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Exploring immigrant gaps in education: empirical evidence

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Abstract

Migratory background is known to influence students' school performance, both in reading and mathematics and science literacy. Using data from the OECD PISA (Programme for International Student Assessment) 2018, we analyze the differences in scores between immigrant and native-born students in Italy, considering the variables that most influence the existing gaps. To better understand this achievement gap through econometric analyses as the Oaxaca-Blinder decomposition (Oaxaca, 1973; Blinder, 1973), our study analyzes the role played from other variables (i.e. gender, social and economic background, motivational variables, school context, school address) and how these differently influence the education gap of students with a migrant background, in the different subjects. The decomposition results suggest that the differences on PISA assessment from immigrant and non-immigrant student are all significant but larger in reading and science than in mathematics. On these matters, the study confirms the relevant weight of the language spoken at home by the student.

Keywords: Migratory Background, School Performance, Reading Literacy, Mathematics Literacy, Science Literacy, PISA Test

1. Introduction

Geography and classroom management with high shares of migrants are highly correlated. The subject is indeed very useful in the promotion and dissemination of values linked to active citizenship, as many studies claim. Indeed, it would not only help to describe the earth, but also to discover new worlds (Alaimo et al., 2015).

Specifically, by studying this subject, anthropological aspects relating to world populations are also known, and clearly, this type of teaching becomes very useful in classes that experience the proximity of peers from other geographical areas.

Many studies currently indicate that foreign families and young people choose education and training as their goal. This choice is motivated both to possess active citizenship tools and to

compensate through study for the formal social rights they are denied. Moreover, a strong motivation lies in the increased job opportunities that could overcome the immigrant status to which they would eventually be condemned. To sum up, gaining recognition in the social sphere also concerns the possibility of greater approval from others (Colombo, 2014).

Although foreign families are motivated, the drop-out rate in 2020 was three times higher than that of the native population. Moreover, it would appear that it is the 17-18 year olds who drop out of education and training systems prematurely (Ministry of Education, 2021). School participation is thus part of a set of indicators useful to measure the level of integration and is considered as an element of stability and improvement of the migrants' situation (Cesareo and Blangiardo, 2009).

It seems important to invest in reception, inclusion and integration processes. Firstly, because in numerical terms migrants can integrate and increase pupils per class. Secondly, it is important to remember that migrants can significantly enrich an "internationalised mindset". Many researches highlight this strong relevance of immigrants in terms of new ideas and perspectives arising from the "suspended" adolescents' condition of immigrant origin (Besozzi et al., 2009; Colombo, 2010).

Apparently, students involved in "mixité scolaire" demonstrate greater adaptability in terms of inequality of entry, which can be overcome without further specific action. Of course, remain several factors that exacerbate or mitigate the problems associated with school migration. First, there are the socio-demographic aspects relating to the ratio of foreigners to total Italians. Then there are the cultural factors in terms of adequate preparation for reception by school facilities, teachers and families. Moreover, among the most important factors, there is that relating to the duration of immigrants' school insertion, where time stands out as a stabilising and chronising factor (Colombo, 2014).

The teaching of geography would indeed promote opportunities for inclusion in schools through the enhancement of differences. Working and living with children often means coming into contact with different types of differences: gender, physical ability, cultural heritage, family background, or economic availability (Gallinelli and Malatesta, 2018).

Geography becomes fundamental in this historical moment in which the processes of cultural globalization are creating a complex socio-territorial context which is increasingly difficult to interpret and teach (Giorda and Zanolin, 2020).

Despite the great efforts that are made in terms of education to be able to transmit the values of active citizenship, the condition of "pupils of foreign origin" if accompanied by long periods of school failure could lead to serious damage to the life of the individual from an economic and social point of view, as well as affecting society as a whole for the same reason.

According to the sociological approach, education (understood as participation in education) and educational success would be essential for the redistribution of social resources.

Furthermore, according to the same approach, the presence of foreigners in the classroom and the formation of classes made up of different ethnic groups would be seen as a penalization because they encourage the growth of further inequalities such as the cultural belonging, the differences in terms of citizenship status and socio-economic differences.

In this sense, many studies aim to investigate further which variables most influence inequality in learning and final results and try to propose policy making solutions (Colombo, 2014).

Immigrant and non-immigrant students gap in academic performance is widely studied in literature (Marks, 2005; Mostafa, 2010) but understanding the factors that most affect this gap is a debated topic on which there is not clear interpretative agreement.

Our paper is aimed to estimate the differential between immigrant and non-immigrants students' scores in the fields of science, mathematics and reading. A high level of reading performance is important for all disciplines for which reading is required. Reading can therefore influence academic achievement in all subjects such as science, history, geography etc. For these reasons, we think it is important to verify which variables most influence the difference between natives and foreigners, thus contributing to school failure and integration difficulties.

2. The educational disadvantages of young migrants

Many studies tend to compare school systems by referring to macro-indicators, comparing educational models and political systems at an international level (Entorf and Minoiu, 2005; Micklewright and Schnepf, 2006). Other studies focus their theses on the unequal availability of human capital and of resources for foreign students, arguing that in many countries the parents of immigrant students tend to be less educated, work in lower-level jobs, earn lower incomes, hold generally less wealth (Ammermueller, 2007; Archambault et al., 2017; Murat and Frederic, 2015; Teltemann et al., 2022).

The line of research focusing mainly on background highlights how socio-economic disadvantages are sometimes compounded by other factors, such as parental attitudes towards schoolwork or the educational aspirations of parents and immigrant students themselves. In these cases, the greater propensity to attend vocational schools has been highlighted by many studies (Barban and White, 2011; Kao and Thompson, 2003).

The preference for vocational schools seems to be associated with the measure of family income and generates a self-selection in which brighter students are more likely to choose "better" school paths (Bratti et al., 2007). This is also the case in Italy, where in particular, the risk of school delay or dropping out for foreign students is significantly higher, even net of social origins (Azzolini and Barone, 2013).

However, educational choices seem to be mediated accurately by educational attainment and, therefore, mainly by academic difficulties rather than a preference for non-academic paths (Cebolla-Boado and Garrido Medina, 2011). Deepening the link between these elements seems undoubtedly relevant. Human capital disadvantage added to educational disadvantage is also reflected in access to the labour market and with inevitable implications for wages (Heckman and Mosso, 2014).

The disadvantage in terms of human capital added to the educational disadvantage is also reflected in access to the labor market (Heckman and Mosso, 2014) with inevitable implications on wages (Machin and Puhani, 2003).

Furthermore, less wealth and human capital in many cases also means a gap in the possession of digital devices, or internet connections (Ragnedda, 2018), and there is a growing number of studies that focus on the role of technology also about access to information, all learning, to socialization, which seems to be positively associated with the acquisition of skills, even if only in part (Hu and Yu, 2021).

Finally, language is undoubtedly one of the main mechanisms behind the educational disadvantage of students with a migrant background, and among those most studied. It is well established that migrant students' level of knowledge of the host country's language influences their academic success, but it is important to understand to what extent, and the possible role in different school subjects. Limited language proficiency may lead to differences in academic performance, not only in literacy but also in other areas, such as mathematics, in which progress may be impeded by limited literacy skills (Gandara et al., 2003).

Research that focusses on the role of language distinguish between the students' familiar language used at home and the language used at school (generally referred to as L1 and L2, respectively). In fact, the language spoken at home could reflect not only a greater or lesser competence in linguistic disciplines, but also a greater or lesser degree of integration of the student's family. The relationship between language use and academic performance is very complex and cannot be resolved with a dichotomous approach, as it seems that linguistic diversity sometimes acts as a resource for academic performance, if on the other hand in the school environment if used with sufficient balance in the language of the host country (Agirdag and Vanlaar, 2018).

Evidence from the Program for International Student Assessment (PISA), which measures 15-year-old students' ability to use their reading, math and science knowledge and skills, provides with a scenario of persistent immigration gaps in schooling between different countries. Investigating the performance of students, it would appear that in most countries the scores of immigrant students tend to be lower than those of native-born areas.

However, the gap was not observed in all OECD countries, or has different magnitudes. The different disparities observed in countries are the subject of possible reflection on the mechanisms and channels through which disparities are most amplified.

In 2018, across OECD countries, 48% of 15-year-old immigrant students (first and second generation) cannot speak the language of the PISA assessment received at home (OECD, 2018).

In Italy, the family environment, the high degree of regional heterogeneity and the consequent disparity in terms of the quality of the school system play an important role and influence students' educational outcomes (Agasisti and Vittadini, 2012; Quintano et al., 2012; INVALSI, 2017).

Understanding the factors that increase the gaps between immigrant and non-immigrant students appears very useful for the construction of educational models in the way of facilitating social inclusion and promoting equality in educational and career opportunities for all students. Reflection on these factors appears even more urgent because of the growth of migratory flows appears constant.

The research aims to analyze the academic performance of foreign students in Italy and the relationship with some individual, educational, or socioeconomic variables previously discussed such as background, home language, school climate, digital resources, the class or school they attend. Moreover, we analyze the differentials in distribution of academic performance.

3. Data and Methods

The PISA Survey (Programme for International Student Assessment) is carried out by the OECD every three years. The central aim of this survey is to investigate about the skills in reading, mathematics and science of 15 years old students, and what they can do with what they know.

This paper analyses the survey of 2018. The main dependent variables are alternatively the mathematic, reading and science scores.

Based on the availability of PISA data, the covariates included in the equation of academic scores were the characteristics of the individual, family, academic background (Table 1).

We consider "Students with an immigrant background", those students whose mother and father were both born in a country other than that where the student sat the PISA test. "Non-immigrant students" are students whose mother or father (or both) was/were born in a country other than that where the student sat the PISA test, regardless of whether the student him/herself was born in Italy.

Female	The variable takes value 1 if student is female, 0 for the male.
Escs	PISA index of economic, social and cultural status.
mean_escs	Pisa index of economic, social and cultural school status (ESCS).
Gfofail	Fear of failure. Positive values in this index mean that the student expressed a greater fear of failure than the average student across OECD countries.
Age	Age of students
Belong	Positive values on this scale mean that students reported a greater sense of belonging at school than the average student across OECD countries.
Mastgoal	Learning goals (MASTGOAL). Positive values in the index indicate more ambitious learning goals than the average student across OECD countries.
Disclima	Disciplinary climate. Positive values on this scale mean that the student enjoyed a better disciplinary climate in language-of-instruction lessons than the average student across OECD countries.
cell3p	Variable indicating the possession of 3 or more mobile phones with internet access at home
vocat_school	Variable indicating the vocational school path
lang_at_home	The variable takes value 1 if the language of origin country is spoken at home, 0 otherwise

Table 1. Variables included in the estimates.

In order to estimate the amount of the differential between immigrant and non-immigrants students scores, we applied the OB decomposition (Blinder, 1973; Oaxaca, 1973; Jann, 2008). This method allow us to distinguish which part is due to the differences in characteristics included in model estimations and which part remains unexplained. We estimated the threefold decomposition, dividing math, science and reading scores differences into endowments (E, due to differences in the predictors), coefficient (C, the contribution of the unexplained component) and interaction effects (I, indicating simultaneous differences) between the two groups:

$$E = \{E(X_{NI}) - E(X_I)\} \beta_M \quad (1)$$

$$C=E(X_{NI})(\beta_{NI}-\beta_I) \quad (2)$$

$$I=\{E(X_{NI})-E(X_I)\}(\beta_{NI}-\beta_I)) \quad (3)$$

Our reference group are immigrants. The endowments component designates the expected change in the scores of the immigrant group if the group is characterized by the predictor levels of the non immigrant group. The coefficient effect indicates the expected change in mean scores of the immigrant group if the immigrant group had the non immigrant group's coefficients.

$$R = \{E(X_{NI}) - E(X_I)\} \beta_{NI} + E(X_{NI}) (\beta_{NI} - \beta_I) - \{E(X_{NI}) - E(X_I)\} (\beta_{NI} - \beta_I) \quad (4)$$

To observe the decomposition of the immigrant/non-immigrant students-gap along the distribution we apply the OB decomposition by computing RIF regressions proposed by Fortin et al. (2011). We performed an OB decomposition for 10^{th}, 50^{th} and 90^{th} percentile based on estimates previously obtained (Firpo et al., 2018).

4. Results

We use the Oaxaca-Blinder decomposition (Oaxaca, 1973; Blinder, 1973), originally used in labor economics to decompose earnings gaps, to discriminate the part of the gap that can be explained by differences in observed variables from the part that remains unexplained.

The Oaxaca results (Table 2) show that the differential between non immigrants and immigrants is slightly smaller for mathematics (33 points), and higher for science (39 points) and reading (40 points). Most part of this differential seems to be explained by the variables we considered in the model. In particular for mathematics, the differential connected to the discrimination effect is lower (5 points). While it is higher for the sciences (14 points).

The variables which explain better the differential are the school socio-economic index and the language spoken at home. At school level, as the socio-economic level of the school increases, the difference between non-immigrants and immigrants increases (14 points).

It is interesting to note that if the socio-economic index increases the differential for all three subjects (from 15 to 16 points), the language spoken at home affects only the differential in reading (13 points) and science (15 points).

The classroom disciplinary climate perceived by the students seems to influence the differential by around 3 points for all the subjects considered in the study.

The vocational path increases the differential only in reading.

In the unexplained part, the most significant variable are the language spoken at home which is significant for reading and for science (not for mathematics) and owning three or more cell phones connected to the internet, which we hypothesize create not only a proxy of a higher socio-economic background, but also of greater social and cultural capital.

	OB_pv5math y	OB_pv5rea d	OB_pv5scien ce
	b/se	b/se	b/se
overall			
group_1	495.7816***	487.9717***	477.8865***
	[0.9433]	[0.9632]	[0.9006]
group_2	462.5460***	446.9883***	438.5354***
	[2.9495]	[3.0629]	[2.9545]
difference	33.2356***	40.9834***	39.3511***
	[3.0967]	[3.2108]	[3.0887]
endowments	24.8104***	34.3996***	30.1307***
	[3.4292]	[3.5521]	[3.4268]
coefficients	5.2580*	11.2623***	14.4993***
	[2.8871]	[2.9755]	[2.9009]
interaction	31.672	-46.785	-5.279
	[3.2425]	[3.3372]	[3.2582]
endowments			
female	0.5524	-0.2917	0.3803
	[0.4202]	[0.2469]	[0.3026]
escs	-0.1815	-21.946	-5.4435***
	[2.0602]	[2.1088]	[2.0694]
mean_escs	16.5015***	14.0033***	15.8229***
	[1.8545]	[1.7256]	[1.8099]
gfofail	-0.1285	-0.1709	-0.1494
	[0.1525]	[0.1762]	[0.1626]
age	0.1308	0.0267	0.0761
	[0.1506]	[0.1074]	[0.1208]
belong	11.866	2.6355***	0.4704
	[0.8067]	[0.8675]	[0.7942]
mastgoal	-0.7088*	-0.2778	-0.1804
	[0.3757]	[0.3321]	[0.3185]
disclima	2.7721***	2.6919***	3.0996***
	[0.7204]	[0.7204]	[0.7580]
cell3p	0.3613	0.4954	0.54
	[0.2522]	[0.3117]	[0.3298]
vocat_school	0.7443	4.7124***	0.6452
	[1.0436]	[1.1520]	[1.0396]
lang_at_home	35.803	12.7694***	14.8696***
	[2.5290]	[2.6198]	[2.5692]
coefficients			
female	-16.171	-17.691	0.8935
	[2.7934]	[2.8570]	[2.7788]
escs	-40.017	-43.578	-9.3026***
	[2.6442]	[2.7048]	[2.6490]
mean_escs	15.427	-1.12	30.974
	[2.5962]	[2.6552]	[2.5840]
gfofail	0.0042	0.0103	0.0099
	[0.0776]	[0.1913]	[0.1831]
age	298.512	1.794.539	1.030.495
	[142.5360]	[145.7777]	[141.8121]
belong	0.9329	1.6218**	0.5757
	[0.5868]	[0.6349]	[0.5726]
mastgoal	-1.8706**	-13.348	-0.3742
	[0.8385]	[0.8439]	[0.8093]
disclima	0.8099	0.5817	0.9380*
	[0.5511]	[0.5543]	[0.5546]
cell3p	-78.355	-15.0981*	-20.6758**
	[8.5145]	[8.7097]	[8.4714]
vocat_school	-24.186	6.677	-21.008
	[3.9952]	[4.0895]	[3.9724]
lang_at_home	-18.131	5.9501*	12.7778***
	[3.5296]	[3.6141]	[3.5227]
_cons	-83.263	-1.593.528	-74.389
	[143.1313]	[146.3865]	[142.4048]
interaction			
female	0.0752	0.0823	-0.0416
	[0.1409]	[0.1457]	[0.1327]
escs	3.258	35.479	7.5737***
	[2.1551]	[2.2047]	[2.1690]
mean_escs	-0.7879	0.572	-15.819
	[1.3272]	[1.3567]	[1.3248]
gfofail	0.1086	0.2681	0.2566
	[0.1481]	[0.2377]	[0.2286]
age	0.0226	0.1359	0.078
	[0.1096]	[0.1590]	[0.1259]
belong	-13.573	-2.3597***	-0.8376
	[0.8410]	[0.8876]	[0.8281]
mastgoal	0.7587*	0.5414	0.1518
	[0.3955]	[0.3714]	[0.3307]
disclima	-0.8528	-0.6125	-0.9876*
	[0.5802]	[0.5836]	[0.5840]
cell3p	-0.1598	-0.3079	-0.4217
	[0.1932]	[0.2413]	[0.2826]
vocat_school	0.6751	-18.637	0.5864
	[1.1168]	[1.1537]	[1.1100]
lang_at_home	14.267	-4.6822*	-10.0551***
	[2.7777]	[2.8459]	[2.7809]
N	10146	10146	10146

Table 2. Oaxaca decomposition math, reading and science gap. Elaborations of the authors on PISA data.

The Oaxaca Rif results related to math show that there are from 32 to 36 points of difference between immigrant and non-immigrant students depending on the percentile of the considered score (Table 3). It is important to note that the differential is almost entirely explained by the variables that we have taken into consideration in our study because of the significance of explained part.

The discriminatory effect in mathematics would seem to emerge among those who have the best results, however it is not very significant the unexplained part. The variables that best explain the difference are related to the average of the school socio-economic index, in particular the highest coefficient is up to the median.

Still in the differential of mathematics, the climate classroom it seems to be significant in terms of differential. In particular, it is about 2 or 3 points. For those who have the highest yields, the difference can be made by having a

high number of technological devices in the house. In this case, we have used the presence of several mobile phones as a proxy for a quite high level of Internet-enabled technology devices in the house. In the last part of the distribution, it is also very important the school type.

We will comment on the unexplained part only for the 90th percentile as it is the significant one. In this part, we see weighing more the tenacity and individual characteristics; while the fear of failure, in the unexplained part, would seem to bring closer the two groups.

In the unexplained part, the presence of a large number of smartphone in the family, over three, seems to decrease the differential between immigrant and non-immigrant students in mathematics and reduce the discriminatory effect. As already noted, the presence of digital devices probably flattens the differential because it could be the result of a greater wealth of the family (which could also mean a higher cultural and integration index) and because "internet-connected" devices, such as smartphones, offer information resources and study support. These findings also appear to be supported by those studies which have indicated that moderate, rather than high or no use of ICT, may positively predict academic achievement or scores on computer-based cognition on OECD PISA tests (Odell, 2020).

Reading performance is obviously the most problematic in terms of the difference between immigrant and non-immigrant students (Table 4). The differential decreases as test outcomes increase. The immigrant boys who achieve the lowest results are those who suffer from the greatest differences compared to their native peers. However, the explained part increases in the same way the discriminatory effect concerns only and exclusively the less well-prepared children.

	Math rif_m10	Math rif_m50	Math rif_m90
Overall	b/se	b/se	b/se
group_1	377.1056***	499.5578***	610.6440***
	[2.6671]	[1.6404]	[1.9705]
group_2	341.0488***	466.6339***	575.4964***
	[9.7367]	[6.2761]	[5.9473]
Difference	36.0567***	32.9238***	35.1476***
	[10.0954]	[6.4870]	[6.2653]
Explained	19.6943**	44.9691***	16.8598**
	[9.0100]	[7.0808]	[7.0247]
Unexplained	163.624	-120.452	18.2878*
	[10.7916]	[8.4054]	[10.1221]
Explained			
Female	0.7333	0.737	0.6676
	[0.7067]	[0.6110]	[0.5666]
Escs	-9.523	44.881	10.183
	[6.7977]	[4.5886]	[4.6914]
mean_escs	26.0874***	21.8448***	11.1962***
	[6.9732]	[4.4371]	[2.6771]
Gfofail	-0.0908	-0.2994	0.3694
	[0.4195]	[0.3622]	[0.3803]
Age	0.3468	0.1675	0.049
	[0.5026]	[0.2929]	[0.2458]
Belong	2.879	20.947	-0.0615
	[2.7971]	[2.0222]	[1.6005]
Mastgoal	-12.709	-0.826	-0.8703
	[1.5267]	[0.7870]	[0.6988]
Disclima	3.7920*	3.0392**	2.6424*
	[1.9713]	[1.3462]	[1.4671]
cell3p	10.496	0.2388	0.6294*
	[1.1507]	[0.4857]	[0.3778]
vocat_school	-64.428	25.102	4.8420**
	[5.0054]	[3.0801]	[2.2194]
lang_at_home	21.337	10.9741*	-36.227
	[9.4343]	[5.6340]	[6.0888]
	Unexplained		
Female	58.278	11.038	-19.355
	[9.9065]	[6.2249]	[6.3268]
Escs	-2.7319*	0.805	-0.9748

	[1.6254]	[1.0838]	[1.1238]
mean_escs	70.977	45.039	17.795
	[6.5831]	[3.9684]	[2.6012]
Gfofail	0.3228	0.2314	-0.5875*
	[0.4551]	[0.3085]	[0.3128]
Age	-225.05	24.362	947.895
	[558.9440]	[350.1076]	[337.9553]
Belong	-0.3288	-0.8656	-0.1757
	[0.9024]	[0.6513]	[0.5256]
Mastgoal	-10.638	-13.735	-1.6655*
	[2.2307]	[1.1359]	[1.0081]
Disclima	-0.0665	-0.0469	-0.0721
	[0.1208]	[0.0817]	[0.1063]
cell3p	-9.442	-48.873	-33.7442***
	[51.7570]	[24.0494]	[10.8768]
vocat_school	-186.285	29.522	54.806
	[13.3338]	[8.2013]	[6.0411]
lang_at_home	-0.7121	14.817	-15.093
	[2.8262]	[1.6335]	[1.7545]
_cons	2.611.376	-183.863	-430.973
	[571.8139]	[348.7159]	[336.1017]

Table 3. Oaxaca RIF decomposition math gap. Elaborations of the authors on PISA data.

As far as the comment of the explained part concerns: the differential is mainly due to the school socio-economic index, in particular this variable weigh for those who are in the lowest part of the distribution. The sense of belonging to the class also increases the differential in the first part of the distribution.

Even the climate classroom would seem to be an element that increases the differential. Language spoken at home also appears to increase the differential in the 50th and 90th percentiles. On the other hand, observing the unexplained part, the language spoken at home would seem to decrease the discriminatory effect in the first part of the distribution. At the 90th percentile, on the other hand, it is noted that the discriminatory effect increases

	Reading rif_m10	Reading rif_m50	Reading rif_m90
Overall	b/se	b/se	b/se
group_1	363.1784***	492.1031***	604.5344***
	[2.8701]	[1.6845]	[1.9452]
group_2	321.2888***	451.6212***	567.2862***
	[10.2849]	[5.0479]	[7.0938]
Difference	41.8896***	40.4819***	37.2482***
	[10.6779]	[5.3215]	[7.3557]
Explained	172.171	34.5175***	43.2685***
	[11.6699]	[5.8235]	[9.3929]
Unexplained	24.6726*	59.644	-60.203
	[14.4056]	[6.6486]	[14.6767]
Explained			
Female	-1.273	-0.0261	0.0098
	[1.0452]	[0.2419]	[0.3692]
Escs	-124.354	-16.824	79.941
	[9.0809]	[3.4780]	[6.0031]
mean_escs	15.6372**	14.8470***	10.9067***
	[6.5519]	[3.2947]	[3.0610]
Gfofail	0.0244	-0.3095	-0.3265
	[0.4191]	[0.3372]	[0.5142]
Age	0.7586	-0.2851	0.2554
	[0.7764]	[0.3095]	[0.4100]
Belong	7.1834**	18.603	16.504
	[3.2358]	[1.5021]	[2.1460]
Mastgoal	0.4369	-0.7184	-0.2272
	[1.3211]	[0.6725]	[0.6661]
Disclima	3.8798**	2.1247*	18.574
	[1.9456]	[1.0946]	[1.4475]
cell3p	18.991	0.1995	-0.2065
	[1.4686]	[0.3322]	[0.3828]
vocat_school	32.811	37.579	6.0054**
	[4.6089]	[2.4578]	[2.5642]
lang_at_home	-21.751	14.7496***	15.3495**
	[9.4182]	[4.6624]	[7.2646]
Female	-136.311	26.791	0.3769
	[10.3852]	[5.2167]	[7.8309]
Escs	-25.375	-0.4018	0.7441

	[2.1339]	[0.8426]	[1.4076]
mean_escs	-54.332	0.3736	11.491
	[6.4528]	[3.0510]	[2.9830]
Gfofail	0.2944	0.332	0.4021
	[0.4637]	[0.2756]	[0.4853]
Age	-660.107	552.9237**	-312.138
	[605.2173]	[272.8401]	[473.9109]
Belong	-13.844	-0.7526	-0.5225
	[1.0275]	[0.4942]	[0.6933]
Mastgoal	11.955	-14.865	-11.837
	[2.0076]	[0.9852]	[1.0227]
Disclima	-0.0482	0.0186	-0.0236
	[0.1095]	[0.0578]	[0.0776]
cell3p	-753.652	-31.404	96.593
	[54.6865]	[16.7774]	[19.3843]
vocat_school	10.521	0.3102	92.943
	[12.5251]	[6.6438]	[6.8112]
lang_at_home	-5.2757*	21.325	3.5160*
	[2.8983]	[1.3941]	[2.0391]
_cons	7.764.439	-547.0239**	2.827.054
	[624.3254]	[274.5976]	[473.1642]

Table 4. Oaxaca RIF decomposition reading gap. Elaborations of the authors on PISA data.

As far as the sciences are concerned, we again observe that the unexplained part of the distribution is significant in the lowest part (Table 5). The unexplained portion represent for more than 60%. In the remaining percentiles, it does not observe any significant coefficient effect on the differential.

Once again the variable that has the greatest impact is the socio-economic index of the school. The foreign language spoken at home increases the differential from the median upwards. In the unexplained part of the 10th percentile, no variable seems to be significant, evidently there are some aspects that have not been considered in our dimensions, which implement the coefficient effect.

	Science rif_m10	Science rif_m50	Science rif_m90
Overall	b/se	b/se	b/se
group_1	360.7385***	480.5886***	586.6152***
	[2.5496]	[1.6698]	[1.8916]
group_2	322.9535***	444.8824***	555.4217***
	[5.9081]	[5.5503]	[6.3523]
Difference	37.7850***	35.7063***	31.1935***
	[6.4348]	[5.7961]	[6.6280]
Explained	15.7903**	37.5894***	26.3598***
	[7.2037]	[6.4565]	[8.9282]
Unexplained	21.9947***	-18.832	48.337
	[8.2468]	[7.3053]	[12.4833]
Explained			
Female	0.4084	0.346	0.7801
	[0.4221]	[0.3603]	[0.6440]
Escs	-80.059	-61.629	-3.052
	[5.5070]	[3.9032]	[5.1377]
mean_escs	13.9792***	16.2839***	13.6757***
	[3.9112]	[3.5809]	[3.0570]
Gfofail	0.1609	-0.4365	-0.0809
	[0.2738]	[0.4217]	[0.2768]
Age	0.116	-0.02	-0.1777
	[0.2664]	[0.2132]	[0.2919]
Belong	17.682	0.2887	-1.92
	[1.8369]	[1.5711]	[1.7035]
Mastgoal	0.3142	0.2526	-0.0636
	[0.7073]	[0.6886]	[0.6460]
Disclima	18.831	5.0059***	14.676
	[1.2503]	[1.3995]	[1.5199]
cell3p	0.6985	0.1787	0.099
	[0.6487]	[0.3967]	[0.3532]
vocat_school	-24.508	13.538	4.6308**
	[2.9734]	[2.5046]	[2.3368]
lang_at_home	69.186	20.4992***	11.0008*
	[5.1464]	[5.0883]	[6.2913]
Female	49.107	0.4876	62.868
	[6.6751]	[5.5377]	[6.5460]
Escs	-19.009	-1.8757**	-17.048

	[1.3328]	[0.9419]	[1.2230]
mean_escs	-42.265	18.801	43.472
	[3.9428]	[3.3006]	[2.8964]
Gfofail	0.1062	0.5920*	0.0029
	[0.2853]	[0.3159]	[0.2930]
Age	1.326.457	286.823	4.767.023
	[357.9257]	[294.3908]	[347.7988]
Belong	-0.4166	-0.3389	0.4199
	[0.6206]	[0.5132]	[0.5513]
Mastgoal	10.029	0.2634	-0.0104
	[1.1416]	[1.0440]	[0.9942]
Disclima	0.039	-0.1345	0.0034
	[0.0782]	[0.1560]	[0.0775]
cell3p	-0.4591	-84.065	-170.738
	[28.8924]	[20.0899]	[18.7524]
vocat_school	-72.171	-2.171	60.261
	[8.3723]	[6.8067]	[6.2997]
lang_at_home	-0.2998	4.6918***	24.444
	[1.8303]	[1.5012]	[1.7939]
_cons	-102.19	-283.695	-472.61
	[357.8577]	[296.9187]	[350.4309]

Table 5. Oaxaca RIF decomposition science gap. Elaborations of the authors on PISA data.

5. Conclusions

The differences on PISA assessment in reading, mathematics and science are larger in reading and science than in mathematics where are slightly smaller (but still significant).

If in mathematics most part of the variables considered in the study seem to be responsible for the gap between immigrant and non-immigrant students, for reading and science seems also to have a relevant weight the unexplained features.

In any case, in line with the literature, the socio-economic variables and the language spoken at home are those that most affect the genesis of the gap between immigrant and non-immigrant students. In the study, however, the school socioeconomic level rather than the family level, plays a significant role and influences academic achievement in all three domains analysed.

According to the literature, at the origin of the school failure could also be the schools' unpreparedness to deal with teaching more attentively to foreign pupils, furthermore, excessive mobility of these students in the territory, and socio-economic and cultural deprivation could further contribute to this dynamic. The nationalities of origin that show difficulties particularly in the first generation improve in the second generation in terms of school performance (Colombo, 2014).

In fact, it seems that in school contexts with a high socio-economic level the gap between immigrant and non-immigrant students is emphasized, while students' scores probably tend to get closer in the most disadvantaged contexts. This occurs more strongly for immigrant students with lower scores, for whom the disadvantage of the immigrant condition probably adds up to that of his individual characteristics.

Therefore, the role of the socio-economic variables regarding to the family does not seem relevant, at an individual level, but rather the school socio-economic context, in which for immigrant students with lower performance, in the lower part of the proficiency distribution, the disadvantage is significantly amplified, and more significantly for mathematics.

Good scholastic performance generally concerns children from the Eastern European area. Conversely, young students of the Latin American area are more at risk of school failure due to material poverty and the low social and cultural capital of families (Colombo, 2014).

On the other hand, the role of socio-economic variables on mathematics learning outcomes, and the possible role of these characteristics through background, is an area of study widely explored by scholars (Karakolidis et al., 2016; Bodovsk et al., 2020). Although, these studies tend to focus mainly on the gender perspective, as we know that the female students have lower scores on average (Zhu, 2018).

We have also seen that the increased availability of technological resources at the household level (such as the possession of more than three Internet-connected smartphones) flattens the differential between immigrant and native students, especially with regard to

achievement in mathematical skills. Given the increasing role of digital technology also in relation to learning, this finding will require future investigation. It may be important to understand the extent to which digital technology is closely linked to greater family wealth, or is a sign of a higher cultural and integration index, as well as a tool in the service of studying, learning and socialising.

In the end, analyzing the role of language, our results confirm the relevant weight of the language spoken at home on reading and science.

Although we do not have empirical evidence, we can deduce that all the subjects in which the students understand, elaborate, and explain themselves in Italian can be strongly influenced by reading results.

The language used at home by the student with his family members therefore constitutes a crucial variable not only in the transmission of knowledge, and in strengthening linguistic mastery, in reading and science, but probably constitutes a proxy for the level of integration and general inclusion of the family in the country of destination (Isphording and Otten, 2014).

To sum up, we also underline how the language spoken at home has no effect on performance in mathematics, where the socio-economic context of learning seems to affect almost exclusively.

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