

Educational Achievement of Immigrant Students. A Cross-National Comparison Over-Time Using OECD-PISA Data

I risultati scolastici degli studenti immigrati. Un confronto fra nazioni attraverso i dati PISA

Mariano Porcu

Abstract According to the Organization for Economic Cooperation and Development (OECD) a substantial performance differential between students with immigrant background and natives is observed in most countries. On average, immigrants tend to underperform their native peers even after their socio-economic conditions are controlled. In this work we study, in a time span perspective, the gap in school performances between native and immigrant students in five different European countries. Two of them are considered as new destination countries, namely Italy and Spain; the others three are traditional immigration countries (albeit with different migration history): France, United Kingdom, and Germany. We analyze data collected for the OECD Program for International Student Assessment (PISA) surveys of 2009, 2012, and 2015 by fitting in a multilevel setting multiple regressions to simultaneously model students' performances in reading and mathematics. We control for gender, socio-economic background, and immigration status (1st generation or 2nd generation immigrants). Results display that the performance gap between immigrant and native students is narrower in mathematics and that it is far from being bridged over-time. No substantial differences in trend are observed differentiating destination countries as new or traditional.

Abstract *Secondo l'Organizzazione per la cooperazione e lo sviluppo economico (OCSE), nella maggior parte dei paesi si osserva una sostanziale differenza di rendimento scolastico tra studenti con background migratorio e nativi. In media, gli immigrati tendono ad avere performance inferiori a quelle dei loro pari nativi, anche dopo aver controllato rispetto alle condizioni socio-economiche. In questo lavoro, in una prospettiva temporale viene studiato il divario nelle prestazioni scolastiche tra studenti nativi e immigrati in cinque diversi paesi europei. Due di questi sono considerati come paesi di nuova immigrazione, ovvero Italia e Spagna; gli altri tre sono paesi di immigrazione tradizionale (anche se con una storia migratoria diversa): Francia, Regno Unito e Germania. Verranno analizzati i dati raccolti*

Mariano Porcu

Università degli Studi di Cagliari, Dipartimento di Scienze Sociali e delle Istituzioni, e-mail: mr-porcu@unica.it

nell'indagine PISA del 2009, 2012 e 2015 adattando alle performance in lettura e matematica dei modelli di regressione multilivello controllando rispetto al genere, al contesto socio-economico e allo status migratorio (immigrati di prima generazione o di seconda generazione). I risultati mostrano che il divario di prestazioni tra studenti immigrati e nativi è meno pronunciato in matematica, non si riduce nel tempo e i trend non si differenziano tra i paesi di nuova immigrazione e gli altri.

Key words: Immigration, Educational inequalities, PISA, Multilevel models

1 Introduction

Every year, the hope for a better life or the escape from wars or conditions of economic hardship push millions of people to cross the boundaries between the nations. This has happened since there were boundaries to cross and, perhaps, we can say that the drive to emigrate is itself a characteristic of the human kind.

However, in the last thirty years, the phenomenon has taken on impressive dimensions and is probably the most present issue at stake in the global political agendas. Modern means of transport, the globalization of economies, and the aging of Western populations will make this issue even more pressing in the coming years. So, the integration of immigrants in the hosting countries is crucial both for the economic systems and for a long-term growth of the social welfare.

Indeed, the best way to evaluate how well the immigrants are integrated into a society is certainly not that to compare their performance in the labor market (or in the economy in general) with those of the natives. Reasons for justifying a performance gap between native and immigrants workers are clear: difficulty in using the language of the host country, qualifications or work experience that are not recognized or exploitable are the most important reasons to explain the observed gaps. These motivations, however, should not apply to school performance of their children and the success of immigrant integration policies will be increasingly mirrored by the school performances of no-native students.

According to the Organisation for Economic Cooperation and Development (OECD), on average, in the last two decades, the percentage of 15-year-old students with a migratory background has increased by more than 2 points starting from 2000 OECD [2015, 2012a]. This is a very important evidence for education policies because at the same time a substantial performance differential between students with immigrant background and natives is also observed. On average, immigrants tend to underperform their native peers even after the socio-economic conditions are controlled.

Assessing what are the causes of the observed gaps is very difficult because the social groups of immigrant students are very heterogeneous, educational systems differ among countries, and there are different ways in which resources are distributed and educational policies are defined. Therefore, the contexts in which the

immigrant students learn are different both from the historical-political point of view and looking at the governance of the school-system.

In this paper, we will try to assess in a time span perspective the gap in school performances between native and immigrant students in five different European countries. Two of which are considered as new destination countries, namely Italy and Spain. Both have been, for most of the twentieth century, emigration nations and only after the fall of the Iron Curtain they became destinations for migrants from South America, Eastern Europe, Middle East, and Africa. The others three countries have a consolidated albeit different migration history having long been a destination for important migratory flows. On one side, France and United Kingdom experimented incoming flows of migrants that reflected the colonial history of the countries. On the other, Germany rampant industrialization process, has long acted as a magnet for foreign workers since the beginning of the second half of twentieth century. This aim has been pursued by adopting two multilevel regression models which consider students' test scores as Level-1 units and schools as Level-2 units. Differences in student test scores have been analysed taking into account a wide range of students and schools socio-economic and cultural characteristics and introducing interaction terms between immigrant status (native, 1st generation or 2nd generation immigrant), country (France, United Kingdom, Germany, Italy and Spain) and waves (2009, 2012, 2015). The approach allowed to capture the effect of having an immigrant background in the five countries across waves.

2 Data

Since the year 2000, the Organisation for Economic Cooperation and Development (OECD) carries on its Program for International Student Assessment (PISA). It is administered every three years to provide comparisons of students' achievement among the participating countries. In this analysis data collected in three rounds of the PISA survey have been considered, say 2015, 2012, and 2009. PISA surveys could be considered as the most comprehensive and accurate international assessment of students's skills in reading, mathematics, and sciences. In addition PISA assesses not only students' competences, but also collects information on their socio-demographic background and on the school context in which they are enrolled. In each round PISA carries on a detailed assessment of each of the three subjects and the 2009 survey marks the return to a focus on reading so that our analysis considers three different subject focuses (nonetheless, in each round the three subjects are, however, considered).

The PISA target population is that of students aged between 15 and 16 years at the time of the survey and who have completed a minimum of 6 years of formal education regardless of the type of institution where they are enrolled. The age of 15-16 represents, for many countries, the transition time from a basic education to a more advanced one. Detailed information on PISA sampling design and procedures are

available in a collection of thematic and technical reports at PISA-OECD website [OECD, 2012b, 2014, 2017].

We consider as dependent variables the student's performance in reading and mathematics tests. OECD defines reading literacy as the ability in "[...] understanding, using, reflecting on and engaging with written texts, in order to achieve one's goals, to develop one's knowledge and potential, and to participate in society ..." [OECD, 2012b]. Math literacy is "[...] the extent to which students can use their mathematical knowledge and skills to solve various kinds of numerical and spatial challenges and problems [...]" [OECD, 2017].

In PISA surveys, in order to minimise the assessment burden on each student and to avoid that the scaling of skills would be influenced by the "booklet effect" each student is asked to handle only a part of the whole test in the three domains assessed (reading, maths, science) following a systematic booklet assembly and rotation procedure. For that reason rather than one single measure of achievement, the PISA databases provides 5 plausible values (PV) of student's score in each topic. The use of PV allows to take into account the uncertainty associated with the estimate of a measure of achievement for each student by reproducing the likely distribution of students' competencies in each topic [Monseur and Adams, 2009, OECD, 2017].

At student level we considered (for each wave) the following information:

- Country of residence (COUNTRY): France (FRA), Germany (DEU), Italy (ITA), Spain (ESP), United Kingdom (GBR).
- Immigrant status (IMMSTAT): according to OECD-PISA classification we differentiate between immigrant and non-immigrant students based on the information on the country of birth of both their parents; if both parents were born in a country different than the country where the student take on the test, then the student is classified as immigrant. Non-immigrant or natives (IMMSTAT= 0) are the remainder. Among immigrants we distinguish between second-generation (IMMSTAT= 1) and first-generation students (IMMSTAT= 2). Second-generation are immigrant students born in the country of PISA assessment; first-generation students are foreign-born alike their parents.
- Language spoken at home (LHOMEDIFF): an additional relevant difference among immigrant students is the language they speak at home. We distinguish between immigrants who speak at home a foreign language (LHOMEDIFF= 1) (i.e. different from the PISA assessment language; dialects or regional languages are considered as test language).
- Gender (GENDER= 0: female).
- Parental educational level (PARED): highest parental education in years of schooling.
- Parental occupational status (HISEI): highest parental occupational status. In PISA surveys, occupational data for both parents are obtained from responses to open-ended questions. Responses are then coded to four-digit ISCO codes (International Standard Classification of Occupations) and mapped to the international socio-economic index of occupational status (ISEI) Ganzeboom and Treiman [2003]. Higher HISEI scores indicate higher occupational status.

- Family possession of culture related items (*CULTPOSS*): the PISA index of family cultural possession is derived from what the students report on the availability of specific household items at home such as classic literature, books of poetry, works of art, musical instruments, etc. Highest values indicate an higher family endowment of culture related items.
- Family possession of educational resources (*HEDRES*): the PISA index of home educational resources (a desk to study at, a computer, educational software, a dictionary, etc.). Highest values indicate higher availability of educational resources at home.
- The percentage of non native students in the school (*SCHNONATIVE*).

In PISA databases, the *HISEI* index is calculated using Principal Component Analysis (PCA). Except for the parental education variable (*PARED*), the remaining variables as well as the PV are calculated by using a model-based scaling procedures belonging to the family of Item Response Theory (IRT) applied to dichotomous or Likert-type responses to questionnaire items OECD [2017].

3 First findings

In this framework we discuss only the main findings we have observed by applying two multilevel regression models for assessing trends in the divergences in mathematics and reading across the five countries in the three years between students with different immigrant background. Results observed for mathematics and reading are listed in Tables 1 and 2. In the following we rapidly focus the attention only on the estimated effect of the country \times year \times immigrant status combination. Looking at the effect jointly exerted overtime by the combination of country and immigrant status we considered, both in reading and mathematics, the achievement of a German native in 2009 as the baseline. Figure 1 displays the caterpillar plot of the estimated 44 parameters, each one with its associated confidence interval limits. In total 44 parameters are displayed for reading and 44 for mathematics: $44 = [(countries \times immigrant\ status \times wave) - 1] = [(5 \times 3 \times 3) - 1]$. Parameters are displayed in ascending order of magnitude. Looking at reading competencies, we can spot that the highest ranks are hold by native or second generation immigrants of Germany, France, and Great Britain (although the only significant difference for these outperforming students are those of natives from Germany in 2015 and from France in 2012). Whenever we consider trends of performances according to immigrant status within each countries, situations are noteworthy differentiated. Figures 2 groups the estimated parameters by immigration status for reading. The caterpillar plots clearly show divergences across countries according to the immigrant backgrounds. In Germany we can observe that performances in reading of natives increase from 2009 to 2015; the same occurs for second generation immigrants while performances of first generation steadily underperform.

Table 1 Reading. Model parameter estimates

Variable	Beta	se	z-score	pvalue	95% CI	
					lw	up
Intercept	494.898	3.574	138.472	0.000	487.893	501.903
PARED	0.370	0.062	5.981	0.000	0.249	0.492
HISEI	0.506	0.010	50.887	0.000	0.486	0.525
CULTPOSS	10.436	0.191	54.639	0.000	10.062	10.811
HEDRES	5.258	0.191	27.550	0.000	4.884	5.632
LHOMEDIF = Yes	-13.706	0.929	-14.751	0.000	15.527	-11.885
SEX = M	-22.740	0.330	-68.895	0.000	23.387	-22.093
SCHNONATIVE	-72.754	4.123	-17.647	0.000	-80.835	-64.674
DEU.NAT.09 (<i>bas.</i>)	—	—	—	—	—	—
DEU.NAT.12	8.829	4.819	1.832	0.067	-0.615	18.274
DEU.NAT.15	16.241	4.665	3.481	0.000	7.097	25.385
⋮*	⋮	⋮	⋮	⋮	⋮	⋮
Random-effect Parameters			Estimate	se	95% CI	
Between Schools Std.Dev.			47.631	0.438	46.782	48.495
Residual Std.Dev.			63.912	0.110	63.696	64.129

*The estimates for the other countries and the related 95% CI have been plotted in the Figure 1.

Table 2 Mathematics. Model parameter estimates

Variable	Beta	se	z-score	pvalue	95% CI	
					lw	up
Intercept	486.682	3.487	139.557	0.000	479.847	493.517
PARED	0.301	0.061	4.908	0.000	0.181	0.422
HISEI	0.542	0.010	54.967	0.000	0.523	0.561
CULTPOSS	8.799	0.189	46.452	0.000	8.428	9.170
HEDRES	6.292	0.189	33.241	0.000	5.921	6.663
LHOMEDIF = Yes	-7.676	0.921	-8.330	0.000	9.482	-5.870
SEX = M	20.874	0.327	63.776	0.000	20.233	21.516
SCHNONATIVE	-76.029	4.024	-18.896	0.000	83.915	-68.143
DEU.NAT.09 (<i>bas.</i>)	—	—	—	—	—	—
DEU.NAT.12	0.125	4.698	0.027	0.979	-9.082	9.332
DEU.NAT.15	-3.374	4.547	-0.742	0.458	-12.287	5.539
⋮*	⋮	⋮	⋮	⋮	⋮	⋮
Random-effect Parameters			Estimate	se	95% CI	
Between Schools Std.Dev.			46.312	0.425	45.488	47.152
Residual Std.Dev.			63.393	0.109	63.178	63.608

*The estimates for the other countries and the related 95% CI have been plotted in Figure 1.

4 Conclusion

On the light of the main findings we can state that in general in the traditional immigration countries we see that first generation immigrants steadily lag behind. Nonetheless, we observe similar performances for natives and second generation immigrants: the upper limits of the confidence intervals for second generation over-

lap with the bottom limits of the confidence intervals estimated for natives (albeit in France differences are sensibly wider).

In Italy and Spain differences in performances according to immigrant status are wider; immigrants underperform and no trends of improvement turn up overtime. Nonetheless, we shall note that in Spain reading performances of second generation immigrants are similar to those of natives in 2015 (likely due to the fact that a large part of the immigrant population in Spain comes from Latin America). In mathematics performances of natives and immigrants are in somewhat less noticeable.

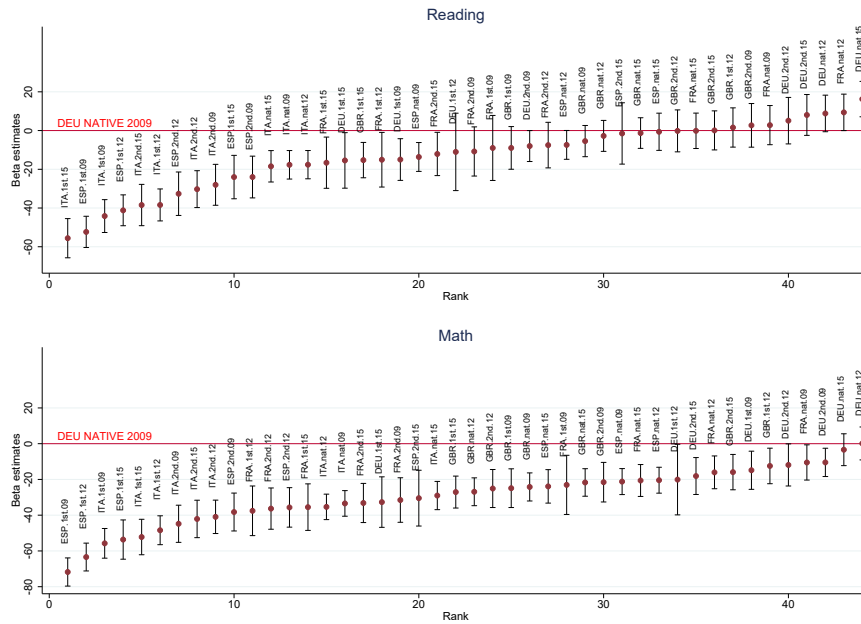


Fig. 1 Caterpillar plot of estimated parameters for immigrant status-country-year effect. Baseline: German-Native 2009

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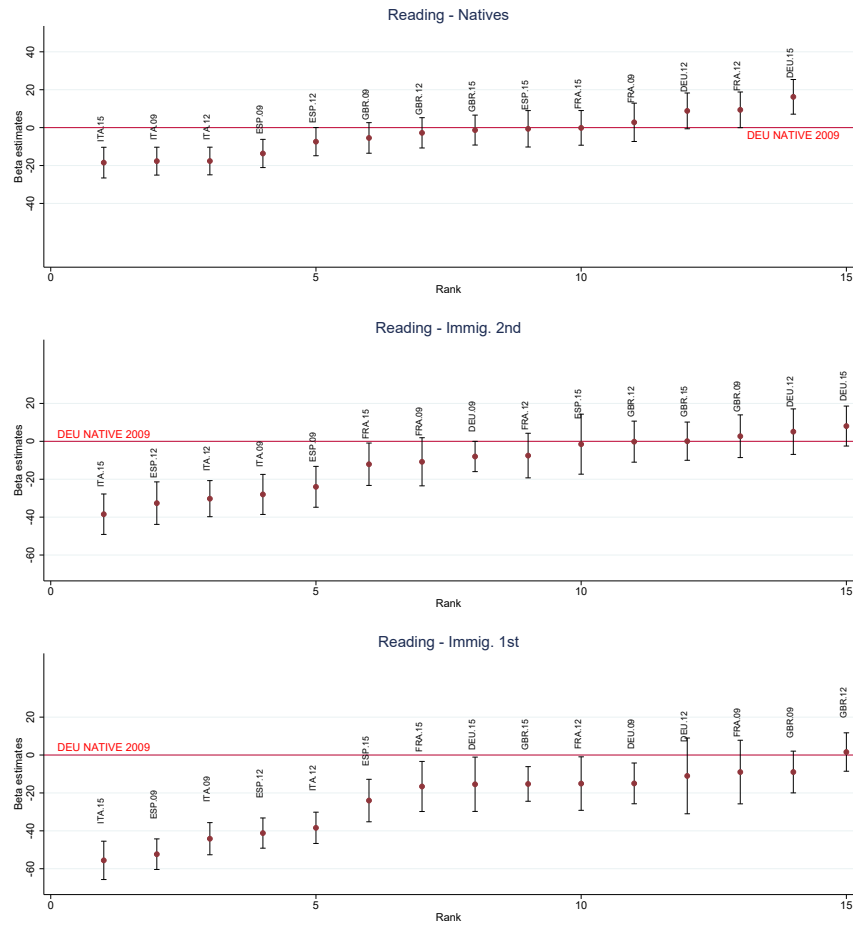


Fig. 2 Caterpillar plot of estimated parameters for country-year effect by immigrant status. Baseline: German-Native 2009 – Reading

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