PIAAC 2011& 2014. Standard deviations are presented in parentheses. *The number of observations for the following may be smaller: Parent's education, books at home, % of school funding, school size, and percentage of girls in school and for all school autonomy variables. PISA's scoring range is 0-1,000, whereas PIAAC is 0-500; ESCS (SES) stands for student socio-economic background and is only available in the PISA dataset. School size is included because PISA collects data at the school level because it is not a class-based test; it is given to 15 year olds, regardless of which class or grade they are in (which is different across OECD countries) the sample selection is affected by the school size (OECD, 2009).

The descriptive statistics show that the cognitive skills assessment scores differ between young people with and without immigrant backgrounds. First generation immigrants under-perform in comparison to both second generation immigrants and natives. Second, at first sight it is surprising that the literacy scores for first generation young adults (PIAAC) appear to be higher than the numeracy scores, since literacy assessments are more likely to reflect fluency in the testing language than numeracy assessments. Recall, however, the group of first generation immigrants in this study is constrained to young people who arrived before the age of 15. Therefore, learning the language of the host country may have been the first priority and might have taken time away from studying mathematics.

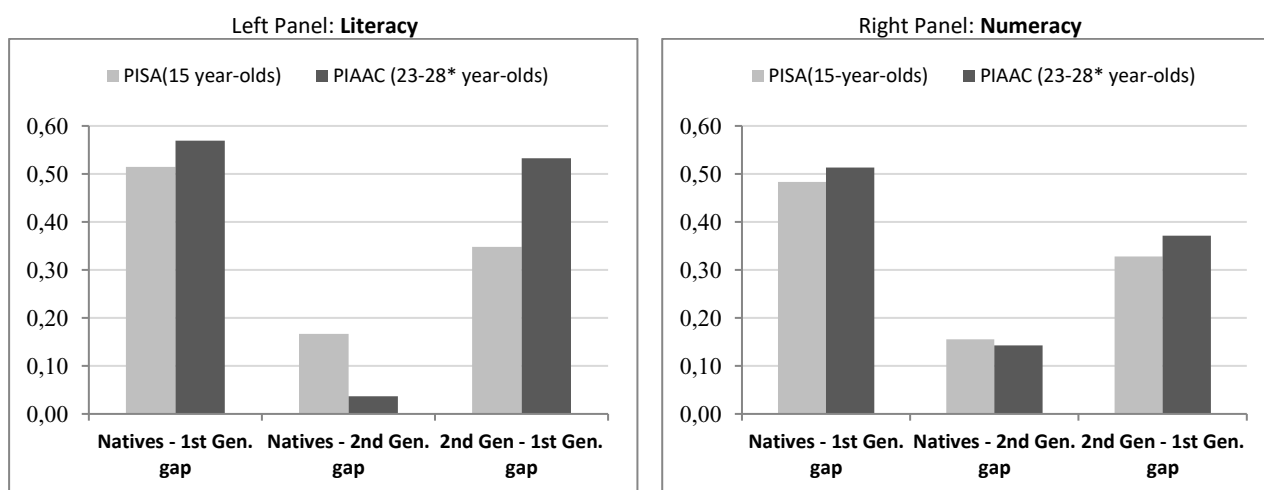
Second generation immigrants are born in the same country as the natives and have thus passed through the same education system as the natives. Therefore, it is not surprising that their scores are more alike to natives than to first generation immigrants. It is also evident that in our sample, first and second generation immigrants are coming from more disadvantaged socio-economic backgrounds than their native peer group. First generation immigrants' parents tend to have received less education and there are fewer books in the home. Socio-economic characteristics of the second generation immigrants seem to be closer to natives than to first generation immigrants. Therefore, it is important to control for these variables to disentangle whether the differences in testing scores are driven by socio-economic backgrounds rather than by their immigrant backgrounds. Demographic variables such as

gender and age and school quality statistics are similar across the three groups. Whether the test language is the same as the language spoken most often at home is, as expected, much lower for first generation immigrants than for second generation immigrants, which is again lower than for natives.

Figure 1 illustrates the standardized skills-gaps between the young people with different immigrant backgrounds. The left hand panel compares standardized PISA score literacy gaps of 15 year-olds (light grey bars) with standardized PIAAC score literacy gaps (dark grey bars). Reading from left to right, the first gap comparison is between natives and first-generation immigrants, the second gap comparison is between natives and second-generation immigrants and the third gap comparison is between second-generation and first-generation immigrants. The set-up of the right hand panel is the same but now for numeracy. According to the literature, differences in standardized gaps are considered small if the difference is less than 0.3, medium if the difference is between 0.3 and 0.5, and large if it is greater than 0.5.

We observe different trends for the different groups and differences between literacy and numeracy gaps. The literacy gaps for the first generation immigrants widen over time. The difference in literacy between natives and second-generation immigrants disappears almost completely by early adulthood (PIAAC). The t-test shows that the difference (in this case only) is not statistically different from zero.¹⁰ This finding is promising, because it suggests convergence in literacy between immigrants and natives over time, starting with the second generation immigrants. However, the gap in literacy skills among the first-generation and natives as well as the one among first-generation and second-generation immigrants has increased over time.

Figure 1. Standardized skill-gaps between natives, first- and second- generation migrants



Notes: We follow Borgonovi et al. (2017) in the way we calculate 'standardized skill gaps'. The gap refers to the difference in means for each immigrant group divided by the standard deviation for the entire sample. For Greece, the PIAAC age-range is 26-31 year-olds. Greece is the only country in our sample to implement PIAAC in 2014/2015. The other 13 countries in the sample implemented PIAAC in 2011/2012.

We observe similar patterns for numeracy as for literacy, but the size of the gaps differs. For PISA, the standardized numeracy gaps between natives and first generation immigrants is

¹⁰ The t-test of the gaps in PIAAC proficiencies indeed shows that the difference between natives and second generation immigrants is statistically insignificant.

slightly lower than for literacy (medium just shy of 0.5) and widen (just over 0.5) in early adulthood, but the widening is less dramatic than for literacy. The narrowing of the small standardized gaps between natives and second generation groups is also less dramatic for numeracy and the gap remains statistically different into young adulthood.

The standardized gaps presented in Figure 1 pool the results from the fourteen countries in our sample. Figure 2 shows how the gaps have evolved over time by country. The top panel plots the evolution of literacy gaps between the three groups of young people with and without an immigrant background for each country. The x-axis represents the PISA score gaps at age 15 and the y-axis represents the PIAAC score gaps of roughly 10 years later. The bottom panel plots the numeracy gaps in the same way as the top panel. The upper right corner of each scatter plot shows the countries for which gaps were large (typically above 0.5) at age 15 and remained large into early adulthood. The lower right corner of each scatter plot contains countries for which gaps were high at age 15, but narrowed as the cohort entered adulthood. In the lower left corner of each scatter plot we find countries where the gaps started and remained relatively small. The upper left corner contains countries where gaps were originally relatively small, but widened over time.

Figure 2 .Evolution of Literacy and Numeracy Gaps between Young People with and without Immigrant Backgrounds

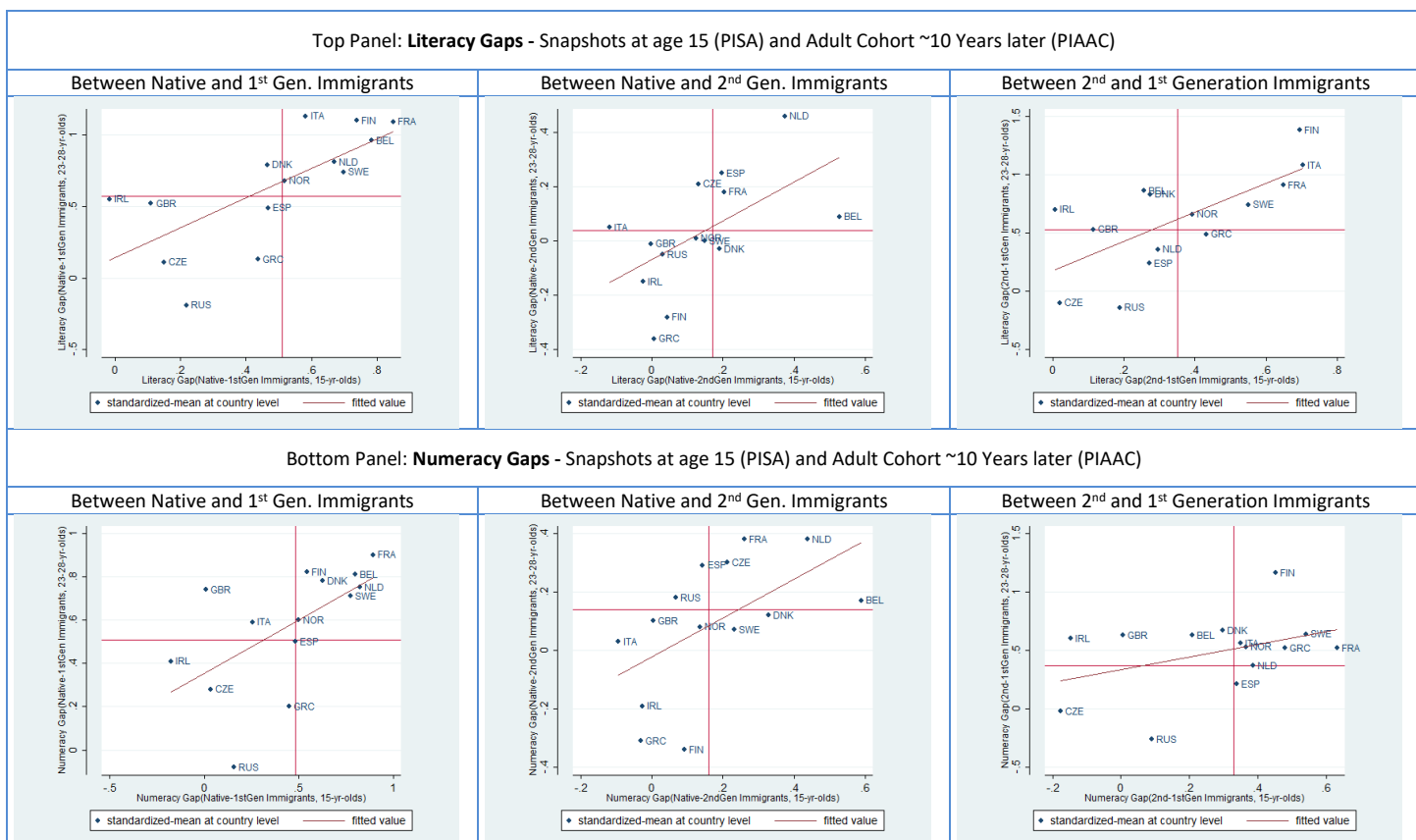


Figure 2 clearly shows that the gaps between natives and 1st generation immigrants tend to be the largest and most persistent gaps. The gaps between natives and second generation

immigrants start and stay relatively small, in Norway, Sweden and the UK gaps between these groups tend to hover around zero for both PISA and PIAAC. In Belgium and the Netherlands on the other hand, gaps between natives and second generation immigrants appear to be large and persist into young adulthood. Gaps between second and first generation immigrants appear to be large and stay large in France and Finland. From this figure, we expect to find the largest and most persistent achievement differentials between the native and first generation immigrant group, despite the fact that the first generation immigrants in our sample would have arrived in the destination country before the age of 15.

EMPIRICAL FRAMEWORK

Empirical studies that use international assessments to analyze underlying determinants of cognitive skills tend to use the education production function as the point of departure (Hanushek and Woessmann 2017). We use such a production function as well and start with

$$T = \alpha_0 + \alpha_1 IM + \alpha_2 D + \alpha_3 FB + \alpha_4 SQ + \alpha_5 A + \alpha_6 CG + \varepsilon \quad (1)$$

where T is the outcome of the process of educational production (educational performance), measured by test scores in Literacy and Numeracy; IM indicates the categorical group (natives, first or second generation immigrant); D is a vector of personal traits (listed under demographic variables in Table 3) that may impact cognitive skills. FB is a vector of Family Background characteristic; SQ stands for a vector of measures of School Quality; A represents individual ability and it remains unobservable in our analysis. CG represents the country group which is assigned based on a classification of peer-countries with similar immigrant population characteristics. The error term ε captures unmeasured variables and the randomness of learning.

The empirical set-up allows us to perform two types of analyses. First, we can analyse differences in educational performance and attribute these to family background and school quality. Second, we can analyse the educational and economic implications of these differences in terms of education attainment and labour market position. We can use our independent variables to assess the significance of these variables.

To analyse differences in educational performance we first estimate equation (1) using OLS. In the first specification, we include IM as a categorical variable with natives as the reference group. The results of this regression are presented in Table 4 and discussed in the next section. We then follow McEwan and Marshall (2004) and employ the Blinder-Oaxaca decomposition to empirically assess achievement gaps between groups of young people with and without immigrant backgrounds and decompose these gaps into each of the components of interest: family background, school quality, demographics, and country group. For this decomposition, we first re-estimate equation 1 for each of the categorical groups in IM (using OLS). Second, since the fitted line $(\bar{X} \hat{\beta})$ passes through the means (T) , we know that for each group it holds:

$$\bar{T}_N = \bar{X}_N \hat{\beta}_N \quad (2)$$

$$\bar{T}_{1stGen} = \bar{X}_{1stGen} \hat{\beta}_{1stGen} \quad (3)$$

$$\bar{T}_{2ndGen} = \bar{X}_{2ndGen} \hat{\beta}_{2ndGen} \quad (4)$$

where \bar{T} and \bar{X} are the means for each group: in equation (2) the subscript N stands for natives, in equation (3) the subscript 1stGen stands for first generation immigrants, and equation (4) 2ndGen stands for second generation immigrants. In equations (2)-(4), X represents a vector of all independent variables used in the regression. In each equation $\hat{\beta}$ represents the coefficients from the OLS regressions for the specific groups. These coefficients are not directly reported in Table 4. Third, from (2)-(4) we can calculate the achievement gaps by calculating the differences between the dependent variables in the equations. Using the estimated coefficients, we can disentangle the differences. Using the difference between native and first generation immigrant groups as an example, to derive the achievement differentials between the two groups, we subtract equation (3) from equation (2). Rewriting it, we can express this difference as follows:

$$\bar{T}_N - \bar{T}_{1stGen} = (\bar{X}_N - \bar{X}_{1stGen}) \hat{\beta}_N + \bar{X}_{1stGen} (\hat{\beta}_N - \hat{\beta}_{1stGen}) \quad (5)$$

The first term on the right hand side of equation 5 represents the difference in educational achievement due to variation in the differences between the independent variables. The second term on the right hand side shows the differences in the marginal effects of the independent variables on educational achievement, across the groups. We focus on the first term. We show the determinants of the total achievement gaps between each group for both literacy and numeracy in Table 4. We also report the part of the achievement gap that can be explained by all of our independent variables together. We further attribute which portion of the gap can be attributed each of the independent variables. This can be done separately for each variable or as a group of independent variables (i.e., for family background, school quality, demographic and country group components). We also calculate which fraction of the explained difference is accounted for by each independent variable which we sum (to a subtotal) for each component of interest (family background, school quality, demographics, and country group). We repeat this procedure for the decompositions of the achievement gaps between natives and second generation immigrants, and between first and second generation immigrants. The decomposition results are presented in Table 4 and discussed in the next section.

In the final part of our analysis, we shift our focus to evaluate the probability of the young adults in our sample achieving three separate labour market outcomes: wage premium, paid employment and working in a STEM sector. We use numeracy skills as one of our explanatory variables. (Hanushek et al., 2015). find that an increase of one standard deviation in PIAAC numeracy scores is associated with an 18 percent increase in wages of workers aged 35 to 54. Sasso and Ritzen (2016) use differences in PIAAC numeracy skills to account for differences in productivity across sectors and countries. Since most studies use numeracy scores to evaluate the economic implications of higher achievement scores in international settings, we follow suit.

We use the PIAAC data to estimate the probability that the young adults in our sample had paid employment in the past 12 months. We then estimate the probability that the employed young adults in our sample have a high or medium skill job. We also estimate the probability that the employed young adults in our sample are working in a STEM sector.

In all of the linear probability estimations we keep the same set of independent variables as in our initial OLS regression. We run the baseline model with the demographic variables and add the numeracy scores and subsequently the components of interest (family background and school quality) in a stepwise fashion.¹¹ This analysis allows us to empirically explore how the skills differentials we observe and decompose in the first part of the paper, may affect the economic integration of young people with immigrant backgrounds. Table 3 reports the results of this analysis.

RESULTS AND DISCUSSION

Table 3 shows the results of the estimation of equation (1) with simple OLS. Panel A presents the results for PISA and Panel B for PIAAC for both literacy and math scores. Column (1) and (3) report the results without school quality variables and column (2) and (4) present the results with the school quality variables. We specify IM (immigrant group) with a categorical variable that uses the group of natives as a reference. Thus a “-” sign means that the result is lower than for natives. The dependent variable is achievement scores in math and reading for PISA and literacy and numeracy for PIAAC. The results show that being a first generation immigrant is strongly negatively associated with lower performance in both PISA and PIAAC. This is also true for second generation immigrants, with the exception of PIAAC literacy scores, where the sign on the coefficient is negative, but not statistically significant. On average, PIAAC numeracy scores for first generation immigrants are 20.65 points lower than numeracy scores of natives, without controlling for school quality variables. When we include the school quality variables, this difference is reduced to 17.83. This is one third (36 percent) of the standard deviation in PIAAC numeracy scores for our total sample. Relating this to the study by Hanushek et al. (2015) where they concluded that one standard deviation increase in adult PIAAC numeracy scores is associated with 18% increase in wages this could amount to lower wages of approximately 7 % for first generation immigrants with respect to natives. Recall that these are first generation immigrants who would have come to the destination country before the age of 15 and spent at least some time in the destination country’s education system. The numeracy scores for second generation immigrants are 6.69 points lower than adult numeracy scores of natives, on average. Once we control for school quality variables, this difference decreases to 6.08 which is about 12 percent of a standard deviation in PIAAC numeracy scores for our total sample and which could translate to lower wages of approximately 2 percent for second generation immigrants.

These regression results control for the socio-economic background variables that are common in the two datasets. Adding the school quality variables slightly exacerbates the negative coefficients at age 15 (PISA). However, in young adulthood (PIAAC), controlling for the quality of the education systems mitigates the negative coefficient for first generation immigrants. This finding suggests that school quality takes time to show its effect in education achievement. The present ‘screen shot’ analysis at two points in time (for the birth cohort) has the advantage that it manages to circumvent the issue of selection that within country studies face. Using the PISA and PIAAC data together is an iterative improvement over a purely cross-sectional analysis conducted at a single point in time, which is usually the price that cross-country studies of this kind have to pay (Hanushek and Woessmann, 2017). For example, the studies that use cross-

¹¹ We maintain the demographic and country groups in every regression.

country comparative models with PIAAC data (thus far) are constrained to cross-sectional analysis, because countries have not yet implemented a second wave of the PIAAC survey.

Table 3: OLS Regression Family inputs, School inputs and Literacy/Numeracy Skill Scores

| | Panel A: PISA scores | | | | Panel B: PIAAC scores | | | |
|---|----------------------|---------------------|---------------------|---------------------|-----------------------|---------------------|---------------------|----------------------|
| | Literacy | | Math | | Literacy | | Numeracy | |
| | (1) | (2) | (3) | (4) | (1) | (2) | (3) | (4) |
| <i>Immigration Group (Natives are the reference)</i> | | | | | | | | |
| 1st-generation immigrants | -12.17*** (2.23) | -12.56*** (2.39) | -13.54*** (2.51) | -15.19*** (2.72) | -20.65*** (3.03) | -16.19*** (2.95) | -21.01*** (3.20) | -17.83*** (3.09) |
| 2nd-generation immigrants | -5.49*** (1.25) | -5.85*** (1.39) | -9.020*** (1.48) | -8.78*** (1.68) | -2.87 (1.79) | -2.91 (1.88) | -6.69*** (2.01) | -6.08*** (2.09) |
| <i>Demographic variables:</i> | | | | | | | | |
| Female | -27.21*** (0.82) | -22.85*** (0.94) | 13.96*** (0.99) | 17.32*** (1.15) | -0.39 (0.97) | -0.374 (0.99) | -10.92*** (1.05) | -10.52*** (1.08) |
| Test language same as the language at home (%) | 23.89*** (1.39) | 19.96*** (1.50) | 16.74*** (1.74) | 12.46*** (1.93) | 10.15*** (3.16) | 13.63*** (3.30) | 4.28 (3.46) | 7.73** (3.53) |
| <i>Family variables:</i> | | | | | | | | |
| Either parent has a higher education degree | 16.34*** (0.88) | 14.02*** (0.95) | 17.73*** (1.07) | 16.00*** (1.18) | 14.69*** (1.36) | 14.81*** (1.42) | 15.35*** (1.53) | 14.84*** (1.57) |
| Home owned | | | | | | | | |
| 11-100 books | 37.18*** (1.30) | 32.76*** (1.46) | 36.56*** (1.42) | 32.46*** (1.62) | 22.57*** (1.85) | 22.40*** (1.88) | 24.19*** (2.02) | 24.70*** (2.03) |
| 101-500 books | 71.38*** (1.40) | 64.86*** (1.55) | 71.61*** (1.62) | 65.82*** (1.81) | 40.93*** (1.92) | 40.74*** (1.97) | 43.16*** (2.10) | 43.95*** (2.14) |
| More than 500 books | 82.39*** (2.09) | 73.96*** (2.22) | 81.78*** (2.85) | 75.03*** (3.00) | 45.46*** (2.38) | 45.25*** (2.49) | 48.99*** (2.62) | 49.86*** (2.72) |
| <i>School inputs</i> | | | | | | | | |
| % of government funding in total school funding | N | Y | N | Y | N | Y | N | Y |
| | | -0.26*** (0.02) | | -0.25*** (0.03) | | 0.48 (0.45) | | 0.50 (0.50) |
| Table 4 (continued) | | | | | | | | |
| | Panel A: PISA scores | | | | Panel B: PIAAC scores | | | |
| | Literacy | | Math | | Literacy | | Math | |
| | (1) | (2) | (3) | (4) | (1) | (2) | (3) | (4) |
| No shortage of language/math teachers* | | 5.16*** (0.94) | | 8.61*** (1.13) | | -17.93 (16.07) | | -65.78*** (16.82) |
| % of full-time certified teachers | | -0.21* (0.11) | | -0.21** (0.10) | | 13.46 (14.51) | | -14.68 (15.18) |
| <i>School autonomy</i> | | | | | | | | |
| Hiring teachers | | 15.55*** (1.02) | | 15.98*** (1.29) | | 30.97*** (7.38) | | 18.13** (8.87) |
| Determining salary increases | | -0.55 (1.13) | | -0.80 (1.42) | | -8.69 (9.24) | | 3.57 (8.79) |
| Formulating budget | | -6.16*** (1.07) | | -10.11*** (1.35) | | -26.25* (15.17) | | -1.97 (15.84) |
| Determining course content | | -1.15 (1.04) | | 0.31 (1.25) | | -24.23** (10.57) | | -18.86* (10.52) |
| <i>School accountability</i> | | | | | | | | |
| Assessment is used to: | | | | | | | | |
| inform parents child's progress | | 1.459 (2.44) | | 2.179 (2.67) | | 39.65 (25.14) | | 22.96 (24.65) |
| Decide grade retention/promotion | | 10.72*** (1.22) | | 10.54*** (1.66) | | 38.38*** (6.14) | | 44.26*** (6.48) |
| Group students | | 3.42*** (0.99) | | 1.62 (1.22) | | 8.31 (11.18) | | 10.47 (11.29) |
| Compare the school to national performance | | 0.21 (1.12) | | 0.09 (1.38) | | 31.80 (21.84) | | -11.5 (22.46) |
| Monitor school's progress | | -2.17** (1.07) | | -2.57** (1.31) | | -41.76** (19.07) | | -9.27 (19.19) |
| Judge teachers' effectiveness | | -9.56*** (0.90) | | -13.88*** (1.07) | | 1.96 (8.09) | | -5.71 (8.53) |
| <i>Country groups</i> | | | | | | | | |
| Significant recent migration and humanitarian countries | 18.82*** (0.96) | 40.55*** (1.46) | 2.76** (1.12) | 17.38*** (1.87) | 4.49*** (1.26) | 38.98*** (8.06) | 9.66*** (1.39) | 48.27*** (8.76) |
| New destinations | -25.72*** (0.81) | -13.24*** (1.10) | -53.63*** (0.92) | -46.95*** (1.36) | -20.35*** (1.30) | 2.55 (8.26) | -19.41*** (1.41) | -4.36 (8.10) |
| Eastern European destinations | -61.45*** (1.02) | -48.42*** (1.45) | -53.47*** (1.23) | -41.35*** (1.86) | -9.63*** (1.57) | 17.04 (11.43) | -1.86 (1.70) | 23.12** (11.18) |
| R-squared | 0.27 | 0.29 | 0.22 | 0.23 | 0.21 | 0.25 | 0.22 | 0.25 |
| Number of observations | 106,090 | 106,090 | 106,090 | 106,090 | 6,870 | 6,361 | 6,870 | 6,361 |

Note: Source: PISA 2000 & 2003; PIAAC 2011& 2014. Dependent variable for Panel A are PISA literacy (column (1) & (2)) and math scores (Column (3) & (4)). Dependent variable for Panel B are PIAAC literacy (column (1) & (2)) and math scores (Column (3) & (4)). Each cell represents the coefficient of the corresponding variable estimated by Equation (1). Details please refer to note under Table 3. Robust standard errors are in parentheses. * significant at 10%, ** significant at 5%, *** significant at 1%

As we might expect from our descriptive analysis, for second generation immigrants, the initial difference in performance for literacy (the PISA measurement) becomes statistically insignificant as the cohort transitions into adulthood (the PIAAC measurement). This does not hold for numeracy skills however. The coefficients for second generation immigrants remain significantly negative. Note that for the second generation immigrants, the size of the coefficient is about one third of the size of the coefficient of the first generation immigrants. Second, the school quality variables do not seem to mitigate the coefficients as much as for the first generation immigrants. These results suggest that second generation immigrants start with an arrear in literacy but seem to catch-up during their time at school. The results also show that when the language spoken at home is the same as the test language, this has a positive and statistically significant relationship with all achievement scores, except numeracy (when school quality variables are not included). This is less so for numeracy skills.

In line with the literature, we find that family background variables which might indicate socio-economic indicators and/or proxy the family 'culture' towards education performance, show a strong and significant relation to achievement scores. It is often suggested that this effect may wane as teenagers leave the family home and enter adulthood¹² and that the effect of school quality may emerge later in the education lifecycle. Our results confirm this to some extent. The level of education of the parents is positively and significantly related to educational achievement and is more or less similar in both tests. Similar results are found for measuring the family background by the number of books at home. Our results also show a positive and persistent relation between the variables that proxy school quality and educational performance. For example, we find that school autonomy in hiring teachers is strongly and positively associated with cognitive skills in young adulthood, as is school accountability in decision-making regarding holding students back a year, or skipping ahead a year (retention/promotion).

The coefficients of the country peer-group show large and statistically significant coefficients, although the variability of these coefficients is quite high. The country peer-group variable has been constructed as a categorical variable with 'long standing destination' countries as a reference category. Hence, the coefficients measure the influence in comparison to 'long standing destination' countries. The results suggest that immigrants in 'recent migration and humanitarian' countries have higher achievement scores. On the other hand, immigrants in 'new destination' countries have lower scores in literacy and numeracy, but the size of the coefficients decrease once school quality variables are introduced. Immigrants to Eastern European¹³ countries have lower literacy scores and numeracy scores. If school quality variables are introduced, the differences in literacy scores are no longer statistically significant and the numeracy scores are higher. The results suggest that it does matter to which group of countries immigrants go.

¹² Coleman and Heckman (1998) found that the effect of family background diminished with higher levels of education, but a corollary may be that family background effect might simply fade with age.

¹³ Note that since the language variable is not available for Russia, this peer country group is represented by the Czech Republic only. The results in Table 3 exclude Russia.

Table 4: Oaxaca Decomposition Results

| | Panel A: PISA scores | | | | | | Panel B: PIAAC scores | | | | | |
|---|----------------------|-------|------------------|-------|--------------------|--------|-----------------------|--------|------------------|-------|--------------------|--------|
| | Native –1st Gen. | | Native –2nd Gen. | | 1st Gen. –2nd Gen. | | Native –1st Gen. | | Native –2nd Gen. | | 1st Gen. –2nd Gen. | |
| | Read | Math | Read | Math | Read | Math | Lit | Num | Lit | Num | Lit | Num |
| <i>Explained by Demographic variables</i> | | | | | | | | | | | | |
| Female | 1.098 | -0.79 | 0.19 | -0.14 | -0.76 | 0.64 | 0.00 | 0.09 | 0.01 | 0.27 | 0.07 | 0.26 |
| Age (PIAAC Only) | | | | | | | 0.33 | 0.57 | 0.03 | 0.06 | -0.76 | -0.71 |
| Test language same as the language at home (%) | 3.14 | 1.82 | 0.58 | 0.33 | -3.51 | -2.55 | 3.94 | 1.73 | 0.51 | 0.17 | -4.40 | -3.48 |
| Subtotal (a) | 4.24 | 1.04 | 0.78 | 0.18 | -4.27 | -1.91 | 4.27 | 2.39 | 0.55 | 0.50 | -5.09 | -3.93 |
| <i>Explained by Family Variables</i> | | | | | | | | | | | | |
| Either parent has a higher education degree | -1.21 | -1.24 | -0.42 | -0.44 | 1.05 | 1.00 | -1.60 | -1.60 | -0.60 | -0.59 | 0.76 | 0.88 |
| Books at home (All three dummies) | 5.51 | 5.75 | 0.49 | 0.52 | -5.14 | -5.17 | 6.08 | 6.66 | 0.71 | 0.75 | -6.46 | -6.37 |
| Subtotal (b) | 4.29 | 4.51 | 0.07 | 0.08 | -4.10 | -4.18 | 4.48 | 5.06 | 0.11 | 0.16 | -5.70 | -5.49 |
| <i>Explained by School Inputs</i> | | | | | | | | | | | | |
| % of government funding | 0.36 | 0.35 | 0.17 | 0.17 | -0.27 | -0.25 | -0.41 | -0.53 | 0.03 | 0.03 | 3.47 | 3.13 |
| % of full-time certified teachers | -0.01 | -0.01 | -0.01 | -0.00 | -0.00 | 0.00 | 0.20 | -0.55 | 0.12 | -0.07 | -1.08 | 0.11 |
| No shortage of language/math teachers* | 0.24 | 0.29 | 0.32 | 0.41 | 0.05 | 0.14 | -0.59 | -1.18 | -0.54 | -1.69 | -0.82 | -0.35 |
| Subtotal (c) | 0.59 | 0.63 | 0.48 | 0.57 | -0.22 | -0.11 | -0.8 | -2.26 | -0.39 | -1.73 | 1.57 | 2.89 |
| <i>Explained by School Autonomy</i> | | | | | | | | | | | | |
| Hiring teachers | -1.85 | -1.95 | -1.81 | -1.88 | 0.20 | 0.13 | -2.07 | -1.10 | -1.27 | -0.75 | 1.01 | 0.87 |
| Determining salary increases | -0.04 | 0.06 | -0.08 | 0.07 | -0.01 | -0.01 | -0.31 | 0.01 | 0.18 | -0.03 | -2.98 | -2.36 |
| Formulating budget | -0.12 | -0.18 | 0.04 | 0.07 | 0.36 | 0.52 | 0.92 | -0.14 | 0.03 | 0.00 | -5.22 | -3.73 |
| Determining course content | 0.06 | 0.04 | 0.01 | -0.01 | -0.01 | 0.09 | -0.68 | -0.49 | -0.41 | -0.35 | 1.36 | 0.93 |
| Subtotal (d) | -1.96 | -2.02 | -1.83 | -1.76 | 0.55 | 0.74 | -2.14 | -1.72 | -1.47 | -1.13 | -5.83 | -4.29 |
| <i>Explained by School Accountability</i> | | | | | | | | | | | | |
| Inform parents child's progress | 0.00 | -0.01 | -0.00 | -0.01 | 0.00 | 0.01 | 2.49 | 1.50 | 0.63 | 0.36 | 2.72 | 1.57 |
| Deciding grade retention/promotion | -0.33 | -0.31 | -0.16 | -0.14 | 0.02 | -0.07 | 8.19 | 8.89 | 1.62 | 1.81 | -4.48 | -11.44 |
| Group students | -0.03 | -0.03 | -0.08 | -0.07 | -0.18 | -0.15 | -0.07 | -0.26 | 0.65 | 0.74 | 3.58 | 2.17 |
| Compare the school to national performance | -0.08 | -0.05 | -0.03 | -0.00 | -0.01 | -0.01 | 2.89 | -0.62 | -1.32 | 0.25 | 10.97 | 8.58 |
| Monitor school's progress | 0.22 | 0.16 | 0.13 | 0.14 | -0.03 | -0.04 | -5.55 | -0.95 | 0.29 | 0.08 | -6.63 | -2.12 |
| Judge teachers' effectiveness | 1.26 | 1.52 | 1.08 | 1.28 | -0.26 | -0.28 | 0.11 | -1.23 | 0.09 | -0.07 | -2.08 | -3.97 |
| Subtotal (e) | 1.04 | 1.29 | 0.94 | 1.19 | -0.46 | -0.55 | 8.06 | 7.33 | 1.96 | 3.17 | 4.08 | -5.21 |
| <i>Explained by Country Group</i> | | | | | | | | | | | | |
| Significant recent migration and humanitarian countries | 0.40 | 0.01 | 0.86 | 0.42 | 0.34 | 0.01 | -9.01 | -10.24 | 1.43 | 1.68 | -0.07 | 13.31 |
| New destinations | -2.29 | -7.51 | -2.56 | -8.08 | 0.03 | -0.99 | 0.35 | -0.39 | 0.39 | -0.22 | 0.37 | 0.12 |
| Eastern European destinations | 10.79 | 11.21 | 7.13 | 5.76 | -3.35 | -2.66 | 2.00 | 2.36 | 0.79 | 0.91 | 5.42 | 2.33 |
| Subtotal (f) | 8.90 | 3.70 | 5.43 | -1.90 | -2.99 | -3.63 | -6.66 | -8.27 | 2.61 | 2.37 | 5.72 | 15.76 |
| Total Achievement Gap = (g) | 41.43 | 31.11 | 11.36 | 7.75 | -30.07 | -23.36 | 24.40 | 23.14 | 2.69 | 6.39 | -21.71 | -16.76 |
| Demographic variables (a) / Total Gap (g) | 0.10 | 0.03 | 0.07 | 0.02 | 0.14 | 0.08 | 0.18 | 0.10 | 0.20 | 0.08 | 0.23 | 0.23 |
| Family variables (b) / Total Gap (g) | 0.10 | 0.15 | 0.01 | 0.01 | 0.14 | 0.18 | 0.18 | 0.22 | 0.04 | 0.03 | 0.26 | 0.22 |
| School variables (c) / Total Gap (g) | 0.01 | 0.02 | 0.04 | 0.07 | 0.01 | 0.00 | -0.03 | -0.10 | -0.14 | -0.27 | -0.07 | -0.10 |
| School autonomy (d) / Total Gap (g) | -0.05 | -0.06 | -0.16 | -0.23 | -0.02 | -0.03 | -0.09 | -0.07 | -0.55 | -0.18 | 0.27 | -0.07 |
| School accountability (e) / Total Gap(g) | 0.03 | 0.04 | 0.08 | 0.15 | 0.02 | 0.02 | 0.33 | 0.32 | 0.73 | 0.50 | -0.19 | 0.32 |
| Country Groups (f) / Total Gap (g) | 0.21 | 0.12 | 0.48 | -0.25 | 0.10 | 0.16 | -0.27 | -0.36 | 0.97 | 0.37 | -0.26 | -0.36 |
| Total explained / Total Gap (g) | 0.63 | 0.51 | 0.53 | -0.14 | 0.69 | 0.71 | 0.34 | 0.21 | -0.28 | -0.02 | 0.41 | 0.30 |
| Total Explained | 26.22 | 15.84 | 6.03 | -1.08 | -20.76 | -16.59 | 8.34 | 4.96 | -0.74 | -0.10 | -8.80 | -5.11 |

Note: Source: PISA 2000 & 2003; PIAAC 2011& 2014. Dependent variable for Panel A are PISA literacy and math scores. Dependent variable for Panel B are PIAAC literacy and math scores.

Table 4 reports the results of the Oaxaca linear decomposition of the achievement gaps. Negative signs in the decomposition results are an indicator that the variable serves to narrow the gap and positive signs are an indicator that the variable serves to widen the gap, except when we compare the differentials between first and second generation immigrants, when the signs work in the opposite direction.¹⁴ Panel A presents the results from the PISA skills assessments and panel B presents the results from the PIAAC skills assessments. The first two columns in panel B are based on equation 5 and represent the differentials for the predicted achievement scores between natives and first generation immigrants on the PIAAC test. The total mean difference (found in the row labeled ‘Total Achievement Gap = (g)’ in Table 5) in scores between natives and first generation immigrants is 24.4 points in literacy and 23.14 points in numeracy. The decompositions indicate that for literacy, virtually none (0.0004 rounded to 0.00) of the difference between natives and first generation immigrants can be explained by being female. On the other hand, for numeracy 0.09 points of the total

¹⁴ Please note that the gap between first and second generation immigrants is negative and therefore the signs for widening, or narrowing the gap move in the opposite direction.

achievement gap between natives and first generation immigrants can be explained by being female. A much bigger part of the gap is explained by the test language being the same language spoken at home, more so for literacy (3.94 points) than numeracy (1.73 points), as we might expect.

Subtotal (a) sums the part of the gap explained by our demographic variables. In this linear decomposition, we can add the coefficients to calculate the aggregate effect. The demographic characteristics can explain 0.18 or 18 percent of the gap in literacy and 0.10 or 10 percent of the total achievement gap in numeracy. We also sum subtotals for family variables (subtotal b), school inputs (subtotal c), school autonomy (subtotal d), and school accountability (subtotal e) and at the bottom of the table we present how much of the gap can be explained by each sub-total. For the achievement gap between natives and first generation immigrants (as measured by PIAAC scores), 18 percent of the literacy gap and 21 percent of the numeracy can be explained by family background variables. School autonomy variables do not explain the gap well and their contribution to reducing the gap between natives and first generation immigrants is relatively small (ranging from 3 to 9 percent). A large part of both the literacy gap (33 percent) and the numeracy gap (30 percent) is explained by our school accountability variables. Country groupings do not seem to explain much of this particular gap. From these results, we can observe that school quality does matter and contributes to narrowing or widening the gaps between groups.

The row labeled 'Total explained'¹⁵ indicates how much gap in achievement scores can be explained by of the all of the independent variables together. They explain 8.34 (or 34 percent) of the total achievement gap between adult natives and first generation immigrant literacy scores (24.40) and 4.96 (around 20 percent) of the total gap in numeracy (23.14). Our results are in line with McEwan and Marshall's decomposition results for which they could account for around 30 percent of the gaps in scores in Cuba and Mexico.

Our independent variables can account for a much larger part of the gap in the PISA scores. Nevertheless, our determinants leave part of the gap 'unexplained', which means that other determinants of achievement explain a portion of the gaps between groups with and without immigrant backgrounds as well. We also notice that school quality variables do not consistently relate to achievement in the same predictable and steady way that family background variables do. While that may lead to conclude that school quality 'doesn't matter', our empirical results help to confer that we cannot dismiss school quality as important, especially because the importance may take time to emerge. It means that we need to gain a better understanding of why the school quality variables are relating to achievement scores in the way that they are and why some might help to narrow the gaps and others might slightly exacerbate the gaps.

¹⁵ Typically the total explained should be equal to the sum of the subtotals. In Table 5, however, for the sake of presentation, we do not show the decomposition results for all of our variables (for example, school input variables are missing school size or percent of females in the school). Therefore the total explained is taken from the regression output and cannot be easily related to the subtotals in the table.

Table 5: Educational Outcomes Linear Probability Models (PIAAC)

| | Tertiary Education Attainment | | | | STEM Area of Study | | | |
|---|-------------------------------|----------------------|----------------------|----------------------|----------------------|----------------------|----------------------|----------------------|
| | (1) | (2) | (3) | (4) | (1) | (2) | (3) | (4) |
| Immigration Group (Natives are the reference) | | | | | | | | |
| 1st-generation immigrants | -0.089*** (0.034) | 0.037 (0.032) | 0.0385 (0.032) | 0.025 (0.033) | -0.046 (0.031) | -0.027 (0.031) | -0.025 (0.032) | -0.020 (0.033) |
| 2nd-generation immigrants | -0.017 (0.021) | 0.010 (0.020) | 0.005 (0.020) | -0.018 (0.020) | -0.027 (0.019) | -0.023 (0.019) | -0.024 (0.019) | -0.018 (0.021) |
| Demographic variables: | | | | | | | | |
| Female | 0.072*** (0.012) | 0.119*** (0.011) | 0.114*** (0.011) | 0.118*** (0.011) | -0.334*** (0.011) | -0.325*** (0.011) | -0.321*** (0.012) | -0.314*** (0.012) |
| Age | -0.001 (0.003) | -0.004 (0.003) | -0.002 (0.003) | -0.002 (0.005) | 0.001 (0.003) | 0.001 (0.003) | 0.000 (0.003) | 0.013*** (0.005) |
| Test language same as the language at home (%) | -0.071* (0.036) | -0.098*** (0.031) | -0.104*** (0.031) | -0.092*** (0.032) | 0.007 (0.035) | 0.006 (0.034) | 0.007 (0.035) | -0.004 (0.036) |
| Numeracy | | 0.004*** (0.000) | 0.004*** (0.000) | 0.003*** (0.000) | | 0.001*** (0.000) | 0.001*** (0.000) | 0.001*** (0.000) |
| Family variables | | | | | | | | |
| Either parent has a higher education degree | | | 0.163*** (0.016) | 0.143*** (0.015) | | | -0.041** (0.016) | -0.034** (0.017) |
| Number of Books (Childhood Home) | | | 0.108*** (0.017) | 0.127*** (0.018) | | | -0.014 (0.021) | -0.015 (0.021) |
| 11-100 books | | | | | | | -0.031 (0.022) | -0.040* (0.023) |
| 101-500 books | | | 0.185*** (0.020) | 0.225*** (0.020) | | | | |
| More than 500 books | | | 0.193*** (0.026) | 0.250*** (0.026) | | | -0.016 (0.028) | -0.024 (0.030) |
| School inputs | | | | | | | | |
| % of government funding in total school funding | | | | -0.006 (0.005) | | | | 0.003 (0.005) |
| No shortage of language/math teachers* | | | | -0.486*** (0.175) | | | | 0.281 (0.182) |
| Percentage of full-time certified teachers | | | | -0.424*** (0.155) | | | | -0.348** (0.177) |
| School autonomy | | | | | | | | |
| Hiring teachers | | | | 0.046 (0.088) | | | | 0.014 (0.096) |
| Determining salary increases | | | | -0.155* (0.091) | | | | -0.027 (0.093) |
| Formulating budget | | | | 0.175 (0.166) | | | | -0.362** (0.174) |
| Determining course content | | | | 0.137 (0.112) | | | | -0.131 (0.115) |
| School accountability | | | | | | | | |
| Assessment is used to: | | | | | | | | |
| Inform parents child's progress | | | | 0.154 (0.257) | | | | -0.546** (0.273) |
| Deciding grade retention/promotion | | | | 0.404*** (0.070) | | | | -0.081 (0.076) |
| Group students | | | | 0.258** (0.118) | | | | 0.118 (0.128) |
| Compare the school to national performance | | | | 0.137 (0.224) | | | | -0.256 (0.230) |
| Monitor school's progress | | | | -0.348* (0.198) | | | | 0.383* (0.205) |
| Judge teachers' effectiveness | | | | -0.202** (0.088) | | | | -0.211** (0.095) |
| Country groups | | | | | | | | |
| Significant recent migration and humanitarian countries | 0.156*** (0.015) | 0.070*** (0.014) | 0.037** (0.015) | 0.367*** (0.090) | 0.001 (0.014) | -0.013 (0.014) | -0.006 (0.014) | -0.266*** (0.090) |
| New destinations | -0.154*** (0.013) | -0.128*** (0.013) | -0.135*** (0.013) | -0.132* (0.072) | -0.039*** (0.014) | 0.008 (0.014) | -0.003 (0.014) | 0.020 (0.081) |
| Eastern European destinations | -0.084*** (0.016) | -0.094*** (0.016) | -0.100*** (0.017) | 0.09 (0.107) | -0.058*** (0.019) | -0.069*** (0.017) | -0.090*** (0.018) | -0.075 (0.119) |
| Constant | 0.505*** (0.073) | 0.142* (0.075) | 0.100 (0.077) | -4.130*** (1.267) | 0.286*** (0.077) | -0.319*** (0.079) | -0.317*** (0.080) | 1.112 (1.356) |
| R-squared | 0.049 | 0.077 | 0.08 | 0.092 | 0.112 | 0.175 | 0.186 | 0.197 |
| Number of observations | 7029 | 7029 | 6869 | 6360 | 6308 | 6308 | 6163 | 5710 |

Note: Source: PISA 2000 & 2003; PIAAC 2011& 2014. Robust standard errors are presented in parentheses; Dependent variable for column (1)-column (4) is a dummy for having tertiary education attainment; Dependent variable for column (1)-column (4) is a dummy for studying in STEM area. Robust standard errors are presented in parentheses; * significant at 10%, ** significant at 5%, *** significant at 1%

Table 5 presents the results of our estimate of the probability that the various groups of pupils attain tertiary education. For this analysis, we revert back to using a categorical variable for IM (immigrant group) with natives as the reference group and we estimate the probabilities of the educational and employment outcomes.

Initially (column 1) the chance of attaining tertiary education is negatively and significantly correlated with being a first generation immigrant, but once we account for numeracy scores the sign switches and the coefficient is statistically insignificant. This is re-enforced when we add school quality variables as explaining variables. These results suggest that for given numeracy scores, the chances of attaining higher education is not statistically different for young people with and without immigration backgrounds and second, that increasing school quality increases educational achievement. In particular the latter conclusion is important from a policy perspective. Table 6 also reveals that whether or not a pupil comes from an immigrant background does not appear to affect the chances of studying in a STEM field or working in a STEM sector.

Finally, Table 6 shows the results of our estimates on employment of immigrants. Having paid employment in the past 12 months is not significantly related to the first generation immigrant group, but negatively associated with the second generation immigrant group. This confirms the findings of the OECD/EU (2015), that second generation immigrants tend to experience more discrimination than first generation immigrants. We further find that although first generation immigrants are employed, the quality of the job is very low. On the contrary, second generation immigrants are more likely to have a high or medium skilled job than their native counterparts, once we control for numeracy and family background. Probably the second generation immigrants are waiting (without paid employment) until a job that matches their capabilities can be realized.

Table 6: Employment Outcomes Linear Probability Models (PIAAC)

| | Paid Employment in the Past 12 Months | | | | High or Medium Skill Job | | | |
|--|---------------------------------------|----------------------|----------------------|----------------------|--------------------------|---------------------|---------------------|----------------------|
| | (1) | (2) | (3) | (4) | (1) | (2) | (3) | (4) |
| <i>Immigration Group</i> (Natives are the reference) | | | | | | | | |
| 1st-generation immigrants | -0.045 (0.028) | -0.005 (0.027) | 0.004 (0.028) | -0.007 (0.029) | -0.052 (0.032) | 0.013 (0.031) | 0.020 (0.032) | -0.001 (0.034) |
| 2nd-generation immigrants | -0.071*** (0.018) | -0.062*** (0.018) | -0.059*** (0.018) | -0.068*** (0.020) | 0.026 (0.019) | 0.039** (0.018) | 0.041** (0.017) | 0.028 (0.019) |
| <i>Demographic variables</i> | | | | | | | | |
| Female | -0.069*** (0.009) | -0.054*** (0.009) | -0.056*** (0.009) | -0.059*** (0.009) | 0.285*** (0.011) | 0.307*** (0.010) | 0.297*** (0.010) | 0.299*** (0.011) |
| Age | 0.015*** (0.003) | 0.014*** (0.003) | 0.014*** (0.003) | 0.021*** (0.004) | 0.014*** (0.003) | 0.011*** (0.003) | 0.013*** (0.003) | 0.004 (0.005) |
| Test language same as the language at home (%) | 0.015 (0.031) | 0.007 (0.031) | 0.003 (0.031) | 0.013 (0.033) | -0.045 (0.030) | -0.061** (0.029) | -0.062** (0.029) | -0.091*** (0.030) |
| Numeracy | | 0.001*** (0.000) | 0.001*** (0.000) | 0.001*** (0.000) | | 0.002*** (0.000) | 0.002*** (0.000) | 0.002*** (0.000) |
| <i>Family variables</i> | | | | | | | | |
| Either parent has a higher education degree | | | -0.022* (0.013) | -0.016 (0.014) | | | 0.074*** (0.014) | 0.064*** (0.015) |
| Number of Books (Childhood Home) | | | | | | | | |
| 11-100 books | | | 0.056*** (0.018) | 0.056*** (0.019) | | | 0.085*** (0.020) | 0.082*** (0.021) |
| 101-500 books | | | 0.050*** (0.018) | 0.055*** (0.020) | | | 0.144*** (0.021) | 0.144*** (0.022) |
| More than 500 books | | | 0.023 (0.023) | 0.026 (0.025) | | | 0.145*** (0.025) | 0.141*** (0.027) |

| | Paid Employment in the Past 12 Months | | | | High or Medium Skill Job | | | |
|---|---------------------------------------|----------------------|----------------------|----------------------|--------------------------|----------------------|----------------------|--------------------|
| | (1) | (2) | (3) | (4) | (1) | (2) | (3) | (4) |
| <i>School inputs</i> | | | | | | | | |
| % of government funding in total school funding | | | | 0.010** (0.004) | | | | -0.005 (0.005) |
| No shortage of language/math teachers* | | | | -0.169 (0.156) | | | | -0.136 (0.170) |
| Percentage of full-time certified teachers | | | | -0.090 (0.147) | | | | 0.17 (0.156) |
| <i>School autonomy</i> | | | | | | | | |
| Hiring teachers | | | | -0.207*** (0.076) | | | | -0.031 (0.085) |
| Determining salary increases | | | | 0.076 (0.077) | | | | 0.097 (0.088) |
| Formulating budget | | | | 0.139 (0.146) | | | | 0.123 (0.165) |
| Determining course content | | | | -0.054 (0.099) | | | | -0.016 (0.110) |
| <i>School accountability</i> | | | | | | | | |
| Assessment is used to: | | | | | | | | |
| Inform parents child's progress | | | | 0.417* (0.220) | | | | 0.071 (0.253) |
| Deciding grade retention /promotion | | | | -0.101* (0.057) | | | | -0.000 (0.064) |
| Compare the school to national performance | | | | -0.096 (0.188) | | | | 0.075 (0.216) |
| Monitor school's progress | | | | -0.152 (0.156) | | | | -0.07 (0.188) |
| Judge teachers' effectiveness | | | | -0.132* (0.075) | | | | 0.183** (0.084) |
| <i>Country groups</i> | | | | | | | | |
| Significant recent migration and humanitarian countries | 0.045*** (0.010) | 0.017 (0.010) | 0.013 (0.011) | 0.060 (0.076) | -0.010 (0.013) | -0.055*** (0.013) | -0.081*** (0.013) | 0.012 (0.086) |
| New destinations | -0.154*** (0.013) | -0.128*** (0.013) | -0.135*** (0.013) | -0.132* (0.072) | -0.039*** (0.014) | 0.008 (0.014) | -0.003 (0.014) | 0.020 (0.081) |
| Eastern European destinations | -0.084*** (0.016) | -0.094*** (0.016) | -0.100*** (0.017) | 0.090 (0.107) | -0.058*** (0.019) | -0.069*** (0.017) | -0.090*** (0.018) | -0.075 (0.119) |
| Constant | 0.505*** (0.073) | 0.142* (0.075) | 0.100 (0.077) | -4.130*** (1.267) | 0.286*** (0.077) | -0.319*** (0.079) | -0.317*** (0.080) | 1.112 (1.356) |
| R-squared | 0.049 | 0.077 | 0.08 | 0.092 | 0.112 | 0.175 | 0.186 | 0.197 |
| Number of observations | 7029 | 7029 | 6869 | 6360 | 6308 | 6308 | 6163 | 5710 |

Note: Source: PISA 2000 & 2003; PIAAC 2011& 2014. Dependent variable for the left-hand columns is a dummy for having paid employment in the past 12 months; dependent variables for the right-hand columns is a dummy for having high or medium skill job; Robust standard errors are presented in parentheses; * significant at 10%, ** significant at 5%, *** significant at 1%

TABLE 6 (continued): Employment Outcomes Linear Probability Models (PIAAC)

| | Working in STEM Sector (ISIC 2-Digit) | | | |
|--|---------------------------------------|----------------------|----------------------|----------------------|
| | (1) | (2) | (3) | (4) |
| <i>Immigration Group</i> (Natives are the reference) | | | | |
| 1st-generation immigrants | 0.001 | 0.008 (0.015) | 0.012 (0.015) | 0.022 (0.016) |
| 2nd-generation immigrants | (0.010) | 0.008 (0.010) | 0.001 (0.011) | 0.015 (0.011) |
| <i>Demographic variables</i> | | | | |
| Female | -0.036*** (0.005) | -0.034*** (0.005) | -0.034*** (0.005) | -0.031*** (0.005) |
| Age | 0.003*** (0.001) | 0.003*** (0.001) | 0.003*** (0.001) | 0.005* (0.003) |
| Test language same as the language at home (%) | -0.001 (0.017) | -0.003 (0.017) | -0.003 (0.018) | -0.002 (0.019) |
| Numeracy | | 0.000*** (0.000) | 0.000*** (0.000) | 0.000*** (0.000) |
| <i>Family variables</i> | | | | |

| | Working in STEM Sector (ISIC 2-Digit) | | | |
|--|---------------------------------------|----------------------|----------------------|---------------------|
| | (1) | (2) | (3) | (4) |
| Either parent has a higher education degree | | | -0.022*** (0.008) | -0.016** (0.008) |
| 11-100 books | | | 0.010 (0.007) | 0.007 (0.007) |
| 101-500 books | | | 0.009 (0.008) | 0.007 (0.008) |
| More than 500 books | | | 0.009 (0.012) | 0.010 (0.012) |
| <u>School inputs</u> | | | | |
| % of government funding in total school funding | | | | 0.004 (0.003) |
| No shortage of language/ math teachers* | | | | -0.136 (0.105) |
| Percentage of full-time certified teachers | | | | -0.008 (0.097) |
| <u>School autonomy</u> | | | | |
| Hiring teachers | | | | -0.054 (0.049) |
| Determining salary increases | | | | -0.105 (0.072) |
| Formulating budget | | | | 0.015 (0.080) |
| Determining course content | | | | 0.122 (0.084) |
| <u>School accountability</u> | | | | |
| Assessment is used to: | | | | |
| Inform parents child's progress | | | | 0.295** (0.147) |
| Deciding grade retention /promotion | | | | 0.155* (0.080) |
| Compare the school to national performance | | | | 0.272 (0.190) |
| Monitor school's progress | | | | -0.294* (0.178) |
| Judge teachers' effectiveness | | | | 0.038 (0.053) |
| <u>Country groups</u> | | | | |
| Significant recent migration and humanitarian countries | 0.011 (0.008) | 0.007 (0.008) | 0.008 (0.008) | 0.176** (0.070) |
| New destinations | -0.028*** (0.006) | -0.021*** (0.006) | -0.024*** (0.006) | 0.093 (0.070) |
| Eastern European destinations | -0.001 (0.009) | -0.002 (0.009) | -0.004 (0.010) | 0.138* (0.076) |
| Constant | -0.026 (0.038) | -0.090** (0.041) | -0.110** (0.043) | -2.335** (0.961) |
| R-squared | 0.016 | 0.02 | 0.022 | 0.031 |
| Number of observations | 4771 | 4771 | 4670 | 4299 |

Note: Source: PISA 2000 & 2003; PIAAC 2011& 2014. Dependent variable for column (1)-column (4) is a dummy for having working in STEM sector; Robust standard errors are presented in parentheses; * significant at 10%, ** significant at 5%, *** significant at 1%

One striking feature of these results is that whereas gender was not notable as a demographic factor in our analysis of determinants of skills, it is clearly a factor for other outcome variables and often seems to work in different directions. In general, the gender variable behaves as we would expect. Being female increases the chances of tertiary attainment, reduces the chances

of studying in a STEM field or being employed in a STEM sector. Being female decreases the chances of paid employment, but increases the chances of high or medium skill employment.

CONCLUSIONS

In this paper we investigate differences in educational performance between first generation immigrants, second generation immigrants and natives. These differences matter as they can be a barrier for immigrants to enter the labour market (if negative) or be an added value for immigrants to enter the host country (if positive). And it is well-known that integration of immigrants in the labour market is key for a successful immigration policy. In particular we are interested in the dynamics of skills gaps and whether policy that targets the school quality is effective to decrease skills gaps if they exist.

Our results first show some convergence of the skills gap between the second generation immigrants and natives over time. Second, the gap in literacy skills among the first-generation and natives and among first-generation and second-generation immigrants has increased over time. Our decomposition results show that demographics and family background contribute to the achievement gaps between different groups. We also find that school input variables, such as school autonomy and school accountability factors do contribute to decreasing skills gaps of young adults with different immigrant backgrounds, in particular to numeracy gaps. Finally, whether or not a young person comes from an immigrant background does not appear to affect the chances of studying in a STEM field or working in a STEM sector.

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Detailed Country Groupings and Integration outcomes

| Groups | Countries | Characteristics | Integration outcomes |
|---|---|---|--|
| Settlement countries | Australia, Canada, Israel, New Zealand | Immigration is part of the country's heritage, Highly educated immigrants who entered the country as labour migrants, educational policies in the country encourage such migrants to seek further education, | Generally successful immigrant children are better integrated into the school and labour market than their non-migrant counterparts. |
| Long-standing destinations with many recent and highly educated migrants | Luxembourg, Switzerland, the United Kingdom, the United States | Immigration has always been an enduring part of these countries, sudden increase in the last 10yrs due to the free movement within the EU-EFTA area for employment, highly educated. | Generally successful Immigrants and their children have integration outcomes similar to the native-born |
| Long-standing destinations with many settled low-educated migrants | Austria, Belgium, France, Germany, the Netherlands | Migrants to these countries are low-educated They migrated through 'guest workers' programme and later joined by their families They host significant numbers of humanitarian migrants and their families, High share of native-born with at least one foreign-born parent | Generally, not successfully integrated into the labour market, High unemployment rates, Lower levels of parent education are passed on to native-born children compared to their counterparts with no migration background They have lower chances of working at the center of the labour market because lower levels of education |
| New destination countries with many recent, low educated migrants | Greece, Italy, Portugal, Spain | Large numbers of labour migrants to fill low skilled jobs in the early 2000s They are low educated Migrated from lower income countries Although in some cases there are over qualification | Integration is generally poor especially into the labour market |
| New destination countries with many recent highly-educated immigrants | Cyprus, Iceland, Ireland, Malta | Arrival of large numbers of labour migrants in the past 10-15 years, Highly educated immigrants with the exception of Cyprus They come from high income countries | Integration is generally better perhaps due to their high educational level as well as the socio-economic background Over-qualification leading to immigrants downgrading themselves in the labour market |
| Countries with an immigrant population shaped by border changes and/or by national minorities | Croatia, the Czech Republic, Estonia, Hungary, Latvia, Lithuania, Poland, the Slovak Republic, Slovenia | Not much experience with recent migration Foreign born population are as a result of border changes or nation building | Integration is generally successful and even better than native born |
| Emerging destination countries with small immigrant populations | Bulgaria, Chile, Japan, Korea, Mexico, Romania, Turkey | only a handful of foreign-born population recently on the increase because of intermarriages between foreigners and nationals, return of former emigrants children, Integration policies are strong and longstanding to provide equal opportunities for both immigrants and natives | Not much information on integration outcomes |

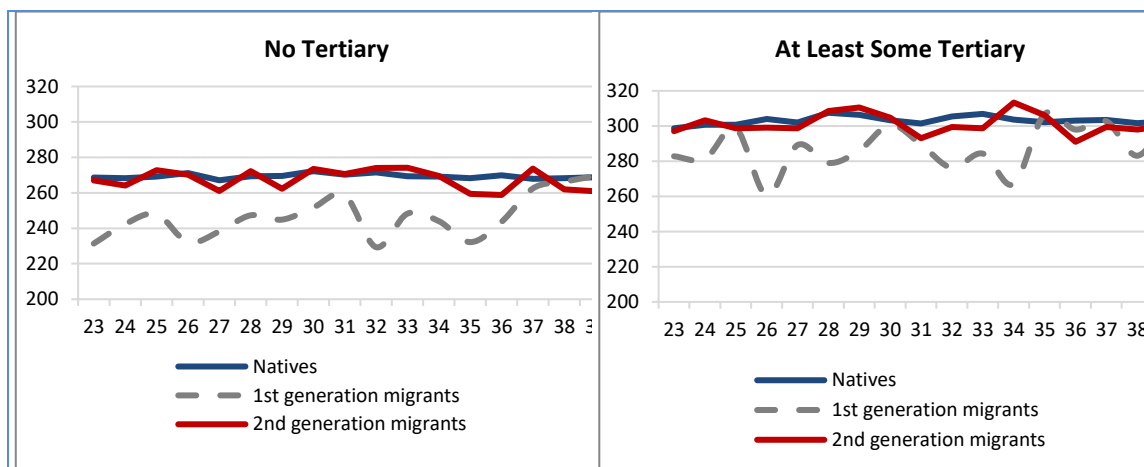
Source: authors' construct, extracted from OECD/EU (2015:27)

APPENDIX 1

Figure 3 looks at whether access to and/or completion of tertiary education is related to the average score discrepancies among the three groups. We are interested in seeing whether higher education is an ‘equalizer’, or whether the gaps persist even when higher education is attained.

The graphs show that the natives and the second generation immigrants are very similar in their path of skill accumulation. The level of literacy skills is substantially higher for all those who have accessed higher education regardless of their migration status, but it is not clear whether the gaps between groups have dissipated, thanks to their participation in tertiary education. There seems to be a smaller gap in skills between first generation immigrants and the other groups when they have attained some tertiary education; however, this is not consistent for all ages portrayed in the graphs. This might be due to the small number of observations for first generation immigrants.¹⁶

Figure 3. Literacy scores by migration status between ages 23 and 39.



¹⁶ On average the number of observations for first generation immigrants without tertiary education is 21 for each age, whereas it is 641 for natives and 61 for second generation immigrants. For those who have attended at least some tertiary education, the average number of observation for first generation immigrants is 18, for natives is 641 and for second generation is 54.