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Better migrants, better PISA results: Findings from a natural experiment

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Abstract

Switzerland changed its migration policy in the 1990s from a "non-qualified only" policy to one of almost free movement of labor. To analyze the impact of this policy change on the schooling outcomes of children of first-generation migrants, the paper compares the PISA results of first-generation pupils in 2000 with the scores of children tested in 2009, whose parents immigrated after the policy changed. We find that around 75% of the 40-point increase in the PISA score of first-generation immigrant students was due to changes in the individual background characteristics of their parents and to improved school composition.

Jel codes: I21; I24; J15
Keywords: Migration; PISA; Blinder-Oaxaca decomposition; Natural experiment

1. Introduction

A decade of internationally comparative analyses of schooling outcomes using data from the Program for International Student Assessment (PISA) (see Hanushek & Woessmann, 2011) has consistently shown that in almost all participating countries, students with a migrant background achieve significantly lower test results than native students. While in many countries even second-generation immigrant students have lower test scores than comparable native students, some countries such as Canada and Australia have managed to integrate immigrant students well, and their test results are comparable to those of natives, even for first-generation immigrants. However, PISA participating countries also differ considerably with regard to their immigration policies, which can either ease or hinder the integration of immigrants in the host society. Although most analyses account for the individual socio-economic backgrounds of students when comparing immigrants and natives, the extent to which these analyses account for the more complex effects that immigration policies may exert on schooling outcomes via changes in school composition (peer effects, threshold effects, and other factors) is unclear. Furthermore, even if one were to control for all of this, it is still difficult to interpret differences in migration policies resulting from a cross-sectional analysis as being exogenous and, consequently, to interpret a correlation with the relative schooling outcomes of migrants as being causal.

This paper attempts to shed new light on the question of the impact of migration policy on the schooling outcomes of immigrant students using a radical change in immigration policy in Switzerland in the mid-nineties as a natural experiment. Until

1994, Switzerland had a "low-qualified only" policy that not only favored the immigration of low-skilled immigrants but also made it very difficult for qualified migrants to enter Switzerland. After 1994, with the so-called Three Circles Policy, Switzerland implemented a more or less free movement of labor for citizens of the European Economic Area (EEA) and barred entry for non-qualified migrants from all other countries. This change has led—as was expected—to a change in the mix of qualifications of new immigrants to Switzerland.

Using the PISA test scores from the years 2000 and 2009, we can analyze the impact of different migration policy regimes on the schooling outcomes of migrants by comparing the results of first-generation immigrant children, whose parents were not affected by the new immigration laws, with the results for 15-year-old immigrant students whose parents had entered Switzerland after the new policy had been implemented. The comparability of the two PISA tests in 2000 and 2009 is enhanced because the test results of native Swiss students remained almost unchanged between the two points in time. Furthermore, to separate the effects that are due to the change in migration policy from the effects that are due to improvements in immigrant integration policy, we compare the changes in the PISA test scores of first-generation immigrants with the changes in PISA scores for similar second-generation immigrants (children born in Switzerland of two foreign born parents) over time. The descriptive evidence shows that the impact of the change in migration laws (+40 points in PISA scores) dwarfs any potential integration effect (+13 points in PISA scores for second-generation immigrant students) that may have occurred over the last decade.

Using a Blinder-Oaxaca decomposition analysis, we show that some 55% of the improvement in the PISA scores of first-generation immigrants is directly due to changes in their individual socio-economic background characteristics, whereas an additional 20% of the improvement is due to the changes in school composition induced by the new immigration policy.

The paper is organized as follows: Section 2 briefly describes the history of Swiss immigration policy. Section 3 provides a brief review of the literature on migrants and schooling. Section 4 presents the data and some descriptive evidence. Section 5 documents the empirical findings and results, and Section 6 concludes the paper.

2. A brief history of Swiss immigration policies

By the end of the 19th century, Switzerland had definitively made the transition from an emigration country into a net immigration country. The period before the First World War was characterized by complete freedom of movement and residence and the relatively easy acquisition of a Swiss citizenship. After the First World War ended, this laissez-faire attitude towards immigrants changed, and in 1925, the federal government adopted the responsibility of regulating settlement conditions for foreigners.[1]

The economic growth after the Second World War increased the demand for foreign workers. The immigration policy during this period was based on two principles: first, the foreign-born labor force should be used to counteract economic cycles, and therefore residence should be limited to a short period. Second, immigrants should only be employed in jobs for which the resident population showed no interest, and therefore migrants were almost exclusively low-qualified and mainly employed in a few sectors of the economy. To make the recruitment of migrant workers more efficient, Switzerland

established treaties, first with Italy, then with Spain and later with Portugal, and granted those countries exclusive rights to send workers to Switzerland. Later, because of the booming economies in Switzerland and Southern Europe, the immigrant population became more diversified, and by the eighties, what was then the Socialist Republic of Yugoslavia became the main sending country.

In the nineties, the demand for low skilled migrants declined significantly, and a large share of the now resident, low qualified migrant population had difficulty finding jobs. At the same time, the expanding new service and high-tech industries complained about the difficulties that they faced in recruiting specialists from abroad under the then current migration regime. Developments in the European Union (the free movement of labor) led to a radical change in Swiss migration policy in 1994 with the introduction of the so-called Three Circles Model. Under this model, citizens of the European Economic Area (EEA) were included in the first circle and given priority for work permits. The second circle included people from the United States, Canada, Australia and New Zealand, who could be recruited for certain jobs if no applicant could be found within the EEA. The third circle encompassed all other countries, from which it became almost impossible to migrate to Switzerland for work.

Due to complaints about the discriminatory nature of this model, the Three Circle Model was replaced by the Two Circle Model in 1998. In this model, the first circle encompassed citizens of the EEA, and the second circle included the rest of the world. In 2002, the first bilateral treaties between Switzerland and the European Union (EU) granted the free movement of labor to all citizens of the EEA (first circle), and immigration for qualified jobs from countries belonging to the second circle was only permitted with the condition that such labor could neither be found in Switzerland nor the EEA.

With the economic recovery at the end of the nineties, the change in the immigration policy began to have a lasting and profound impact on both the qualifications of the new migrants as well as on their countries of origin. Whereas before the change, the majority of new migrants did not speak any one of the national languages and had no post-compulsory education, by the turn of the century, nearly half of the new migrants had an academic degree, and a third spoke one of the national languages. Data from the Swiss Federal Statistical Office confirm that the background of the newly arrived immigrants changed after the change in policy. Data from the Swiss Labor Force survey 2012 show that 35% of immigrants that arrived after 1994 have a university degree, against 8% of the immigrants that arrived before 1994. This change in the composition of skills of the new immigrants was accompanied by a change in the countries of origin of the new immigrants. While in 1991 and 1993 the share of people coming from the Ex-Yugoslavia was 26% and 33%, respectively, these numbers were 11% in 2002 and 5% in 2011. As a counterpart, the number of people coming from neighboring countries, where one of the Swiss official languages is spoken, more than doubled. For example the share of new immigrants from Germany was 8% in 1991 and 22% in 2011; immigrants arriving from France made up 4% of the total new immigrants in 1991, while they made up 9% in 2011 (FSO 2013). These changes in immigration patterns are also clearly reflected in the change in the composition of the school populations that were tested in the first round of PISA in 2000 and in the fourth round in 2009.

These two factors together, more parents with higher educational levels and whose mother-tongue is the test language of the PISA test, are expected to contribute to a

better school performance of the new wave of immigrant children, relative to earlier immigrants. The extent to which an improvement of school performance of first-generation immigrants is due to the change in observable background variables induced by the change in the migration policy is the question to which this paper attempts to give an answer.

3. Migrants and school performance

The general consensus in the literature, especially regarding studies using PISA data, is that immigrant students have lower educational achievement than students from the resident population (Ammermueller, 2007; OECD, 2006; OECD, 2010), and this difference is mainly due to differences in parental education, occupation, income and, especially in non-English speaking countries, to speaking a foreign language at home (e.g. Entorf & Minoiu 2005; Entorf & Tatsi, 2009; OECD, 2006; OECD, 2010; Rangvid, 2007, and Schneeweis, 2011). Meunier (2011), in a study of PISA 2000 data, using the Juhn, Murphy and Pierce decomposition, finds that compositional differences in parental background can explain up to 90% of the score difference between Swiss and second-generation immigrants and 80% of the score difference between Swiss and first-generation immigrants.

Most of the literature focuses on the differences in outcomes between immigrant and native students and considers the immigrants as single group. However, the composition of the immigrant group can be quite heterogeneous. The immigrant group may be composed of students from highly educated and wealthy parents as well as of parents with poor educational, cultural and social backgrounds. Moreover, these factors can be correlated to country of origin, i.e., country of origin is another source of heterogeneity that can influence the different performance of immigrants (Rangvid, 2010). An indication of the need to be aware of the heterogeneous composition of the migrant population within a country is that the socio-economic heterogeneity of immigrants in most OECD countries is significantly higher than that of the native population (see also Schnepf, 2008).

The size of the difference in schooling results between immigrant and native students is highly dependent on the country being studied. An OECD (2006) analysis of the PISA 2003 test results showed that these differences were the most pronounced in Austria, Belgium, Denmark, France, Germany, the Netherlands and Switzerland, and the performance differences were less pronounced in Australia, Canada and New Zealand. Some of the differences in the success of migrants in schools relative to native students disappear for some countries once we make the analysis conditional on family background characteristics (Dustmann et al., 2012), and in some countries the migrant-native difference disappears once we focus solely on second-generation immigrants (Song & Robert, 2010). However, the industrialized countries nonetheless continue to differ considerably in the share of migrants, the socio-economic background of migrants relative to the native population and the success of integration across different generations of migrants.

In addition to differences in socio-economic endowment, residential segregation and school system characteristics, such as tracking (Entorf & Lauk 2008; Cobb-Clark et al. 2012), tend to widen the differences in schooling outcomes between migrants and natives. Multiple studies (e.g., Brunello & Rocco, 2013; Coradi Vellacott et al., 2003; Entorf & Tatsi, 2009; Jensen & Würtz Rasmussen 2011; Rangvid, 2007, and Sund, 2009)

find that high shares of migrant students in schools (which is often the result of residential segregation) have a negative impact on the schooling results of all students, but most profoundly for the migrants themselves (see especially Ohinata & van Ours, 2013) and students from disadvantaged socio-economic backgrounds.

However, to our knowledge, this is the first study that investigates the impact that a change in migration policy and a consequent change in the characteristics of the immigrant population can have on the school performance of immigrant children.

4. Data and descriptive statistics

This study uses data from the first (2000) and fourth (2009) PISA tests, conducted by the Organization for Economic Cooperation and Development (OECD). PISA is a standardized test administered to 15-year-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. The sample 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 school. In addition to the test results, PISA includes a student questionnaire with family and socio-economic background information[2] and a school questionnaire with information on school type and school demographics. We will focus on reading skills, which was the primary domain for both the 2000 and 2009 PISA tests. The reading scores have been standardized to have a mean of 500 points and a standard deviation of 100.

In Switzerland, an additional representative sample of students in grade 9, the last year of compulsory education, has been collected for each of the five PISA tests that have been conducted thus far. We use this so-called national sample in our analysis, first, because a comparison of students in the same grade is more adequate for our purposes and, second, because the over-sampling in the national sample increases the number of observations considerably. In the Swiss national sample, 7,997 and 15,844 students were interviewed in 2000 and 2009, respectively, and the PISA average scores in reading for Swiss children were 494 points in 2000 and 501 points in 2009 (OECD, 2011b). [3]

After deleting those observations with missing values that we could not impute, we have a final sample of 6,662 students with an average PISA reading score of 503 points for 2000, and 13,988 observations and an average score of 510 points for 2009. The average scores are slightly higher (but not statistically significantly so) than the average scores using the full sample with missing background information.

Who is an immigrant?

One of the most important questions when comparing migrants with natives is the definition of students with migrant backgrounds. PISA does not provide information on citizenship. However, the students have to report information on their country of birth as well as those of their mother and father.[4] Based on these three variables, we construct two definitions of immigrants (as in Meunier, 2011):

- First-generation immigrants: The parents and child were born abroad.
- Second-generation immigrants: Child born in Switzerland from two parents born abroad.

The first-generation immigrants group is the most important for our purposes, as it is the most immediately affected by changes in migration policies. All children included in this category in the PISA 2009 sample were born abroad, and almost all of them just before the new migration policy was implemented.[5] This means that their parents had migrated to Switzerland after the new policy was put in place, whereas almost[6] all comparable first-generation immigrant students tested in 2000 were from parents that had migrated under the old regime. Conversely, in the case of the children from the second-generation group (children born in Switzerland), it is almost certain that their parents had migrated to Switzerland under the old policy regime even in the case of the PISA 2009 test group.

Figure 1 shows that, on average, second-generation immigrants in 2000 performed better than first-generation. Figure 2 shows that while the scores of first-generation immigrants are on average still worse than those of second-generation immigrants, they are catching up, and there are more children in the upper part of the score distribution compared to second-generation immigrants in 2009 and first-generation immigrants in 2000.[7]

Probably the reason why first-generation immigrants still could not catch up with second-generation immigrants is that they are still a relatively heterogeneous group and that despite the change in policy and the increase in the average level of parental education, there are still many new immigrants who do not speak the test language or/and come from disadvantaged backgrounds.

Table 1 shows that for the whole sample of immigrants, regardless of first or second-generation, the proportion of children with both parents with tertiary degrees increased, but this was more pronounced for first-generation immigrants. Additionally, the percentage of immigrant children who did not speak the test language at home also declined significantly, and the value of the socio-economic index, which is a proxy for the occupational status of parents, increased between 2000 and 2009 especially for first-generation immigrants.[8] These results also indicate that the change in migration policy had a notable effect on the socio-demographic composition of new immigrants.[9]

Using the pooled data for a difference-in-difference analysis (see Table 6 in the Appendix) and using the native Swiss students as the control group, we can show that

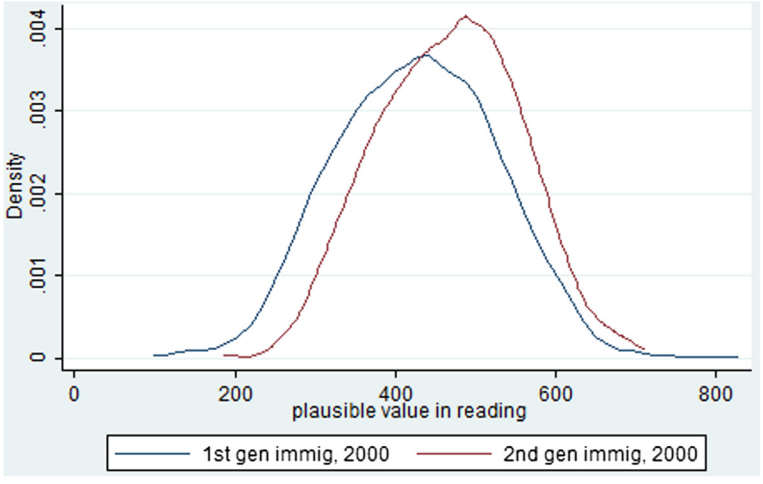

Fig. 1 PISA Scores in reading distribution for year 2000 by first- and second-generation immigrants

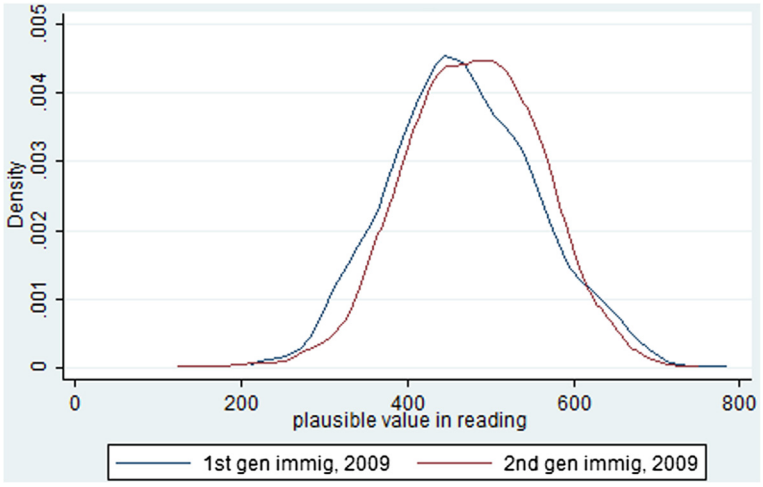

Fig. 2 PISA scores in reading distribution for year 2009 by first- and second-generation immigrants

there has been an improvement for immigrant students over time.[10] As the results for natives did not significantly change between 2000 and 2009, we can interpret this further as an indication that there were most probably no other confounding factors, such as education policies aimed at increasing overall school effectiveness, playing a role in the explanation of the better performance of immigrant children.

5. Empirical methods and results

Following other studies analyzing the performance of children in assessment tests such as PISA, in this paper we will use an educational production function of the form:

$$score_i^t = \alpha^t + \beta^t X_i^t + u_i^t, \quad (1)$$

where $score_i^t$ is the PISA reading score for student i in year t (t =2000, 2009), X is a vector of individual characteristics, and u_i^t is an error term with mean zero and variance σ_t^2.

In order to choose which variables to include in the vector X of individual characteristics, we follow the international literature (Hanushek & Woessmann, 2011). The individual characteristics include parental education (e.g., Bauer and Riphahn, 2007), cultural capital, measured by the amount of books at home (e.g. Ammermueller & Pischke, 2009), parental occupation as a proxy for social status as well as for parental income. For the latter we use the International Socio-Economic Index of Occupational Status, which has a range between 16 and 90. Furthermore, we control for the language spoken at home, as most studies have found that not speaking the test language at home has a negative impact on the PISA scores (see, e.g., Ammermueller, 2007; Meunier, 2011). In addition, we include other variables that have been shown to affect PISA scores in previous studies such as family structure, whether the child has siblings, gender, age, parents' country of origin, residential information (urban vs. rural areas) and language region of residence.

The purpose of this paper is to analyze whether the increase in the PISA scores for first-generation immigrants between 2000 and 2009 was due to an improvement in the individual characteristics of immigrants, in particular an improvement in the socio-

Table 1 Individual and school characteristics by immigrant's definition

	First-generation		Second-generation		Natives[a]		All[b]
	Mean	Std. error	Mean	Std. error	Mean	Std. error	
Year 2000							
Individual characteristics							
Reading score	426.21	3.95	462.63	3.70	517.43	1.16	503.27
Female	0.45	0.02	0.52	0.02	0.50	0.01	0.49
Age	16.06	0.03	15.70	0.03	15.70	0.01	15.74
Parents' education: tertiary[c]	0.08	0.01	0.07	0.01	0.10	0.01	0.09
Parents' education: compulsory	0.20	0.02	0.20	0.02	0.05	0.003	0.08
Foreign language at home	0.81	0.02	0.65	0.02	0.05	0.003	0.18
Socio-economic index	39.1	0.6	43.33	0.61	50.53	0.21	48.72
Less than 100 books at home	0.81	0.02	0.67	0.02	0.45	0.01	0.51
Latin Switzerland	0.29	0.02	0.28	0.02	0.20	0.005	0.21
Country of origin: Germany, France, Austria, Belgium	0.03	0.02	0.06	0.01	-	-	
Country of origin: Italy, Spain, Portugal	0.24	0.01	0.45	0.01	-	-	
Country of origin: Albania, Kosovo, Ex Yugoslavia	0.51	0.01	0.15	0.01	-	-	
Country of origin: Turkey	0.08	0.02	0.11	0.02	-	-	
Country of origin: Rest	0.14	0.01	0.23	0.02	-	-	
School characteristics							
Proportion of foreign language speakers	0.28	0.01	0.28	0.01	0.16	0.002	0.18
Number of students in school	514.61	15.04	536.72	17.06	456.15	4.75	469.34
Public	0.99	0.005	0.97	0.007	0.97	0.002	0.97
N	649		604		5409		6662
Year 2009							
Individual characteristics							
Reading score	466.21	2.84	475.33	1.9	519.83	0.79	509.53
Female	0.53	0.02	0.51	0.01	0.51	0.005	0.51
Age	15.97	0.02	15.73	0.02	15.74	0.01	15.76
Parents' education: tertiary	0.22	0.01	0.19	0.01	0.28	0.004	0.26
Parents' education: compulsory	0.10	0.01	0.11	0.01	0.02	0.001	0.03
Foreign language at home	0.66	0.01	0.58	0.01	0.03	0.002	0.16
Socio-economic index	44.38	0.54	43.76	0.34	53.04	0.15	51.08
Less than 100 books at home	0.75	0.01	0.76	0.01	0.52	0.01	0.65
Latin Switzerland	0.37	0.01	0.45	0.01	0.23	0.004	0.30
Country of origin: Germany, France, Austria, Belgium	0.10	0.01	0.03	0.02	-	-	
Country of origin: Italy, Spain, Portugal	0.20	0.01	0.30	0.01	-	-	
Country of origin: Albania, Kosovo, Ex Yugoslavia	0.34	0.01	0.32	0.01	-	-	
Country of origin: Turkey	0.03	0.02	0.07	0.02	-	-	
Country of origin: Rest	0.33	0.01	0.28	0.01	-	-	
School characteristics							
Proportion of foreign language speakers	0.2	0.003	0.2	0.003	0.13	0.001	0.14

Table 1 Individual and school characteristics by immigrant's definition *(Continued)*

Number of students in school	529.56	11.24	563.35	7.88	497.7	3.43	509.21
Public	0.99	0.003	0.99	0.002	0.99	0.001	0.99
N	1095		2031		10862		13988

[a]Natives include all children who are neither first-generation nor second-generation immigrants
[b]All reports the means of the whole sample
[c]Parents education tertiary (compulsory) is a dummy variable taking the value 1 if both parents have a tertiary (only compulsory school) degree

economic backgrounds of new immigrant, and is therefore a consequence of the change in migration policy. Or if alternatively the increase cannot be explained by changes in the observable background characteristics of the students, this could indicate an improvement in the integration of migrants in the Swiss education system.

We do this by decomposing the score gap for first-generation immigrants between the years 2000 and 2009 into an explained and an unexplained component, using a Blinder-Oaxaca decomposition (Blinder, 1973; Oaxaca, 1973). For each year (2000 and 2009), we estimate the corresponding educational production function using only the sample of first-generation immigrants, and then following Blinder-Oaxaca, we decompose the mean score difference between 2000 and 2009 as follows:

$$\overline{score_{09}} - \overline{score_{00}} = \left(\overline{X_{09}} - \overline{X_{00}}\right)\hat{\beta}_{09} + \overline{X_{00}}\left(\hat{\beta}_{09} - \hat{\beta}_{00}\right), \quad (2)^{11}$$

where the first summand shows how much of the change in PISA scores between 2000 and 2009 can be explained by differences in the predictors or characteristics. This part of the change tells us the extra number of PISA points immigrant students would have had in 2000 if they had had the same observable characteristics as the students in 2009 (the group differences in predictors are weighted by the coefficients from 2009). The second summand shows the contribution of the difference in the coefficients to the total score gap. This is known as the unexplained component, as it includes the part of the change that cannot be accounted for by the difference in endowments.[12] In our case, this component could be observed as an upper bound for the impact of improved immigrant integration, given that this proportion shows improved performance on the part of immigrants, regardless of the change in the observable endowments. It is an upper bound of the integration effect because it also includes any potential impact that could stem from a change in the unobservable characteristics of the students.

Panel A in Table 2 provides the estimation results from the OLS regressions for 2000 and 2009. We use the PISA reading score as a dependent variable, and we control for the demographic characteristics of the students such as gender, age and place of residence, family characteristics such as whether the child lives in a single-parent, mixed or nuclear household and whether the child has any siblings. The most important explanatory variables in our analyses are the socio-economic background characteristics of the parents, among which we include the socio-economic index, parents' education, the number of books at home, the language spoken at home and parents' nationality. The results are in line with previous findings in the literature. The only difference is that, depending on the year, we do not find a significant direct effect of parental

Table 2 Oaxaca decomposition of the score gap between 2000 and 2009 for first-generation immigrants

(A) [e]	Regression OLS 2009		Regression OLS 2000	
	Coefficient	Std. error[c]	Coefficient	Std. error
Female	33.65	2.12[a]	10.64	6.92
Age	−22.64	1.62[a]	−8.43	5.47
SEI	1.10	0.08[a]	0.65	0.29[b]
Parents 'education[d]: tertiary	10.99	3.06[a]	30.84	16.24+
Parents' education: compulsory	4.58	3.57	−26.40	9.19[a]
Family structure[e]: single	−5.35	3.51	−13.29	11.96
Family Structure: mixed	−31.49	11.31[a]	5.31	16.49
Siblings (yes)	−3.05	3.17	−44.07	12.89[a]
Less than 100 books at home	−45.86	2.98[a]	−39.93	10.19[a]
Foreign language at home	3.90	2.80	−6.36	9.85
Age at immigration	−0.30	0.24	−3.12	0.94[a]
Latin Switzerland	0.60	2.54	10.62	8.95
Country of origin[f]: Germany, France, Austria, Belgium	51.41	4.08[a]	24.80	21.91
Country of origin: Italy, Spain, Portugal	−0.18	3.51	−2.46	13.06
Country of origin: Albania, Kosovo, Ex Yugoslavia	−11.48	3.14[a]	−27.39	11.86[a]
Country of origin: Turkey	9.50	7.30	−38.35	15.94[b]
Constant	792.40	26.98[a]	646.93	87.83[a]
R2	0.35		0.27	
N	1095		649	
(B) Decomposition				
Total gap	40	100%		
Explained	22	55%		
Unexplained	18	45%		

[a]significant at 1% level
[b]significant at 5% level, + significant at 10% level
[c]All standard errors account for errors's correlations at the school level (clustered standard errors)
[d]Reference category: Both parents have secondary level education
[e]Reference: Nuclear
[f]Reference: other

education once the socio-economic index and number of books at home are controlled for. [13]

Panel B of Table 2 shows the decomposition results. The total score gap between 2000 and 2009 is 40 points, of which approximately 22 points (55%) can be explained by differences in observable endowments between the two PISA tests.[14] [15]

School characteristics and peers

Thus far we have analyzed the impact that the changes in the individual endowments of new immigrants had on increases in PISA test scores, but because it is likely that the new immigrants come from better socio-economic environments, the residential choices of the parents may also allow the students to attend better schools than the average first-generation immigrants in the 2000 PISA test. We therefore include school characteristics as explanatory variables in a second step of our education production function as well as information on peers as follows:

$$score_{is}{}^{t} = \alpha^{t} + \beta t X_{is}{}^{t} \quad + \quad \psi S s t + u_{is}{}^{t} \tag{3}$$

where $score_{is}{}^{t}$ is the PISA reading score for student i in year t (t =2000, 2009) and school s, X is a vector for individual characteristics, S is a vector of school characteristics, and $u_{is}{}^{t}$ is an error term with mean zero and variance σ_t^2.

Among the school characteristics, we include the proportion of foreign language speakers in the school. Previous studies (for Switzerland, see Coradi Vellacott et al., 2003[16]) have shown that the effect of the this is not linear and that the negative effect of a bigger fraction of students who do not speak the test language on the performance is almost exponential once a threshold of 20% of these students is crossed. We therefore use three dummy variables: less than 20%, between 20 and 40% and more than 40% of students in a school who do not speak the test language.

The proportion of migrant children (first and second generation) who attend schools with more than 40% foreign language speakers decreased significantly between 2000 and 2009, and the fraction of students attending schools with less than 20% foreign language speakers increased (see Table 3). The share of foreign language speakers in school also changed for Swiss natives. The improvement of the schools' composition for natives is most probably not due to a "native flight" from less favorable schools. In Switzerland there is not only a lack of free school choice, but also very low geographical mobility of people, mainly due to differences in housing prices and locally highly diverse tax levels. In this context, Swiss native students with low-skilled and low-earning parents probably live in the same neighborhoods as first-generation immigrants that had entered Switzerland before 1994, and highly educated Swiss natives live in neighborhoods where most of the new better-off immigrants locate. Therefore, children from lower-income households attend the same schools as children from lower–income immigrant families, and better-off Swiss children share schools with better-off immigrant children. As the share of low skilled and foreign language speaking immigrants decreased dramatically over time, also "immobile" native Swiss students were affected by the changes in the composition of schools. Contrary to foreign language speaking immigrant students, however, the change in the composition of schools did not led to a sizeable improvement of schooling results for native students as it is mainly the foreign

Table 3 School composition: Proportion of foreign language speakers at school

(A)	2000		
	<20%	20–40%	>40%
First-generation	0.40	0.34	0.26
Second-generation	0.37	0.37	0.26
Natives [a]	0.74	0.20	0.06
Total	0.67	0.23	0.10
(B)	2009		
First-generation	0.56	0.38	0.07
Second-generation	0.56	0.39	0.06
Natives	0.84	0.15	0.01
Total	0.76	0.22	0.02

[a]Natives include all children who are neither first-generation nor second-generation immigrants

language speaking students themselves that suffer first from high levels of concentrations of foreign language speaking students in a school (see e.g. Coradi Vellacott et al., 2003).

The model in Table 4 includes school characteristics such as total enrollment, school location, whether the school is financed by public or private funds and the proportion of foreign language speakers in the school. The results show that it is indeed the higher proportion of other students in school who do not speak the test

Table 4 Oaxaca decomposition of the score gap between 2000 and 2009 for first-generation immigrants including controls for school characteristics

(A)	Regression OLS 2009		Regression OLS 2000	
	Coefficient	Std. error[e]	Coefficient	Std. error
Female	30.93	2.04[a]	9.93	6.45
Age	−24.15	1.57[a]	−10.73	5.13[b]
SEI	1.06	0.08[a]	0.64	0.27[b]
Parents 'education: tertiary[c]	2.62	2.96	20.20	15.20
Parents' education: compulsory	2.32	3.43	−31.19	8.59[a]
Family structure[d]: single	−8.62	3.36[b]	−7.92	11.12
Family Structure: mixed	−31.15	10.88[a]	10.43	15.42
Siblings (yes)	−9.31	3.05[a]	−46.93	11.97[a]
Less than 100 books at home	−34.60	2.91[a]	−34.26	9.58[a]
Foreign language at home	10.03	2.72[a]	−0.05	9.20
Age at immigration	−0.65	0.23[b]	−3.24	0.88[a]
Latin Switzerland	−2.24	2.59	−9.43	8.64
Country of origin[f]: Germany, France, Austria, Belgium	44.26	3.96[a]	10.63	20.44
Country of origin: Italy, Spain, Portugal	−2.89	3.39	−2.87	12.19
Country of origin: Albania, Kosovo, Ex Yugoslavia	−12.68	3.03[a]	−25.07	11.31[a]
Country of origin: Turkey	12.60	7.00+	−30.05	14.79[b]
Public	−64.49	11.87[a]	−27.55	27.17
School size	0.04	0.003[a]	0.02	0.01+
Proportion of foreign language speakers 20–40%	−28.41	2.35[a]	−35.88	7.96[a]
Proportion of foreign language speakers >40%	−61.17	4.58[a]	−88.80	9.51[a]
Community size[g]: village	−2.58	4.76	−42.16	14.78[a]
Community size: small town	−7.43	3.07*	−13.32	9.77
Community size: town	−9.83	3.19[a]	11.30	10.17
Constant	881.51	29.21[a]	744.72	85.94[a]
R2	0.41		0.38	
N	1095		649	
(B) Decomposition				
Total gap	40	100%		
Explained	30	75%		
Unexplained	10	25%		

[a]significant at 1% level
[b]significant at 5% level, +significant at 10% level
[c]Reference: Both parents have secondary level education
[d]Reference: Nuclear
[e]All standard errors account for errors' correlations at the school level
[f]Reference: Other
[g]Reference: City

language that is the primary contribution to low test scores both in 2000 and in 2009. Because the proportion of students not speaking the test language is much smaller in 2009, this variable explains a great deal of the change in the test scores of first-generation immigrants between 2000 and 2009. The part of the difference explained by observables increases from 55% to 75%.[17] With respect to other school characteristics, attending a private school[18] has a positive influence on the PISA scores, and a larger number of students has a negative influence, but these variables are not significantly explaining the score differences between the two years.

In contrast, for immigrants that were born in Switzerland of two foreign-born parents, the increase in PISA scores between 2000 and 2009 is not only much smaller but also cannot be explained by changes in observable endowments (See Table 5).[19] When we include school characteristics, and especially the proportion of foreign language speakers, the explained component of the score difference over time increases also for these children (see Table 5).[20] This is because the percentage of students who attend schools with more than 40% of foreign language speakers was also reduced in this group, and the percentage of students who attend schools with less than 20% foreign language speakers increased inversely. Although all immigrants benefit from lower shares of students who do not speak the test language in Swiss schools, the first-generation immigrants benefited the most. This is because first-generation immigrants, despite having much better socio-economic backgrounds on average in 2009, still have the largest share of low qualified parents. Because it is predominantly the pupils of these parents who benefited from a lower share of foreign language speaking pupils in schools, the first-generation immigrants themselves are also those that benefited the most from the improved composition of new immigrants.[21] Additionally, the lower effect of the policy for the second-generation can also be explained by the fact that they are more likely to speak or have at least better knowledge of the test language, and therefore, just like for natives, their reading literacy is less likely to be affected by the presence of foreign language speaking pupils. First-generation pupils not speaking the test language are by contrast the ones who have the most to gain from an improvement of the peer group.

6. Conclusions

In most OECD countries, migrant children have considerably lower schooling outcomes compared to the native population, although judging from PISA test score differences, some countries seem to perform much better than others. In the past, these inter-country differences have largely been attributed to differences in integration policies and much less to differences in migration policies. Because it is

Table 5 Oaxaca decomposition of the score gap between 2000 and 2009 for second-generation immigrants

	Without controlling for school characteristics[a]	Controlling for school characteristics
Total gap	13 points	13 points
Explained	0%	11%
Unexplained	100%	89%

[a]We used the same models as in Tables 2 and 4 to calculate these results. $N = 604$ (2000) and 2031 (2009)

difficult to separate integration and immigration policies in a cross-country analysis, this paper uses a radical change in migration laws in the mid 1990s in Switzerland as a natural experiment to analyze the impact that migration policies can have on the schooling outcomes of migrant children.

Comparing first-generation immigrant children's PISA 2000 test scores with first-generation immigrant children in the PISA 2009 test shows a remarkable increase of 40 points in the PISA test score. Around three quarters of this increase can be attributed to observable changes in the individual socio-economic characteristics of the new migrants and the positive impact that this had on school composition by reducing the shares of students who did not speak the test language in many schools below the threshold that negatively impacts student outcomes. The observation that PISA test results for the native population remained stable over the whole decade makes it possible to conclude that at least three quarters of the increase in performance cannot be attributed to an overall improvement in schooling in Switzerland.

Additionally, the improvement of some 10 PISA points of the first-generation immigrant students that cannot be explained by changes in observable characteristics matches exactly the non-explainable improvement for second-generation immigrants whose parents had all migrated to Switzerland under the old migration policy. It is therefore safe to assume that improvements in educational integration have only contributed, up to this point, to the massive increase in PISA scores for first-generation immigrants in Switzerland.

Therefore, considering that a change in migration policy was able to improve the PISA results of first-generation immigrant students by almost a third of a standard-deviation in PISA scores over a decade alone, it becomes clear that differences in immigration policies and laws probably explain as much if not more of the differences in the success of migrants in OECD countries as the differences in policies to integrate migrants into the national school systems. For comparative purposes, it is also important to note that a about a third of the improvement came through indirect effects (changes in school composition) and could therefore not be accounted for when controlling for individual characteristics of migrants alone, which is usually the case when comparing the country-specific schooling outcomes of migrants.

Endnotes

[1]For a detailed description of the Swiss immigration policy, see Piguet (2006) and Wicker et al. (2003).

[2]Missing data is an issue in all PISA data sets. For the socio-economic index (SEI), some 5% of the responses in 2000 and 4% in 2009 were missing. We replaced the missing values with the full sample averages. To check the sensitivity of our method of imputing missing values, we also predicted the missing values by regressing them on other background characteristics. Because our results did not change qualitatively, we use the averages in this paper. Furthermore, comparing the responses for parents' education with census data, we discovered that the share of parents with no post-compulsory education in the data from the PISA background questionnaire was too

high. Therefore, we double-checked the students' information regarding parental education with the information on parental occupation (ISCO classification). In cases of inconsistent data, we imputed the educational level that corresponded to the educational level that was closest to the ISCO level. In so doing, we obtained averages that match the census averages quite closely.

[3]The PISA average scores in reading are 497 for 2000 and 502 for 2009 using the national sample of students in grade 9 (EDK, 2011).

[4]Technically, because we do not have information on the nationalities of the students but only their places of birth, we could label a Swiss citizen an 'immigrant' if his parents are Swiss citizens but were born abroad. Although this potentially contaminates all of the results of studies working with PISA data, we do not think that this is a problem that would substantially alter our results, as this affects not more than a couple of pupils and because it is probably not the citizenship that matters in the education production function but the fact that someone was raised outside the country where his or her children attend school.

[5]There are 22 children in the 2009 sample of first-generation immigrants who answered that they came to Switzerland 15 years earlier and 5 children who said they came 16 years earlier. Excluding these students from the sample does not alter the results.

[6]In the 2000 first-generation immigrants' sample, there are 105 children out of 649 who answered that they came to Switzerland after 1994.

[7]A test of equality of distributions shows that the distributions are not the same.

[8]The socio-economic status is based on the International Socio-economic Index of Occupational Status (Ganzeboom et al., 1992), which ranges between 16 and 90 (16 corresponding to the lowest occupational status). In this paper we use the highest parental socio-economic status.

[9]The percentage of parents with a tertiary degree also increased for natives. However, a part of this increase can be due to the fact that some Swiss degrees that were categorized as secondary at the beginning of the 2000 decade, such as degrees from teacher colleges, were later re-categorized as tertiary before the 2009 survey.

[10]Table 6 shows the results of a multivariate difference-in-difference OLS regression model where we included a dummy variable for first-generation immigrants, a dummy variable for the year 2009, and an interaction term between first-generation immigrants and year 2009. The coefficient of 2009 is very small and not statistically significant, indicating that besides the raise in performance for migrants, there was no general increase in school performance between 2000 and 2009. Although first-generation immigrants perform, in general, worse than the rest of the tested students, the interaction term is positive and significant, indicating that the change in performance over time was significantly stronger for first-generation immigrants than for native Swiss students.

[11]We use the coefficients from 2009 as weights. There are several alternatives to this (see Reimers, 1983; Cotton, 1988; Neumark, 1988; Oaxaca & Ransom, 1994). Another possibility would be to calculate a threefold decomposition of the form $\bar{score}_{09} - \bar{score}_{00} = (\overline{X_{09}} - \overline{X_{00}})\hat{\beta}_{00} + \overline{X_{00}}\left(\hat{\beta}_{09} - \hat{\beta}_{00}\right) + \left(\overline{X_{09}} - \overline{X_{00}}\right)\left(\hat{\beta}_{09} - \hat{\beta}_{00}\right)$ to avoid making assumptions about which β should be used as a weight. In this specification, the last summand shows how much of the gap can be explained by differences in the predictors and the coefficients.

[12]Although decomposition methods have initially been used mainly in cross-sectional comparisons, decompositions used to analyze changes over time have become more frequent and in settings comparable to ours (see for example Barrera-Osorio et al. 2011 and Fortin et al., 2013).

[13]Some of coefficients change considerably between 2000 and 2009, much more than if we compare the two regressions for the whole sample of tested students. Therefore, it would be interesting to find some explanations for some of the major changes in the effect sizes of some variables. The change in the coefficient for females could be due to the fact that the "old" immigrants (2000) came from countries with a more traditional female role, and therefore girls were not so much encouraged to do well in school. In the case of parents' education the differences in the size of the coefficients and the standard errors are most probably due to changes in the quality and heterogeneity of educational degrees for the group of first-generation immigrants. First-generation immigrants whose children were tested in 2000, were mostly employed in the construction, agriculture and tourism sector for menial tasks. Therefore, immigrants with a tertiary education in their country of origin accepting these kind of jobs had probably very different qualifications compared to other tertiary educated migrants, who at the same time were being employed as university professors or doctors. This evidentially leads to very imprecise estimations, with large standard errors, of the effect of tertiary education on students' achievement in 2000. In 2009 the group of people with tertiary qualifications were mainly employed in the service sector in jobs requiring high qualifications and came from a more homogenous group of countries. Besides, the decrease in the size of the effect is probably due to the fact that also the composition of the reference group (countries of origin) changed markedly over time, and some of the positive effects of parental education on student outcomes are now captured by the coefficients of countries of origin. Given the change in migration policy and the structural changes in the Swiss economy, it is very likely that first-generation immigrants from Turkey, Albania, Kosovo or Ex-Yugoslavia in 2009 must be better educated, at all educational levels compared to those in 2000, which would explain the changes of the coefficients over time for these immigrants.

[14]The results do not change when we use canton of residence instead of region.

[15]We tried including variables for missing values for sensitivity purposes, but the results were not affected.

[16]Coradi Vellacott et al. (2003) have analyzed the PISA 2000 data for Switzerland using a hierarchical multilevel model with dummy variables for the share of students who do not speak the test language in the second level of their model.

[17]The share of the increase in PISA scores between 2000 and 2009 attributable to school characteristics is of course not the difference between 55 and 75% because the extended regression contains more regressors and some of the independent variables are also correlated. The increase in the explained share only shows that the model including school characteristics explains a much higher share of the change than the reduced model.

[18]Contrary to other studies (see, e.g., OECD, 2011a) that show better results for pupils attending public schools, we find a negative effect. The explanation for this difference lies in the use of the national PISA sample instead of the

international PISA sample. In the national PISA sample, pupils are compared conditional on enrollment in the 9th grade, whereas in the international sample, they are compared conditional on being 15 years old. As many pupils attending private schools have repeated school years, they are older on average than the average 9th grader in a public school, whereas in the international sample, they are more likely to be in the 8th grade at the age of 15 instead of being in the 9th grade.

[19]Another interpretation of this is that the 13 points of improvement between 2000 and 2009 is the upper bound of the impact of improved integration of students with migrant backgrounds in Swiss schools. The effect size is, however, more than three times smaller than the increase in test scores of first-generation immigrants. Given that the part of the increase for first-generation immigrants that cannot be explained by changes in individual endowments and school composition effects is also about 15 PISA points, a comparison of the results for these two groups of immigrant students is a good indication that the upper bound of integration effects is around this number.

[20]See Table 7 in the appendix for complete results.

[21]A number of past studies have shown that peer effects are usually non-linear (see Lavy et al., 2012; Sund, 2009), and low-achieving students are more affected by the presence of better peers.

Appendix

Table 6 Difference in difference analysis of PISA outcomes

	Coefficient	Standard Error[d]
Immigrant first generation	−31.21	6.19[a]
Year 2009	0.94	4.29
Immigrant first generation[b]Year 2009	20.49	6.91[a]
Female	27.71	1.86[a]
Age	−18.00	2.04[a]
SEI	1.08	0.07[a]
Parents 'education[c]: tertiary	6.18	2.24[a]
Parents' education: compulsory	−21.14	5.12[a]
Family structure[e]: single	−3.27	2.64
Family Structure: mixed	−13.46	5.09[a]
Siblings (yes)	−6.70	2.56[a]
Less than 100 books at home	−37.10	2.33[a]
Foreign language at home	−26.45	3.17[a]
Latin Switzerland	−15.56	4.02[a]
Constant	759.39	33.15[a]
R^2	0.24	
N	20650	

Whole sample
[a]significant at 1% level
[b]significant at 5% level, +significant at 10% level
[c]Reference: Both parents have secondary level education
[d]All standard errors account for errors' correlations at the school level
[e]Reference: nuclear

Table 7 Oaxaca decomposition of the score gap between 2000 and 2009 for second-generation immigrants

(A)	Regression OLS 2009		Regression OLS 2000	
	Coefficient	Std. error[g]	Coefficient	Std. error
Female	21.56	1.57[a]	19.20	6.47[a]
Age	−15.12	1.22[a]	−12.56	5.05[b]
SEI	0.51	0.06[a]	0.96	0.26[a]
Parents 'education[c]: tertiary	2.14	2.20	4.89	14.66
Parents' education: compulsory	−0.14	2.62	−3.75	8.87
Family structure[d]: single	−1.74	2.54	−12.73	10.11
Family Structure: mixed	−50.72	14.07[a]	−6.22	14.20
Siblings (yes)	−14.10	2.31[a]	−9.63	12.91
Less than 100 books at home	−39.08	2.05[a]	−19.36	7.67[b]
Foreign language at home	1.35	1.81	−22.44	7.55[a]
Latin Switzerland	−16.35	1.98[a]	−27.87	9.37[a]
Country of origin[e]: Germany, France, Austria, Belgium	34.60	4.43[a]	0.20	14.13
Country of origin: Italy, Spain, Portugal	−9.07	2.24[a]	−12.85	9.07
Country of origin: Albania, Kosovo, Ex Yugoslavia	−18.17	2.26[a]	−8.23	11.40
Country of origin: Turkey	−14.90	3.27[a]	−19.04	11.88
Public	−52.25	10.65[a]	−33.84	19.58+
School size	0.05	0.002[a]	0.02	0.01[a]
Proportion of foreign language speakers 20–40%	−22.53	1.78[a]	−26.94	8.11[a]
Proportion of foreign language speakers >40%	−32.62	3.63[a]	−79.71	9.91[a]
Community size: village	−4.77	3.87	−80.95	18.36[a]
Community size: small town	−8.56	2.40[a]	−17.77	9.24+
Community size[f]: town	−3.80	2.44	−3.59	9.68
Constant	796.46	23.32[a]	726.92	85.27[a]
R2	0.24		0.30	
N	2031		604	
(B) Decomposition				
Total gap	13	100%		
Explained	1	11%		
Unexplained	12	89%		

[a]significant at 1% level
[b]significant at 5% level, +significant at 10% level
[c]Reference: Both parents have secondary level education
[d]Reference: Nuclear
[e]Reference: Other
[f]Reference: City
[g]All standard errors account for errors' correlations at the school level

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