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"A me ascoltare quei discorsi, essere amico di Nuto, conoscerlo cosí, mi faceva l'effetto di bere del vino e sentir suonare la musica. Mi vergognavo di essere soltanto un ragazzo, un servitore, di non sapere chiacchierare come lui, e mi pareva che da solo non sarei mai riuscito a far niente. Ma lui mi dava confidenza, mi diceva che voleva insegnarmi a suonare il bombardino, portarmi in festa a Canelli, farmi sparare dieci colpi nel bersaglio. Mi diceva che l'ignorante non si conosce dal lavoro che fa ma da come lo fa, e che certe mattine svegliandosi aveva voglia anche lui di mettersi al banco e cominciare a fabbricare un bel tavolo.- Cos'hai paura, -mi diceva, - una cosa s'impara facendola. Basta averne voglia . . . Se sbaglio correggimi.

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La luna e i faló
Cesare Pavese

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Contents

Introduction

Italy has historically been characterized by high emigration rates. However, over the last two decades, it became an important destination country facing new challenges associated with immigrants' integration in the host society.
The way education systems respond and contribute to migration plays a crucial role on the successful integration of immigrant students. This begins with fostering immigrant students' academic achievements that very much influence their future labour market outcomes and social inclusion: in fact, evidence shows that in Italy, immigrant students perform worse than native students at all grades of the educational career. Research has showed that many factors exacerbate immigrant students' educational disadvantage such as the students' socio-economic backgrounds, host country language acquisition, peers' and school characteristics as well as the attendance to pre-school and early childcare programmes.
This doctoral thesis is divided into three distinct chapters empirically examining some of the most relevant aspects concerning immigrant students' integration in the Italian school system. The administrative data in this dissertation are drawn from the Italian National Institute for the Evaluation of the Education System on the entire population of students.

The first chapter provides the rationale, the context and the background knowledge for the rest of the dissetation. It presents and discusses comparative evidence on the performance of first and second-generation immigrant students with respect to that of native students providing up-to-date evidence on the main factors driving immigrant students disadvantage. We find that at every grade and in each subject, students with an immigrant background perform worse than native students, with first-generation immigrant students showing the largest educational disadvantage. The immigrant-native gap shrinks substantially once students', families' and schools' characteristics are taken into account but it never disappears.

The second chapter investigates the impact of early childcare attendance on immigrant students' educational performance. Exploiting cross-sectional and time series variation in the provision of early childcare service across Italian municipalities as an instrument for individual early childcare attendance, we estimate large effects of early childcare attendance on immigrant children's literacy outcomes when 10 years old. In particular, we find a positive and significant effect for children of low educated parents, suggesting that early childcare it is an effective tool to help level the playing field and promote immigrant students' integration in the host country education system.

The final chapter explores whether the ability of native and immigrant peers affects immigrant students' educational achievement in the classroom. We use the within-pupil across subject variation to identify the impact of classmates on students' achievements in 10th grade of lower secondary school. We focus on the impact of peers' average ability and the fraction of peers at the extreme tails of the ability distribution. Our findings show that peers' ability matters and within-group

effects are stronger than across group effects.

Overall, this dissertation sheds light on the nature and determinants of the immigrant students' educational disadvantage suggesting educational policies that might positively affect immigrant students' outcomes and integration.

Chapter 1

Immigrant-native gap: evidence from Italy

Abstract

In this paper we examine educational attainments in literacy and numeracy standardized test scores of first and second-generation immigrant students in Italy using a detailed, large and recent administrative data set. At every grade and in each subject, students with an immigrant background perform worse than native students. The gap shrinks substantially once students', families' and schools' characteristics are taken into account but it never disappears. The educational disadvantage is particularly noticeable for first-generation immigrant students and the language mostly spoken at home, age at arrival and parents' country of birth are the factors that mostly explain the immigrant-native gap. Further, we show that lower educational targets might play a relevant role on the immigrant students' educational success while conditional on past achievements and background characteristics, we report that immigrant students are not less likely than natives to enrol into upper secondary school high-demanding tracks.

Keywords: Immigrant children, Immigrant-native gap, Education.

JEL Classification Numbers: J15, I21.

1.1 Introduction

Over the last two decades, Italy has experienced an unprecedented increase in the flows of migrants that has deeply affected the national educational system. In the school year 2016/17, immigrant students comprise 9,4% of the student population in Italy with an increase of 39% since the school year 2006/2007. As a consequence, policy responses aimed at helping immigrant students' assimilation in the school place plays a prominent role. Research has shown that integration of migrants in the host country largely depends on their academic performances (OECD (2019)). However, large gaps in academic outcomes of immigrant students are observed across all OECD countries. In Italy, immigrant students perform worse than native students at all levels of education and according to PISA 2018 results, they exhibit one of the largest performance gap among OECD countries.

In this paper, we investigate the educational performance gap between immigrant and native students at different stages of their educational career. We focus on the comparison of the gap between natives, first and second-generation immigrant students as a measure of how the educational system is successful at integrating children with an immigrant background. In particular, we analyse which factors such as socio-economic background and school characteristics are the most relevant in explaining the achievement gap in second, fifth, eighth and tenth grade. Moreover, we consider several sources of heterogeneities in the group of immigrant children, such as the generational status and the age at arrival and we assess how they affect their educational disadvantage. We also complement our analysis checking whether we detect in Italy some of the regularities observed for old-immigration countries such as the disproportionate presence of immigrant students in vocational and technical than academic tracks.
We carry out our analysis using literacy and numeracy standardized test scores provided by INVALSI, a national agency in charge of monitoring Italian students' educational performances.

Our article builds on the economic and sociological literature investigating immigrant children educational attainment. Much of the existing literature has focused on countries with a long-standing history in dealing with migration (see, for example, Colding et al. (2009) for Denmark,Bratsberg et al. (2012) for Norway, Dustmann and Theodoropoulos (2010) for the UK and Ohinata and van Ours (2012) for the Netherlands). Results from these studies point out that the most relevant determinant of the immigrant children disadvantage is the family socio-economic background. In fact, in most of the aforementioned countries conditioning on parental background, characteristics and resources, the gap decreases sharply or even disappears. The same pattern of results emerges from comparative studies analysing jointly several countries (see Dustmann et al. (2012) and Schnepf (2007)).

However, evidence from southern European countries are scanter and more nuanced. Although the socioeconomic family background is a key factor, it has a weaker contribution in explaining the immigrant students' disadvantage (Schnell and Azzolini (2015); OECD (2012)). This difference across destination countries lead to investigate which other factors shape immigrant children's outcomes. Some of the most relevant candidates have been identified in the language mostly spoken at home, schools' characteristics, educational aspirations and, for first-generation immigrant students, age at arrival. In our empirical analysis, we investigate the contribution of these factors at different stages of the students' educational career.

The study closest to ours is Di Liberto (2015). Using 2010/11 school year of the INVALSI data set, the article investigates the immigrant students' disadvantage in literacy focusing on the role

played by age at arrival and country of origin. We extend the contribution of this study providing evidence on both literacy and numeracy immigrant students' disadvantage and using the most recent available INVALSI school year: 2016/17. We are able to control for a greater number of controls arguably providing more reliable estimates. Further, we investigate another dimension that may be relevant in explaining immigrant children educational disadvantage: 10th grade students' educational aspirations. Additionally, using a linear probability model, we investigate whether immigrant students are less likely to enrol into high demanding tracks for upper secondary school attendance, conditional on past achievements and socio-economic background.

Our results show that students with an immigrant background have lower educational achievements in literacy and numeracy compared to natives. In particular, across all grades, first-generation immigrant students perform worse than second-generation students that in turn perform worse than native students. To provide some insight into magnitudes, at the beginning of primary school, being an immigrant student reduces, on average, literacy test scores by 0.25% of a standard deviation. Further, our analysis shows that a large fraction of the immigrant-native performance gap is explained by socio-economics factors, language mostly spoken at home, school and class characteristics and parents' area of origin. However, even after accounting for these factors the existing gap does not close entirely, suggesting that the Italian school system struggles at successfully integrating immigrant students.

Our paper proceeds as follows. In section 1.2 we describe the institutional background and the data used in the analysis. Section 1.3 presents descriptive evidence on immigrant students' background and educational achievements. In Section 1.4, we investigate first and second-generation immigrant students' gap in literacy and numeracy with respect to native children. Then, we focus on the role played by age at arrival, immigrant students' educational expectations and upper secondary school track choice on the immigrant students academic disadvantage. Section 1.5 concludes and discusses some potential policy implications of our findings.

1.2 Institutional background and data

The Italian educational system is compulsory from age 6 until the age of 16 and is organized in 2 cycles. First cycle lasts for 8 years and is made up of primary school (5 years) and lower secondary school (3 years) which ends with a nationally-based examination. Students who pass the final exam are admitted to the second cycle of education (upper secondary school) that is compulsory for two years and lasts for five years offering different tracks: the academic (lyceum), the technical and the vocational one. Regardless of the attended track, all students that have completed 5 years of upper secondary school are entitled to enrol into higher education and there is no tracking by ability. However, each track provides different outcomes in terms of employment opportunities and further education. The lyceum is more academic in nature and prepares student for university level courses, the technical track mostly prepares students to work in administrative and technical capacity and the vocational track is directed to provide students with more training and practical skills to faster students' access to the job market. Although no legal barriers to university admission exists, the academic track offers a more general education with many instruction hours dedicated to literacy, numeracy and science providing a better education that translates in better students' future attainments compared to those that attended a technical or a vocational track. In what follows we define as the "high track" the academic track and the "low track" the vocational and

technical track. [1]

1.2.1 Immigrant students in Italy

Over the last decades, Italy has experienced a massive increase in migration inflows. The number of foreign residents increased from 781 thousand in 1990 to more than 5 million in 2018. The majority of immigrants that Italy has attracted are poorly qualified and with a low educational level (although it is similar to the one of natives). In fact, among European countries in 2017, Italy is the country where immigrants have the lowest educational level: 48% has at most primary education and only 14% has tertiary education.[2] Most represented countries of origin are Romania (23%), Albania (8.5%), Morocco (8%), China (5.6%), Ukraine (4.6%) and Philippines (3.26%). [3] Immigrant communities live mostly in Northern and Central regions although the number of foreign residents is increasing also in the South and the Islands. The same sharp increase of the immigrant population has been witnessed also by the educational system. In the school year 2016/17 the number of immigrant students amounted to 826,000 units. They represent 10.8 % of students in primary school and 9.7% in lower secondary school and 7.1% in upper secondary education.

1.2.2 Data

In this paper we use administrative data for the school year 2016/17 on the entire population of students in Italian public and private schools, which are gathered by the Institute for the Evaluation of the Educational System (INVALSI). The school year 2016/17 is the most recent data set available. INVALSI is a compulsory standardized achievement test administered yearly to the entire population of students in second, fifth, eighth and tenth grade. Students are evaluated in literacy and numeracy by means of both multiple choice and open ended questions that vary in difficulty and structure according to the selected grade. The literacy test evaluates reading comprehension, vocabulary and grammar. The numeracy test assesses students' mastering of mathematics skills such as geometry, algebra and problem solving. The INVALSI test is standardized implying that all students answer the same questions in the same time and correction is made externally and using a predetermined procedure. It follows that students' results on the INVALSI test are fully comparable across schools and students attending the same grade. Test scores are expressed as the number of correct answers ranging from 0 to 100 and are adjusted by a cheating factor provided by INVALSI to take into account students' cheating behaviour during the test.

Together with test scores, the data set at hand contains rich demographic information on the student and students' family such as student' gender, date of birth, attendance to early childcare and preschool, language mostly spoken at home and parents' educational level and working status. In the fifth and tenth grade, on the day of the test, a students' questionnaire is also administered collecting additional students' personal information such as a synthetic index of Economic, Social and Cultural background (ESCS) [4] and students' educational aspirations (in tenth grade only).

[1] In 2011, only 6.1% and 15.8% of students that graduated, respectively, from a vocational or a technical school continue for further studies compared to 53.4% of those that graduated from a lyceum (Istat (2015)).

[2] See Frattini and Vigezzi (2018) for further details.

[3] Istat, "Demografia in cifre" (www.demo.istat.it).

[4] The ESCS index is built applying principal component analysis using the information provided by students in the Questionnaire and by schools about families' cultural resources, such as internet connection and the number of books, and parents' educational level and working status. By construction, the index has null mean and unit standard deviation. It implies that a student with a strictly positive individual value of the ESCS index has a socio-

For all grades in the analysis, we also include a number of class and school characteristics such as average size (linear and quadratic), average ESCS index, the share of females per class, the fraction of immigrants and retained students per class, time of instruction per week and the proportion of low educated parents per class.

Concerning immigrant students, INVALSI data allow us to distinguish between first and second-generation immigrant students based on citizenship that in Italy is acquire following the *Ius sanguinis* rule according to which nationality at birth is the same as that of parents, irrespective of the child's place of birth. [5] The INVALSI data set has also information on first generation students age at arrival and parents' and children's area of birth. Unfortunately, the specific country of birth is not available and the information is provided in four large aggregated geographical macro-areas: Italy, European Union (EU), countries in Europe but not in the European Union (non-EU), countries outside Europe (other).

For each of the four grades, Table 1.1 reports the sample proportions in percentage points and the total number of natives and immigrant students by generational status. After eliminating all the observations with missing values in the variables of interest, our sample has about 300,000 students per grade and it emerges clearly that primary school is the educational stage with the highest number of students with an immigrant background. The share of second-generation immigrant students is larger than the share of first-generation immigrant in all grades but they get closer in 10th grade. Over the five school years 2012/13 - 2016/2017, the number of second-generation immigrant students has increased by 35.4% and it is easily foreseen that in the next future this group will be by far the largest group in all educational cycles (MIUR, 2018).
This evidence updates the one in Di Liberto (2015) where in the 6th and 8th grade of the 2010/11 school year the share of first-generation immigrant students was larger than the second-generation one.
Table 1.1 shows another interesting point: the shrinking number of second-generation immigrant students between the lower secondary school (8th grade) and the upper secondary school (10th grade). This reduction in the number of immigrant students is likely to be driven by the higher drop-out rates among immigrant students than among natives, especially in the first two years of upper secondary school (Contini (2013)).

economic-cultural background more favourable than the Italian average. The index is provided at the individual, class and school level.

[5] For the sake of simplicity, we do not break the sample of second generation immigrant students into children of mixed parentage (children with only one foreign-born parent) and children with both foreign-born parents. Children of mixed parentage represent a small fraction of students in our sample (see Table 2) and we stick to the definition of first and second-generation immigrant students made in accordance with Italian citizenship rule.

Table 1.1: Native and immigrant students by generational status and by grade attended a.y. 2016/17

	Sample proportions in %	Total number
2nd grade primary school		
Natives	89.98	263,244
1st generation	1.25	3,646
2nd genration	8.77	25,660
5th grade primary school		
Natives	91.56	297,796
1st generation	1.75	5,683
2nd genration	6.69	21,770
8th grade lower secondary school		
Natives	92.12	315,921
1st generation	2.61	8,942
2nd genration	5.27	18,074
10th grade upper secondary school		
Natives	92.06	280,9741
1st generation	3.46	10,567
2nd genration	4.47	13,615

Source: Invalsi. a.y. 2016/17

1.3 Descriptive evidence

Table 1.2 displays the mean and the standard deviations (in parenthesis) of student-level variables used in our analysis by citizenship and grade. In each grade we distinguish between native, first-generation and second-generation.

First two rows of Table 1.2 show that, on average, native students outperform immigrant students both in literacy and numeracy in all four stages of schooling. Concerning immigrant students, generational status matters. Second-generation immigrant students have higher educational achievements than first generation. Interestingly, the disadvantage between the two groups with respect to native students is similar at the beginning of the educational career, in second grade of primary school. However, already at the beginning of fifth grade of primary school, the gap becomes wider, with second-generation immigrant students steadily narrowing their disadvantage with respect to native students through the end of primary school. On the other hand, first-generation immigrant children educational disadvantage remains large. Concerning demographic variables such as the ESCS index indicating the socio-economic and cultural background of the family and the parents' working status and education, mean differences across native and immigrant children are significant. On average, native students come from more affluent families and are more likely to have working parents with a higher level of education. Further, on average, immigrant and native children differ in the choice of the upper secondary school branch. As explained in sub-section 1.2, the school track choice has substantial consequences on the probability to enrol into higher education and eventually on the labour market outcomes. Last rows of Table 1.2 report that both first and second-generation immigrant children are more likely to enrol in a less demanding track. On the other hand, native students are more likely to enrol into the academic track, the lyceum.

Turning to the description of internal differences between first and second-generation immigrant

children, in terms of socio-economic background, our descriptive evidence show no striking difference. However, relevant differences emerge concerning the preschool attendance rate and the language mostly spoken at home. In fact, second-generation immigrants have a preschool attendance rate similar to the one of natives while first-generation children show relatively low attendance rates, between 79% and 84%. Concerning the share of pupils that mostly speak a foreign language at home, Table 1.2 shows that the majority of first-generation immigrant students speak a foreign language: 74% in fifth grade of primary school and 66% in tenth grade of upper secondary school. Among second-generation immigrant students the same fraction becomes smaller although remaining large in size: 57% in fifth grade of primary school and 39% in tenth grade of upper secondary school.

Table 1.2: Descriptive statistics by grade and citizenship

		Natives		**1G immigrants**		**2G immigrants**	
		mean	**sd**	**mean**	**sd**	**mean**	**sd**
Literacy test score	Grade 2	0.089	(1.00)	-0.435	(0.936)	-0.408	(0.89)
	Grade 5	0.106	(0.96)	-0.506	(1.054)	-0.35	(0.995)
	Grade 8	0.103	(0.96)	-0.589	(1.101)	-0.278	(1.006)
	Grade 10	0.089	(0.98)	-0.501	(0.981)	-0.257	(0.959)
Numeracy test score	Grade 2	0.087	(0.97)	-0.329	(1.03)	-0.315	(1.00)
	Grade 5	0.092	(0.97)	-0.392	(1.040)	-0.257	(1.00)
	Grade 8	0.085	(1.00)	-0.368	(0.969)	-0.186	(0.977)
	Grade 10	0.062	(1.00)	-0.319	(0.917)	-0.148	(0.950)
Female	Grade 2	0.493	(0.50)	0.501	(0.50)	0.488	(0.50)
	Grade 5	0.496	(0.50)	0.491	(0.50)	0.498	(0.50)
	Grade 8	0.493	(0.50)	0.490	(0.50)	0.50	(0.50)
	Grade 10	0.498	(0.50)	0.522	(0.50)	0.496	(0.50)
Preschool	Grade 2	0.969	(0.173)	0.848	(0.359)	0.939	(0.242)
	Grade 5	0.939	(0.240)	0.806	(0.396)	0.931	(0.254)
	Grade 8	0.961	(0.193)	0.793	(0.405)	0.936	(0.245)
	Grade 10	0.975	(0.158)	0.81	(0.392)	0.932	(0.251)
Working mother	Grade 2	0.669	(0.47)	0.278	(0.448)	0.37	(0.483)
	Grade 5	0.638	(0.481)	0.306	(0.461)	0.393	(0.448)
	Grade 8	0.621	(0.485)	0.381	(0.486)	0.444	(0.497)
	Grade 10	0.637	(0.481)	0.485	(0.50)	0.506	(0.50)
Working father	Grade 2	0.951	(0.261)	0.876	(0.33)	0.899	(0.301)
	Grade 5	0.944	(0.229)	0.885	(0.32)	0.893	(0.309)
	Grade 8	0.941	(0.235)	0.888	(0.315)	0.903	(0.296)
	Grade 10	0.942	(0.234)	0.912	(0.284)	0.904	(0.295)
Mother tertiary education	Grade 2	0.283	(0.450)	0.218	(0.413)	0.170	(0.376)
	Grade 5	0.236	(0.425)	0.164	(0.370)	0.152	(0.360)
	Grade 8	0.195	(0.396)	0.138	(0.345)	0.145	(0.352)
	Grade 10	0.275	(0.446)	0.224	(0.417)	0.254	(0.435)
Father tertiary education	Grade 2	0.201	(0.401)	0.186	(0.389)	0.126	(0.332)
	Grade 5	0.178	(0.383)	0.142	(0.349)	0.124	(0.330)
	Grade 8	0.157	(0.364)	0.119	(0.324)	0.123	(0.328)
	Grade 10	0.237	(0.425)	0.204	(0.403)	0.232	(0.422)
ESCS student	Grade 5	0.180	(0.982)	-0.57	(0.892)	-0.486	(0.869)
	Grade 10	0.223	(0.425)	0.204	(0.403)	0.232	(0.422)
Foreign language	Grade 5	0.026	(0.161)	0.747	(0.435)	0.574	(0.494)
	Grade 10	0.014	(0.118)	0.660	(0.474)	0.394	(0.489)
Foreign language	Grade 5	0.026	(0.161)	0.747	(0.435)	0.574	(0.494)
	Grade 10	0.014	(0.118)	0.660	(0.474)	0.394	(0.489)
Lyceum	Grade 10	0.557	(0.497)	0.309	(0.462)	0.412	(0.492)
Technical	Grade 10	0.142	(0.349)	0.307	(0.461)	0.208	(0.406)
Vocational	Grade 10	0.301	(0.459)	0.384	(0.486)	0.380	(0.485)

Notes: The table reports mean and standard deviation (in parenthesis) of main student-level variables used in the analysis. a.y. 2016/17

Immigrant students are not a homogeneous group. As underlined in Table 1.2, a first source of internal differentiation is immigrant students' generational status. A second important element is immigrant parents' country of birth. Immigrant children have to swiftly learn the host country language together with adjusting to a new culture and institutions that might differ substantially from the ones in the country of birth. INVALSI provides the variable country of birth aggregated in four different areas: Italy, European Union, European country non in the European Union and Non-European country. Although we cannot distinguish students' specific country of birth, using different sources of data is possible to retrieve that most represented nationalities are the Romanian for the "EU group", the Albanian for the "non-EU group" and the Moroccan for "non-Europe group".[6]

Lastly, we consider heterogeneities deriving by immigrant children age at arrival. Age at arrival is a key element when analysing immigrant children disadvantage. In fact, mastering the host country language has a crucial impact on the successful economic and social integration of immigrant students (Bleakley and Chin (2004) and Bleakley and Chin (2010)) and age at arrival plays an important role on the speed and fluency with which the language is acquired (Newport (1990); Johnson and Newport (1989)). In particular, learning a new language after the critical period of acquisition ranging from 0 to 6 years old adversely affects immigrant children's successful integration in the host society. Our data report students' age at arrival in Italy and we aggregate the information in four ranges: up to three years, four to six years, seven to twelve years and thirteen years or more. [7]

Concerning students' country of birth, Figure 1.1 shows the relation between literacy and numeracy standardized test scores and first-generation immigrant students' region of birth. Overall, the graph illustrates that, in both subjects, students' that are born in a country different from Italy have lower standardized test scores than native students. The largest disadvantage is observed for literacy test scores and children born in a Non-European country.

[6] ISTAT, "Demografia in Cifre" (www.demo.istat.it).

[7] In second, fifth and eighth grade, students are asked to indicate the exact age at arrival. On the other hand, in tenth grade the student questionnaire provides information only on six age ranges: up to three years, four to six years, seven to nine years, ten to twelve years, thirteen to fifteen years, sixteen years or older. Thus, we aggregate the information in a way that is consistent across the observed years.

Figure 1.1: Literacy and Numeracy standardized test scores in relation to studentsâĂŹ place of birth by grade

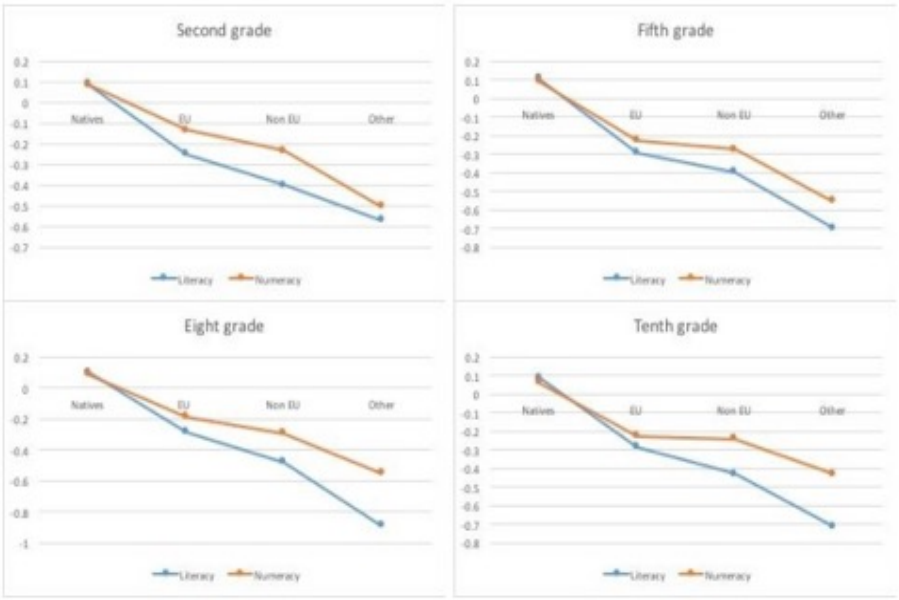


Figure 1.2 shows literacy and numeracy standardized test scores as a function of first-generation immigrant student age at arrival in Italy at different stages of education. It emerges clearly that there is a negative relation between age at arrival and students' achievements both in literacy and numeracy.

On average, the older is the child the lower is its academic performance. This relationship between age at arrival and performance holds all over the analysed grades. Across all grades, the largest immigrant-native gap is observed in literacy. The latter is arguably due to the fact that literacy is the subject where language proficiency is more essential for learning. All in all, evidence from Figure 1.2 suggests that lack of language proficiency is a crucial determinant of immigrant students' disadvantage and that language acquisition occurs under maturational constraints implying that language successful acquisition is privileged if exposition to the host country language happens early in life (Newport (1990)).

Figure 1.2: Literacy and Numeracy standardized test scores in relation to students' place of birth by area of birth

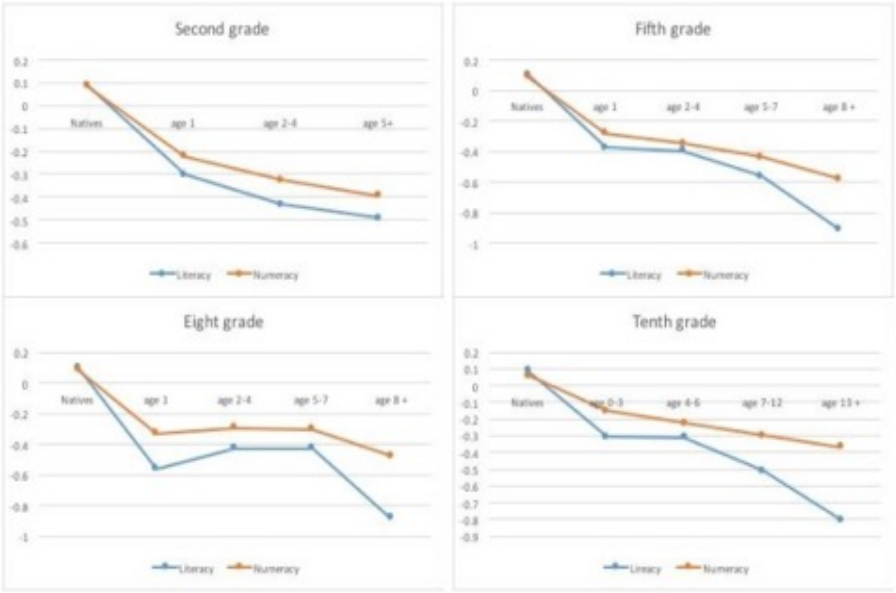


Table 1.3 displays the mean and the standard deviation (in parenthesis) of eighth and tenth grade INVALSI literacy and numeracy standardized test scores by citizenship. Table 1.3 shows that the type of track chosen varies by students' prior achievements with those enrolled in the high track (academic high schools) presenting higher eighth grade scores. Substantial differences emerge also between tenth grade performances of students attending the high and low track and across native and immigrant pupils both of first and second-generation. In particular, students enrolled in the high track outperform students in the low track in literacy as well as in numeracy. As in Table 1.2, we observe that second-generation immigrant students tend to perform better than first-generation but still worse than native students.

Table 1.3: Mean and standard deviation of 8th and 10th grade INVALSI literacy and numeracy test scores by citizenship.

	Natives		**First generation**		**Second generation**	
	High Track	**Low Track**	**High Track**	**Low Track**	**High Track**	**Low Track**
8th grade literacy test score	0.482	-0.083	0.227	-0.465	0.316	-0.297
	(0.871)	(0.887)	(0.930)	(0.974)	(0.863)	(0.907)
8th grade numeracy test score	0.409	-0.028	0.254	-0.212	0.322	-0.153
	(0.976)	(0.920)	(0.951)	(0.916)	(0.959)	(0.891)
10th grade literacy test score	0.553	-0.383	-0.248	-0.642	0.321	-0.530
	(0.813)	(0.855)	(0.848)	(0.844)	(0.842)	(0.840)
10th grade numeracy test score	0.410	-0.246	-0.196	-0.395	0.286	-0.313
	(0.974)	(0.876)	(0.956)	(0.835)	(0.972)	(0.833)

In tenth grade of upper secondary school, students are asked to indicate which is the educational qualification they aim to achieve among no qualification, vocational training, high school diploma, qualifications equivalent to those provided by universities, bachelor degree and master degree. Table 1.4 shows the average educational aspiration (in percentage points) by citizenship.
It emerges clearly that there are striking differences across native and immigrant children concerning their educational targets: immigrant children hold less ambitious expectations than non-immigrant students. Among students with an immigrant background, first-generation immigrant students are less likely to express high-level of achievements motivation compared to second-generation immigrant students. Only 19% of first-generation immigrant students expect to com-

plete tertiary education compared to 25% of second-generation and 33% of native students which are over 10% more likely to complete tertiary education. It is worth mentioning that at a descriptive level we cannot address whether immigrant children have lower aspiration because they have lower performance or vice versa.

Table 1.4: 10th grade Educational Aspiration by citizenship (in percentage points)

	Natives	First generation	Second generation
None	2.27	3.56	3.98
Vocational training	2.27	6.60	3.53
High school diploma	31.28	41.95	36.26
Qualification equivalent to those issued by universities	8.80	12.05	11.18
Bachelor degree	21.46	15.96	19.45
Master degree	33.92	19.89	25.60

1.4 Immigrant-native gap

In this section we conduct a series of cross-sectional regressions of the impact of the immigration status on students' educational achievements. All specifications are done using ordinary least squares. In particular, we report gaps in literacy and numeracy standardized test scores (Y_i^j) between immigrant and native students in second, fifth, eighth and tenth grade. [8]The specifications estimated are of the form:

$$Y_{is}^j = \alpha_{is} + \beta first_{is} + \gamma second_{is} + X_{is}^{'}\delta + \epsilon_{is} \tag{1.1}$$

where i indexes students, s the school attended by student i and j literacy/numeracy test scores. We include a full set of dummy variables indicating first-generation immigrant students (*first*) and second-generation immigrant students (*second*), with native students as the omitted category. Thus, the coefficients β and γ capture the gap between the immigrant student category and native students. In the most fully parameterized models, the vector of controls ($X_{is}^{'}\delta$) includes students' characteristics (gender, quarter of birth, ESCS at the student level, preschool attendance, language mostly spoken at home), families' characteristics (parents' working status and education) and school and classes' characteristics (share of girls at the class level, share of retained students at the class level, share of low educated parents at the class level, school size and its average, class size and its average, share of immigrant students at the class level, time of instruction, ESCS at the school level, school funding type, school track). ϵ_{is} is the error term and standard errors are clustered at the school level. It is worth mentioning that despite the richness of our data our estimates cannot be considered to be causal.

For every grade, we report four different specifications corresponding to four different columns. In each column, we condition on a growing number of explanatory variables. In particular, in first column (model 1) we report the raw immigrant-native gap, in second column (model 2) we include student and families' characteristics, in third column (model 3) we add macro areas dummies and school and class' characteristics and in fourth column (model 4) we add parents' place of birth. As explained in subsection 1.2.2, the number of control variables is richer in fifth and tenth grade because students are asked to answer a questionnaire that is not administered in second and eighth grade.

[8]We have transformed standardized test scores that to have zero mean and standard deviation equal to 1 for each test and grade.

In model 1 we report the regression estimates before adding any control (columns 1,4, 8, 12). In all the observed grades, results show a statistically significant difference between immigrant and native students with first-generation immigrant children performing worse than second-generation that in turn perform worse than native students.

In model 2 (columns 2,5,10 and 14) we introduce students' background characteristics. We control for students' gender, parents' occupational status and educational level, [9] preschool attendance and quarter of birth. The control variables enter with the expected signs. Consistently with the literature underlying that girls perform better than boys in literacy, we find that the literacy gap is in favour of female students (Borgonovi et al. (2018)), attendance to preschool has a positive impact as well as having working and high educated parents. All in all, the performance difference in literacy shrinks once children socio-economic background is taken into account but does not disappear. In fifth and tenth grade we additionally control for an indicator variable -foreign language- identifying students that mostly speak a foreign language at home and the student's ESCS, a synthetic index of students' socio-economic and cultural background. The effect of speaking at home a language different from the one of instruction has a negative and strongly significant impact while coming from a more affluent family positively affects students' achievements. Although controlling for these variable translates in a more pronounced reduction in the immigrant native-gap with respect to the same specification in second and eighth grade (columns 2 and 14) where these are not available, the differential in literacy test scores between immigrant and native students remain significant. Thus, the socio-economic background does not fully account for immigrant students' educational disadvantage.

In model 3 we include class and school characteristics together with some relevant schools' institutional features. INVALSI data provide a rich and detailed set of school and class' characteristics that arguably provide a good proxy for a broader set of environmental factors as well as for class and school's quality. In particular we include the share of girls, the share of retained students, the share of low educated parents, the share of immigrant students at the class level, the school size and its average, the class size and its average, time of instruction, ESCS at the school level and school funding type. We also include macro area dummies to take into account the established educational disparities across geographical areas, with Northern-East students performing better than students in all the other areas and students from Southern areas being the most disadvantaged students (INVALSI Report 2018). Conditioning on school and class characteristics as well as institutional features, reduces the immigrant-native gap in second and tenth grade while it slightly magnifies the disadvantage in fifth and eighth grade.

In model 4 (columns 4, 8, 12 and 16) we additionally control for parents' area of origin. We include two indicator variables indicating whether the immigrant student's father (mother) was born in a European country not in the European Union (Non EU) or in a country outside Europe, with parents' born in a country in the European Union as the excluded category. We interpret the parents' country of origin to capture social and cultural factors attached to the country of origin that might affect students' academic success. The immigrant students' disadvantage decreases once parents' area of origin is taken into account with the effect of having parents born in country outside Europe being negative and strongly significant. In the last column of tenth grade students' achievements, together with parents' area of origin we additionally control for two additional

[9] We include a set of indicator variables for the mother's and father's level of education. We define parents to be low educated if their educational level is lower or equal to lower secondary school diploma, mid educated if their educational level is lower or equal than high school diploma and high educated if their educational level is greater than high school diploma. In our estimates the excluded category is parents with a low educational level.

dummies: *vocational* and *technical*, to take into account students' track choice. Our reference category is the Lyceum, the academic track. It emerges clearly, that the choice of a vocational upper secondary school is strongly associated with students' performance in literacy.

Table 1.5: First and second-generation immigrants-natives literacy standardized test score gaps in second, fifth, eighth and tenth grade.

	SECOND GRADE				FIFTH GRADE				EIGHT GRADE				TENTH GRADE			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)
First-generation	-0.525***	-0.435***	-0.388***	-0.274***	-0.612***	-0.267***	-0.287***	-0.154***	-0.693***	-0.584***	-0.633***	-0.454***	-0.589***	-0.329***	-0.205***	-0.159***
	(0.019)	(0.018)	(0.017)	(0.02)	(0.016)	(0.016)	(0.016)	(0.018)	(0.014)	(0.013)	(0.013)	(0.015)	(0.015)	(0.014)	(0.01)	(0.013)
Second- generation	-0.498***	-0.396***	-0.349***	-0.227***	-0.456***	-0.178***	-0.205***	-0.066***	-0.381***	-0.312***	-0.371***	-0.164***	-0.346***	-0.169***	-0.164***	-0.113***
	(0.008)	(0.00)	(0.007)	(0.013)	(0.009)	(0.01)	(0.009)	(0.014)	(0.01)	(0.009)	(0.009)	(0.013)	(0.012)	(0.011)	(0.007)	(0.011)
Female		0.069***	0.068***	0.068***		0.110***	0.108***	0.108***		0.318***	0.326***	0.326***		0.365***	0.185***	0.185***
		(0.004)	(0.003)	(0.003)		(0.003)	(0.003)	(0.003)		(0.003)	(0.003)	(0.003)		(0.007)	(0.004)	(0.004)
Preschool		0.074***	0.079***	0.073***		0.052***	0.027**	0.023*		0.140***	0.121***	0.113***		0.180***	0.124***	0.120***
		(0.02)	(0.02)	(0.02)		(0.013)	(0.013)	(0.013)		(0.015)	(0.015)	(0.014)		(0.011)	(0.009)	(0.009)
II quarter		-0.039***	-0.039***	-0.039***		-0.014***	-0.014***	-0.015***		-0.026***	-0.024***	0.119***		-0.006	0.001	0.001
		(0.005)	(0.005)	(0.005)		(0.004)	(0.004)	(0.004)		(0.004)	(0.004)	(0.032)		(0.004)	(0.003)	(0.003)
III quarter		-0.175***	-0.176***	-0.176***		-0.119***	-0.120***	-0.120***		-0.111***	-0.108***	-0.024***		-0.061***	-0.025***	-0.025***
		(0.005)	(0.005)	(0.005)		(0.004)	(0.004)	(0.004)		(0.004)	(0.004)	(0.004)		(0.004)	(0.004)	(0.004)
Mid educ. mother		0.168***	0.173***	0.169***		0.157***	0.148***	0.143***		0.270***	0.262***	-0.108***		0.168***	0.030***	0.029***
		(0.005)	(0.005)	(0.005)		(0.005)	(0.005)	(0.005)		(0.005)	(0.004)	(0.004)		(0.006)	(0.004)	(0.004)
High educ. mother		0.363***	0.369***	0.366***		0.256***	0.251***	0.248***		0.443***	0.444***	0.257***		0.201***	0.007	0.007
		(0.007)	(0.007)	(0.007)		(0.007)	(0.007)	(0.007)		(0.007)	(0.006)	(0.004)		(0.008)	(0.006)	(0.006)
Mid educ. father		0.146***	0.152***	0.148***		0.135***	0.132***	0.128***		0.233***	0.233***	0.440***		0.165***	0.027***	0.027***
		(0.005)	(0.005)	(0.005)		(0.004)	(0.004)	(0.004)		(0.004)	(0.004)	(0.006)		(0.005)	(0.004)	(0.004)
High educ. father		0.305***	0.314***	0.313***		0.206***	0.207***	0.206***		0.374***	0.378***	0.229***		0.231***	0.003	0.003
		(0.007)	(0.007)	(0.007)		(0.007)	(0.007)	(0.007)		(0.007)	(0.006)	(0.004)		(0.008)	(0.005)	(0.005)
Working father		0.044***	0.052***	0.052***		0.061***	0.035***	0.036***		0.170***	0.138***	0.378***		0.062***	0.018***	0.018***
		(0.009)	(0.009)	(0.009)		(0.008)	(0.008)	(0.008)		(0.007)	(0.007)	(0.006)		(0.008)	(0.007)	(0.007)
Working mother		0.031***	0.048***	0.046***		0.072***	0.039***	0.038***		0.096***	0.050***	0.139***		0.126***	0.020***	0.020***
		(0.006)	(0.005)	(0.005)		(0.005)	(0.004)	(0.004)		(0.004)	(0.004)	(0.007)		(0.007)	(0.004)	(0.004)
Girl Share			0.031	0.031			0.026	0.026			-0.154***	0.047***			-0.005	-0.006
			(0.033)	(0.033)			(0.025)	(0.025)			(0.024)	(0.004)			(0.016)	(0.016)
Late Share			-0.19	-0.187			-0.561***	-0.555***			-0.404***	-0.154***			-0.960***	-0.958***
			(0.125)	(0.125)			(0.079)	(0.079)			(0.037)	(0.024)			(0.03)	(0.03)
School Size			0.000	0.000			0.000	0.000			0.002***	-0.396***			0.003***	0.003***
			(0.001)	(0.001)			(0.000)	(0.000)			(0.000)	(0.037)			(0.000)	(0.000)
School Size2			0.000	0.000			0.000	0.000			-0.000***	0.002***			-0.000***	-0.000***
			0.000	0.000			0.000	0.000			0.000	0.000			0.000	0.000
Class Size			0.018**	0.018**			0.014*	0.014*			-0.029***	-0.000***			-0.024***	-0.024***
			(0.009)	(0.009)			(0.007)	(0.007)			(0.003)	(0.000)			(0.002)	(0.002)
ClassSize2			-0.001**	-0.001**			-0.000*	-0.000*			0.000***	-0.029***			0.000***	0.000***
			0.000	0.000			0.000	0.000			0.000	-0.003			0.000	0.000
Low Parent Share			0.086***	0.084***			-0.017	-0.019			0.113***	0.000***			-0.338***	-0.339***
			(0.024)	(0.024)			(0.02)	(0.02)			(0.018)	(0.000)			(0.026)	(0.026)
Migrant Share			-0.153***	-0.139***			-0.106***	-0.091***			0.099***	0.109***			-0.166***	-0.165***
			(0.033)	(0.033)			(0.031)	(0.031)			(0.032)	(0.018)			(0.03)	(0.03)
Private school			0.036	0.037			-0.125***	-0.124***			-0.027	-0.027			0.135***	0.141***
			(0.026)	(0.026)			(0.021)	(0.021)			(0.019)	(0.019)			(0.037)	(0.037)
Instruction time			-0.019***	-0.019***			-0.011***	-0.011***			0.006**	0.007***			-0.095***	-0.095***
			(0.005)	(0.005)			(0.003)	(0.003)			(0.003)	(0.003)			(0.013)	(0.013)
North			-0.011	-0.009			0.156***	0.157***			0.195***	0.197***			0.295***	0.295***
			(0.013)	(0.013)			(0.010)	(0.010)			(0.009)	(0.009)			(0.014)	(0.014)
Centre			0.040**	0.040**			0.112***	0.111***			0.127***	0.126***			0.063***	0.062***
			(0.016)	(0.016)			(0.012)	(0.012)			(0.011)	(0.011)			(0.017)	(0.017)
Non EU father				-0.022				-0.008				0.002				-0.045**
				(0.035)				(0.034)				(0.034)				(0.02)
Other father				-0.130***				-0.162***				-0.174***				-0.211***
				(0.033)				(0.033)				(0.032)				(0.047)
Non EU mother				-0.041				-0.065*				-0.124***				0.000
				(0.035)				(0.034)				(0.034)				(0.021)
Other mother				-0.085**				-0.103***				-0.186***				-0.04
				(0.033)				(0.033)				(0.032)				(0.047)
ESCS student						0.150***	0.148***	0.148***						0.143***	0.037***	0.037***
						(0.003)	(0.003)	(0.003)						(0.003)	(0.002)	(0.002)
Foreign language						-0.201***	-0.207***	-0.199***						-0.215***	-0.166***	-0.156***
						(0.009)	(0.009)	(0.009)						(0.011)	(0.009)	(0.009)
ESCS school							0.02	0.02							0.213***	0.213***
							(0.013)	(0.013)							(0.017)	(0.017)
Technical															-0.352***	-0.353***
															(0.018)	(0.018)
Vocational															-0.616***	-0.616***
															(0.021)	(0.021)
Observations	292,550	292,550	292,550	292,550	325,249	325,249	325,249	325,249	342,937	342,937	342,937	342,937	305,192	305,192	305,192	305,192

Notes:This table reports the literacy test score gaps for first and second-generation immigrant at different stages of the educational career. Column1-4 refer to second grade of primary school, columns 4-8 to fifth grade of primary school, columns 9-12 to eighth grade of lower secondary school and columns 13-18 to tenth grade of upper secondary school. Robust standard errors (adjusted for clustering at the school level) are in parenthesis, *** p<0.01, **<0.05, * p<0.1.

Table 1.6 reports immigrant-native gaps in numeracy standardized test scores. Results for the numeracy immigrant-native gap closely mirror those for literacy. However, in terms of magnitude, the immigrant-native gap in numeracy is smaller than the one in literacy at all analysed educational stages. This finding is arguably due to the fact that proficiency in the host country language is less of a matter in learning a quantitative subject. Concerning control variables, their impact is similar to that in literacy regressions. A relevant difference, worth to underline, is the negative sign associated with the female dummy. This evidence is consistent with the bulk of literature showing that the literacy gap is in favour of female and the numeracy gap is in favour of male students (Borgonovi et al. (2018); OECD (2012); Schleicher (2015)).

Table 1.6: First and second-generation immigrants-natives numeracy standardized test score gaps in second, fifth, eighth and tenth grade.

	SECOND GRADE				FIFTH GRADE				EIGHT GRADE				TENTH GRADE			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)
First-generation	-0.417***	-0.310***	-0.267***	-0.122***	-0.484***	-0.215***	-0.183***	-0.077***	-0.454***	-0.349***	-0.633***	-0.293***	-0.380***	-0.183***	-0.110***	-0.123***
	(0.019)	(0.019)	(0.018)	(0.02)	(0.015)	(0.017)	(0.016)	(0.019)	(0.012)	(0.012)	(0.013)	(0.014)	(0.014)	(0.014)	(0.01)	(0.012)
Second-generation	-0.402***	-0.293***	-0.251***	-0.096***	-0.349***	-0.129***	-0.103***	0.007	-0.271***	-0.198***	-0.371***	-0.132***	-0.210***	-0.076***	-0.116***	-0.132***
	(0.01)	(0.01)	(0.008)	(0.013)	(0.01)	(0.011)	(0.009)	(0.014)	(0.009)	(0.009)	(0.009)	(0.013)	(0.011)	(0.011)	(0.007)	(0.011)
Female		-0.107***	-0.109***	-0.109***		-0.161***	-0.165***	-0.165***		-0.134***	0.326***	-0.127***		-0.182***	-0.107***	-0.107***
		(0.004)	(0.003)	(0.003)		(0.004)	(0.003)	(0.003)		(0.004)	(0.003)	(0.004)		(0.008)	(0.003)	(0.003)
Preschool		0.073***	0.071***	0.064***		0.022	0.024	0.02		0.113***	0.121***	0.088***		0.160***	0.113***	0.113***
		(0.024)	(0.024)	(0.024)		(0.019)	(0.019)	(0.019)		(0.015)	(0.015)	(0.015)		(0.011)	(0.011)	(0.009)
II quarter		-0.047***	-0.047***	-0.047***		-0.017***	-0.017***	-0.017***		-0.027***	-0.024***	-0.025***		-0.012***	-0.002	-0.003
		(0.005)	(0.005)	(0.005)		(0.004)	(0.004)	(0.004)		(0.004)	(0.004)	(0.004)		(0.004)	(0.004)	(0.004)
III quarter		-0.196***	-0.197***	-0.197***		-0.110***	-0.109***	-0.109***		-0.087***	-0.108***	-0.084***		-0.051***	-0.014***	-0.014***
		(0.005)	(0.005)	(0.005)		(0.004)	(0.004)	(0.004)		(0.004)	(0.004)	(0.004)		(0.004)	(0.004)	(0.004)
Mid educ. mother		0.198***	0.203***	0.197***		0.132***	0.131***	0.128***		0.235***	0.262***	0.224***		0.150***	0.013***	0.014***
		(0.006)	(0.005)	(0.005)		(0.005)	(0.005)	(0.005)		(0.005)	(0.004)	(0.004)		(0.006)	(0.004)	(0.004)
High educ. mother		0.342***	0.349***	0.345***		0.209***	0.211***	0.209***		0.421***	0.444***	0.422***		0.174***	-0.004	-0.004
		(0.007)	(0.007)	(0.007)		(0.007)	(0.007)	(0.007)		(0.007)	(0.006)	(0.006)		(0.008)	(0.006)	(0.006)
Mid educ. father		0.147***	0.153***	0.148***		0.112***	0.114***	0.111***		0.211***	0.233***	0.209***		0.152***	0.013***	0.013***
		(0.005)	(0.005)	(0.005)		(0.005)	(0.004)	(0.004)		(0.004)	(0.004)	(0.004)		(0.006)	(0.004)	(0.004)
High educ. father		0.273***	0.285***	0.283***		0.166***	0.173***	0.173***		0.372***	0.378***	0.376***		0.214***	0.002	0.002
		(0.007)	(0.006)	(0.006)		(0.007)	(0.007)	(0.007)		(0.007)	(0.006)	(0.007)		(0.009)	(0.005)	(0.005)
Working father		0.084***	0.089***	0.089***		0.050***	0.049***	0.050***		0.173***	0.138***	0.136***		0.086***	0.027***	0.027***
		(0.01)	(0.01)	(0.01)		(0.009)	(0.009)	(0.009)		(0.008)	(0.007)	(0.008)		(0.008)	(0.006)	(0.006)
Working mother		0.058***	0.069***	0.067***		0.038***	0.042***	0.041***		0.120***	0.050***	0.062***		0.166***	0.030***	0.030***
		(0.006)	(0.005)	(0.005)		(0.005)	(0.005)	(0.005)		(0.005)	(0.004)	(0.004)		(0.007)	(0.004)	(0.004)
Girl Share			0.038	0.038			0.060*	0.060*			-0.154***	-0.137***			-0.758***	-0.758***
			(0.036)	(0.036)			(0.033)	(0.033)			(0.024)	(0.029)			(0.02)	(0.02)
Late Share			-0.146	-0.142			-0.501***	-0.496***			-0.404***	-0.366***			-1.238***	-1.237***
			(0.141)	(0.141)			(0.096)	(0.095)			(0.037)	(0.045)			(0.034)	(0.034)
School Size			0.001	0.001			0.000	0.000			0.002***	0.001***			0.002***	0.002***
			(0.001)	(0.001)			(0.001)	(0.001)			(0.000)	(0.000)			(0.000)	(0.000)
School Size2			0.000	0.000			0.000	0.000			-0.000***	0.000			0.000	0.000
			(0.000)	(0.000)			(0.000)	(0.000)			(0.000)	(0.000)			(0.000)	(0.000)
Class Size			0.022**	0.022**			0.024**	0.024**			-0.029***	-0.027***			-0.027***	-0.027***
			(0.011)	(0.011)			(0.009)	(0.009)			(0.003)	(0.003)			(0.002)	(0.002)
Class Size2			-0.001**	-0.001**			-0.001**	-0.001**			0.000***	0.000***			0.000***	0.000***
			(0.000)	(0.000)			(0.000)	(0.000)			(0.000)	(0.000)			(0.000)	(0.000)
Low Parent Share			0.077***	0.075***			-0.005	-0.006			0.113***	0.119***			-0.301***	-0.301***
			(0.027)	(0.027)			(0.027)	(0.027)			(0.018)	(0.021)			(0.03)	(0.03)
Private school			-0.004	-0.002			-0.069**	-0.068**			-0.027	-0.005			-0.187***	-0.187***
			(0.03)	(0.03)			(0.028)	(0.028)			(0.019)	(0.021)			(0.038)	(0.038)
Migrant Share			-0.209***	-0.190***			-0.168***	-0.157***			0.099***	0.063*			0.218***	0.217***
			(0.038)	(0.038)			(0.04)	(0.039)			(0.032)	(0.036)			(0.042)	(0.042)
Instruction time			-0.010*	-0.010*			-0.005	-0.005			0.006**	0.023***			-0.118***	-0.118***
			(0.005)	(0.005)			(0.004)	(0.004)			(0.003)	(0.003)			(0.016)	(0.016)
North			0.006	0.008			0.025*	0.026*			0.195***	0.247***			0.460***	0.459***
			(0.015)	(0.015)			(0.014)	(0.014)			(0.009)	(0.011)			(0.017)	(0.017)
Centre			0.036**	0.035*			0.022	0.021			0.127***	0.116***			0.125***	0.125***
			(0.018)	(0.018)			(0.016)	(0.016)			(0.011)	(0.013)			(0.021)	(0.021)
Non EU father				0.003				-0.04				0.000				0.022
				(0.037)				(0.037)				(0.033)				(0.02)
Other father				-0.144***				-0.099***				-0.042				-0.04
				(0.034)				(0.033)				(0.031)				(0.043)
Non EU mother				-0.077**				-0.018				-0.099***				0.009
				(0.037)				(0.037)				(0.033)				(0.02)
Other mother				-0.134***				-0.109***				-0.170***				0.013
				(0.035)				(0.033)				(0.031)				(0.043)
ESCS student						0.129***	0.131***	0.131***						0.145***	0.041***	0.041***
						(0.003)	(0.003)	(0.003)						(0.004)	(0.003)	(0.003)
Foreign language						-0.153***	-0.150***	-0.144***						-0.093***	-0.051***	-0.051***
						(0.009)	(0.009)	(0.009)						(0.011)	(0.009)	(0.009)
ESCS school							-0.021	-0.021							0.230***	0.230***
							(0.018)	(0.018)							(0.022)	(0.022)
Vocational															-0.499***	-0.499***
															(0.026)	(0.026)
Technical															-0.274***	-0.274***
															(0.021)	(0.021)
Observations	292,550	292,550	292,550	292,550	325,249	325,249	325,249	325,249	342,937	342,937	342,937	342,937	305,192	305,192	305,192	305,192

Notes: This table reports the numeracy test score gaps for first and second-generation immigrant at different stages of the educational career. Column1-4 refer to second grade of primary school, columns 4-8 to fifth grade of primary school, columns 9-12 to eighth grade of lower secondary school and columns 13-18 to tenth grade of upper secondary school. Robust standard errors (adjusted for clustering at the school level) are in parenthesis, *** p<0.01, **<0.05, * p<0.1.

In Table 1.7 we investigate the role of school and class characteristics in explaining the literacy and numeracy immigrant-native gap in second, fifth, eighth and tenth grade. To do that we regress the literacy (numeracy) standardized test score on immigrant first and second-generation dummies and school and class characteristics. In all specification we control for the share of girls at the class level, share of retained students at the class level, share of low educated parents at the class level, school size and its average, class size and its average, share of immigrant students at the class level, school funding type and time of instruction. In fifth grade we additionally control for the ESCS at the school level and in tenth grade for both the ESCS at the school level and the school track. Studying the impact of these variables in isolation is relevant to understand how much of the immigrant-native gap can be attributed to schools and class characteristics over which families have some choice.

To provide some insight into the relevance of school and class characteristics we compare the magnitude of first and second-generation coefficients with the literacy and numeracy unconditional gaps across grades in Tables 1.5 and 1.6. While in second, fifth and eighth grade these dimensions affect the immigrant-native gap only marginally (slightly reducing or magnifying the gap), in tenth grade they play a crucial role. In literacy the gap is reduced by about 40 percent for first-generation immigrant students and by 30 percent for the second-generation. In numeracy, the gap is diminished by approximately 50 and 20 percennt for first and second-generation, respectively. These findings are consistent with the evidence related to immigrant students' segregation in lower quality high schools and less demanding tracks. The point is investigated at lenght in section 1.4.2.

Table 1.7: First-generation immigrants-natives in literacy and numeracy standardized test score gaps.

	Second grade	**Fifth grade**	**Eighth Grade**	**Tenth grade**
Panel A: **LITERACY**				
First-generation	-0.485***	-0.616***	-0.727***	-0.335***
	(0.017)	(0.015)	(0.014)	(0.009)
Second-generation	-0.454***	-0.473***	-0.438***	-0.243***
	(0.007)	(0.008)	(0.009)	(0.007)
Girl Share	0.102***	0.144***	0.177***	0.228***
	(0.033)	(0.026)	(0.025)	(0.017)
Late Share	-0.254**	-0.670***	-0.445***	-0.820***
	(0.125)	(0.083)	(0.04)	(0.032)
School Size	-0.000	0.000	0.003***	0.004***
	(0.001)	(0.000)	(0.000)	(0.000)
School Size2	-0.000	0.000	-0.000***	-0.000***
	(0.000)	(0.000)	(0.000)	(0.000)
Class Size	0.017*	0.015**	-0.042***	-0.029***
	(0.009)	(0.007)	(0.003)	(0.002)
Class Size2	-0.000*	-0.000*	0.000***	0.000***
	(0.000)	(0.000)	(0.000)	(0.000)
Low Parent Share	-0.403***	-0.454***	-0.568***	-0.546***
	(0.025)	(0.021)	(0.019)	(0.027)
Private school	0.067**	-0.118***	0.062***	-0.045
	(0.026)	(0.022)	(0.019)	(0.032)
Migrant Share	-0.095***	0.232***	0.566***	0.405***
	(0.034)	(0.031)	(0.036)	(0.038)
Instruction time	-0.012**	0.000	0.010***	-0.080***
	(0.005)	(0.003)	(0.003)	(0.013)
ESCS school		0.214***		0.293***
		(0.013)		(0.018)
Technical				-0.297***
				(0.019)
Vocational				-0.578***
Panel B: **NUMERACY**				
First generation	-0.382***	-0.449***	-0.496***	-0.187***
	(0.018)	(0.015)	(0.012)	(0.008)
Second generation	-0.365***	-0.326***	-0.333***	-0.161***
	(0.008)	(0.008)	(0.009)	(0.007)
Girl Share	-0.069*	-0.095***	-0.267***	-0.795***
	(0.036)	(0.033)	(0.029)	(0.021)
Late Share	-0.230	-0.591***	-0.395***	-1.006***
	(0.140)	(0.096)	(0.048)	(0.036)
School Size	0.001	0.000	0.003***	0.004***
	(0.001)	(0.001)	(0.000)	(0.000)
School Size2	-0.000	0.000	-0.000***	-0.000***
	(0.000)	(0.000)	(0.000)	(0.000)
Class Size	0.019*	0.024**	-0.041***	-0.034***
	(0.011)	(0.009)	(0.004)	(0.002)
Class Size2	-0.001*	-0.001**	0.000***	0.000***
	(0.000)	(0.000)	(0.000)	(0.000)
Low Parent Share	-0.408***	-0.374***	-0.546***	-0.578***
	(0.028)	(0.027)	(0.023)	(0.032)
Private school	0.029	-0.079***	0.113***	-0.006
	(0.030)	(0.028)	(0.021)	(0.042)
Migrant Share	-0.115***	-0.043	0.594***	0.673***
	(0.038)	(0.04)	(0.04)	(0.045)
Instruction time	-0.001	-0.001	0.028***	-0.094***
	(0.006)	(0.004)	(0.004)	(0.016)
ESCS school		0.120***		0.357***
		(0.017)		(0.025)
Vocational				-0.433***
				(0.027)
Technical				-0.189***
				(0.023)
Observations	292,550	325,249	342,937	305,192

Notes: This table reports the literacy and numeracy test score gaps for first and second-generation immigrant at different stages of the educational career. First-generation immigrant students are identified by a set of dummy variable indicating children age at arrival in Italy. For each grade we control for the share of girls at the class level, share of retained students at the class level, share of low educated parents at the class level, school size and its average, class size and its average, share of immigrant students at the class level, time of instruction, ESCS at the school level, school funding type, school track. Robust standard errors (adjusted for clustering at the school level) are in parenthesis, *** p<0.01, **<0.05, * p<0.1.

Overall, we conclude that the assimilation process into the Italian educational of students with an immigrant background is weak. On every subject, at every analysed grade there are large achievements gaps between immigrant and native students. Even accounting for a rich number of background factors, the gap shrinks but remains large and significant.

1.4.1 Heterogeneity by first-generation immigrant children age at arrival

In this subsection we investigate the role played by first-generation immigrant students age at arrival in the host country. We replicate previous analysis but the dummy indicating first-generation immigrant students (*first*) in equation (1) is substituted with a set of dummy variables identifying students' age at arrival. In particular, we include four dummies for children that arrive when younger than 3 years old, between 4 and 6 years old, between 7 and 12 years old and older than 13.

A bulk of literature has focused on the impact of late arrival on immigrant students' outcomes. Age at arrival affects proficiency in the host country language that in turn is a key element for immigrant academic success and eventually labour market outcomes (Bleakley and Chin (2004) Bleakley and Chin (2010)). Further, late arrival in the host country affects children's exposure to the host country culture and institution (Cortes (2006)). In other words, age at arrival has a prominent impact on first-generation immigrant students' integration.

As in previous analysis, in Table 1.8 we show four different specifications per grade. In second, fifth and eighth grade, coefficients indicating age at arrival in the host country have a negative and strongly significant effect which increases the older is the child at arrival. The disadvantage gets particularly large for children that arrive when older than six years. Once we control for students' socio economic backgrounds, school and class characteristics and parents' area of origin, the first-generation immigrant students' gap reduces substantially, however, for all the age ranges, performance differences persist, remaining significant. Moreover, second-generation immigrant students perform better than first-generation children, no matter their age of arrival.

We now turn to the analysis of estimates for tenth grade students (columns 13-16). As in previous grade, we find that coefficients are negative and strongly significant suggesting a negative relation between students' late arrival and literacy outcomes. [10] Note that coefficients for students' age at arrival between 0-3 and between 3-6 years old in our most complete specification (column 16) are less straight-forward to interpret in terms of magnitude and significance. The latter is likely due to the high drop-out rates among first-generation immigrant students so that we observe a highly selected sample of first-generation immigrant students.

[10] Note that in second grade we have students' above seven years old. In Italy schools can decide to assign late arrival students with a strong linguistic or cognitive disadvantage to a lower grade with respect to the one they should attend given their age. This also explains the magnitude for the related coefficient that is similar or slightly larger than the one for children who arrived between 4 and 6 years old.

Table 1.8: First-generation immigrants-natives in literacy standardized test score gaps in second, fifth, eight and tenth grade by age at arrival in Italy.

	SECOND GRADE				FIFTH GRADE			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Age at arrival 0-3	-0.473***	-0.396***	-0.348***	-0.245***	-0.494***	-0.164***	-0.188***	-0.065**
	(0.029)	(0.028)	(0.027)	(0.029)	(0.025)	(0.025)	(0.025)	(0.027)
Age at arrival 4-6	-0.563***	-0.472***	-0.423***	-0.297***	-0.601***	-0.253***	-0.275***	-0.149***
	(0.036)	(0.034)	(0.033)	(0.035)	(0.028)	(0.028)	(0.027)	(0.029)
Age at arrival 7-12	-0.562***	-0.462***	-0.405***	-0.284***	-0.908***	-0.551***	-0.566***	-0.417***
	(0.056)	(0.055)	(0.055)	(0.056)	(0.039)	(0.037)	(0.037)	(0.038)
Second generation	-0.498***	-0.396***	-0.349***	-0.227***	-0.456***	-0.179***	-0.206***	-0.069***
	(0.008)	(0.009)	(0.007)	(0.013)	(0.009)	(0.010)	(0.009)	(0.014)
Observations	291,495	291,495	291,495	291,495	323,895	323,895	323,895	323,895
	EIGHTH GRADE				**TENTH GRADE**			
	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)
Age at arrival 0-3	-0.573***	-0.498***	-0.552***	-0.391***	-0.395***	-0.167***	-0.111***	-0.078**
	(0.025)	(0.023)	(0.023)	(0.024)	(0.045)	(0.041)	(0.031)	(0.032)
Age at arrival 4-6	-0.532***	-0.439***	-0.492***	-0.355***	-0.401***	-0.155***	-0.086***	-0.060*
	(0.022)	(0.021)	(0.021)	(0.022)	(0.043)	(0.040)	(0.029)	(0.031)
Age at arrival 7-12	-0.895***	-0.761***	-0.812***	-0.625***	-0.599***	-0.323***	-0.201***	-0.168***
	(0.025)	(0.023)	(0.024)	(0.025)	(0.035)	(0.032)	(0.025)	(0.026)
Age at arrival 13 +					-0.893***	-0.597***	-0.424***	-0.375***
					(0.051)	(0.050)	(0.041)	(0.042)
Second generation	-0.381***	-0.312***	-0.372***	-0.181***	-0.346***	-0.172***	-0.166***	-0.131***
	(0.010)	(0.009)	(0.009)	(0.014)	(0.012)	(0.011)	(0.007)	(0.013)
Observations	340,904	340,904	340,904	340,904	297,827	297,827	297,827	297,827
Individual controls		√	√	√		√	√	√
School and class characteristics			√	√			√	√
Macro area dummies			√	√			√	√
Parents place of birth				√				√

Notes: This table reports the literacy test score gaps for first and second-generation immigrant at different stages of the educational career. First-generation immigrant students are identified by a set of dummy variable indicating children age at arrival in Italy. Column 1-4 refer to second grade of primary school, columns 4-8 to fifth grade of primary school, columns 9-12 to eighth grade of lower secondary school and columns 13-18 to tenth grade of upper secondary school. For each grade in second column we control for student's gender, preschool attendance, quarter of birth and parents' educational level and working status; in third column we control for the share of girls at the class level, share of retained students at the class level, share of low educated parents at the class level, school size and its average, class size and its average, share of immigrant students at the class level, time of instruction, ESCS at the school level, school funding type, school track and in forth column we additionally control for parents' area of birth. Robust standard errors (adjusted for clustering at the school level) are in parenthesis, *** p<0.01, **<0.05, * p<0.1.

In Table 1.9 we reproduce the same analysis as in Table 1.8 but using as the dependent variable numeracy standardized test scores. The pattern of results is similar to one observed when analysing students' performance in literacy showing a negative relationship between students' age at arrival and their performances in numeracy. However, as underlying discussing evidence in Table 1.9, the students' disadvantage results to be smaller than the one in literacy across all grades.

Table 1.9: First-generation immigrants-natives in numeracy standardized test score gaps in second, fifth, eight and tenth grade by age at arrival in Italy.

	SECOND GRADE				FIFTH GRADE			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Age at arrival 0-3	-0.376***	-0.280***	-0.237***	-0.108***	-0.494***	-0.164***	-0.188***	-0.065**
	(0.031)	(0.030)	(0.029)	(0.030)	(0.025)	(0.025)	(0.025)	(0.039)
Age at arrival 4-6	-0.489***	-0.376***	-0.331***	-0.174***	-0.601***	-0.253***	-0.275***	-0.149***
	(0.036)	(0.035)	(0.034)	(0.035)	(0.028)	(0.028)	(0.027)	(0.029)
Age at arrival 7-12	-0.375***	-0.257***	-0.205***	-0.054	-0.908***	-0.551***	-0.566***	-0.417***
	(0.062)	(0.062)	(0.061)	(0.062)	(0.039)	(0.037)	(0.037)	(0.038)
Second generation	-0.402***	-0.293***	-0.252***	-0.099***	-0.456***	-0.179***	-0.206***	0.069***
	(0.010)	(0.010)	(0.008)	(0.013)	(0.009)	(0.010)	(0.009)	(0.014)
Observations	291,495	291,495	291,495	291,495	323,895	323,895	323,895	323,895
	SECOND GRADE				**FIFTH GRADE**			
	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)
Age at arrival 0-3	-0.387***	-0.306***	-0.369***	-0.260***	-0.217***	0.033	-0.039	-0.064*
	(0.022)	(0.021)	(0.021)	(0.023)	(0.040)	(0.041)	(0.033)	(0.034)
Age at arrival 4-6	-0.394***	-0.301***	-0.361***	-0.268***	-0.287***	-0.071*	-0.058*	-0.080**
	(0.021)	(0.020)	(0.020)	(0.022)	(0.043)	(0.042)	(0.030)	(0.031)
Age at arrival 7-12	-0.526***	-0.401***	-0.461***	-0.337***	-0.360***	-0.130***	-0.067***	-0.089***
	(0.021)	(0.020)	(0.021)	(0.023)	(0.034)	(0.033)	(0.024)	(0.026)
Age at arrival 13 +					-0.432***	-0.202***	-0.103***	-0.123***
					(0.043)	(0.044)	(0.036)	(0.037)
Second generation	-0.271***	-0.198***	-0.264***	-0.135***	-0.210***	-0.071***	-0.111***	-0.136***
	(0.009)	(0.009)	(0.008)	(0.014)	(0.011)	(0.011)	(0.008)	(0.013)
Observation	340,904	340,904	340,904	340,904	297,827	297,827	297,827	297,827
Individual controls		√	√	√		√	√	√
School and class characteristics			√	√			√	√
Macro area dummies			√	√			√	√
Parents place of birth				√				√

Notes: This table reports the numeracy test score gaps for first and second-generation immigrant at different stages of the educational career. First-generation immigrant students are identified by a set of dummy variable indicating children age at arrival in Italy. Column 1-4 refer to second grade of primary school, columns 4-8 to fifth grade of primary school, columns 9-12 to eighth grade of lower secondary school and columns 13-18 to tenth grade of upper secondary school. For each grade in second column we control for student's gender, preschool attendance, quarter of birth and parents' educational level and working status; in third column we control for the share of girls at the class level, share of retained students at the class level, share of low educated parents at the class level, school size and its average, class size and its average, share of immigrant students at the class level, time of instruction, ESCS at the school level, school funding type, school track and in forth column we additionally control for parents' area of birth. Robust standard errors (adjusted for clustering at the school level) are in parenthesis, *** p<0.01, **<0.05, * p<0.1.

1.4.2 Immigrant children's choice of upper secondary school

The students' and parents' choice on the type of upper secondary school where to enrol in is a crucial decision. Tracking of students into academic or vocational tracks might substantially affect the students' decision of acquiring additional education as well as future employment opportunities. In all OECD countries, immigrant students tend to disproportionately concentrate into "lower tracks". The latter might be due to immigrant students' parents being unfamiliar with the host country school system, by negative expectations and stereotypes about immigrant students deeply embedded into the host country society as well as by immigrant parents' perception that lower tracks are more directly linked with students' integration into the labour market (Schleicher (2015)).

To investigate immigrant students' upper secondary school type choice, we estimate a linear probability model and we identify two alternatives for students' decision: the high track (the lyceum) and the low track (including technical and vocational schools). We estimate the following equation:

$$Y_i = \alpha_i + \beta first_i + \gamma second_i + Z_i^{'}\theta + X_i^{'}\delta + \epsilon_i \tag{1.2}$$

where the dependent variable is a dummy variable Y_i equal to 1 for students who decided to enrol into the high track (lyceum) and equal to 0 for those who decided to enrol into a technical or vocational track, *first* and *second* are dummy variables indicating, respectively, first and second-generation immigrant students and $X_i^{'}\delta$ is a vector of controls including students' characteristics (gender, quarter of birth, ESCS at the student level, preschool attendance, language mostly spoken at home), families' characteristics (parents' working status and education) and school and classes' characteristics (share of girls at the class level, share of retained students at the class level, share of low educated parents at the class level, school size and its average, class size and its average, share of immigrant students at the class level, time of instruction, ESCS at the school level, school funding type, school track). Eventually, the vector $Z_i^{'}\theta$ controls for students' eighth grade INVALSI literacy and numeracy test scores. In fact, our strategy takes into account students' self-selection into different upper secondary school types controlling for students' past achievements and a rich set of control variables. However, it is worth mentioning that other unobserved factors (i.e. distance from school) might influence students' decision on the type of school they want to enrol in.

In Table 1.10 we report the coefficients of interest: *first* generation and *second* generation. Each coefficient captures the predicted probability of choosing the high track with respect to the low track. First column displays the estimates for the unconditional linear probability regression, in second column we additionally control for students' past achievements (eighth grade INVALSI test scores) and in third column we use our most fully parametrized specification controlling for students', families', schools and classes' characteristics.

Table 1.10: Linear probability estimates for the impact of immigrant generational status on the high school track choice.

	(1)	(2)	(3)
First generation	-0.228***	-0.154***	0.001
	(0.009)	(0.009)	(0.005)
Second generation	-0.130***	-0.088***	0.015***
	(0.008)	(0.007)	(0.005)
8th grade literacy test score		0.149***	0.021***
		(0.003)	(0.001)
8th grade numeracy test score		0.018***	0.012***
		(0.004)	(0.001)
Observation	258,476	258,476	258,476

Notes: This table reports the numeracy test score gaps for first and second-generation immigrant at different stages of the educational career. The dependent variable is a dummy equal to 1 if the child aim at achieveing a qualification higher than upper secondary school and 0 otherwise. Robust standard errors (adjusted for clustering at the school level) are in parenthesis, *** p<0.01, **<0.05, * p<0.1.

Table 1.10 shows that the upper secondary school track choice differs between second-generation immigrant students and native students, while for first-generation immigrant students we do not find significant differences. In particular, once we control for past achievements and the entire set of control variables (column 3), second-generation immigrant students are 1.5% more likely than native students to enrol in a high track. On the other hand, the coefficient for first-generation immigrant students is not statistically significant. The latter evidence suggests an assimilation process of the immigrant student population that, conditional on past achievements and a rich set of controls, in successive generation becomes slightly more likely than native students to enrol in a high demanding track. Our results differ from those of Carlana et al. (2018) describing immigrant

students' high school educational choice in Italy. Conditional on students' initial ability, the authors find that immigrant students are less likely to choose the high track.

1.4.3 Does lower educational aspiration explain immigrant student disadvantage?

Students who hold ambitious expectations about their future educational achievements are more likely to be strongly committed to get the most out of all learning opportunities, investing lot of effort to achieve their goals (OECD (2019); Borgonovi and Pál (2016); Morgan (2005)). Motivation to achieve is a key determinant of school success, especially for immigrant students.
Carlana et al. (2018), estimating the impact of a randomized intervention providing tutoring and counselling to high-achieving immigrant students when choosing the upper secondary school track in Italy, have showed that increasing the immigrant students' academic motivation increases male students' probability of enrolling into the academic track and reduces their grade repetition.

In 10th grade, INVALSI asks students to indicate their educational aspiration and in Table 1.4, we report that students with an immigrant background have lower educational aspiration than native students. Lower educational targets might translate into lack of engagement and motivation than contributing to the widening of the immigrant-native gap. In order to get insight on the effect of students' educational target on students' performance, we use a value-added approach controlling for students' past achievements: students' eighth grade INVALSI test scores.

In Table 1.11 we investigate at a descriptive level whether first and second-generation immigrant students exhibit a disadvantage in terms of educational aspiration with respect to native students. In order to carry out our ananlysis we use same specification as in section 1.4 but defining our dependent variable as a dummy equal to 1 for students that indicate to aim at achieving a qualification higher than the upper secondary school diploma and 0 otherwise.
In column 1 we control for students' generational status and past achievements. In column 2 we add students' individual characteristics. In columns 3 and 4 we further control for school characteristics and parents' country of birth, respectively.
As column 4 shows, there is a significant difference between native and first-generation immigrant students. The latter exhibit a gap in their educational target. They are less likely to aim at a university level qualification than native students. Interestingly, the same pattern of results is not observed for second-generation immigrant students that once we control for characteristics at the individual, school and parental level do not show any significant difference with respect to their native counterpart.

Table 1.11: Literacy and numeracy standardized test score gaps in tenth grade controlling for studentsâĂŹ educational aspirations.

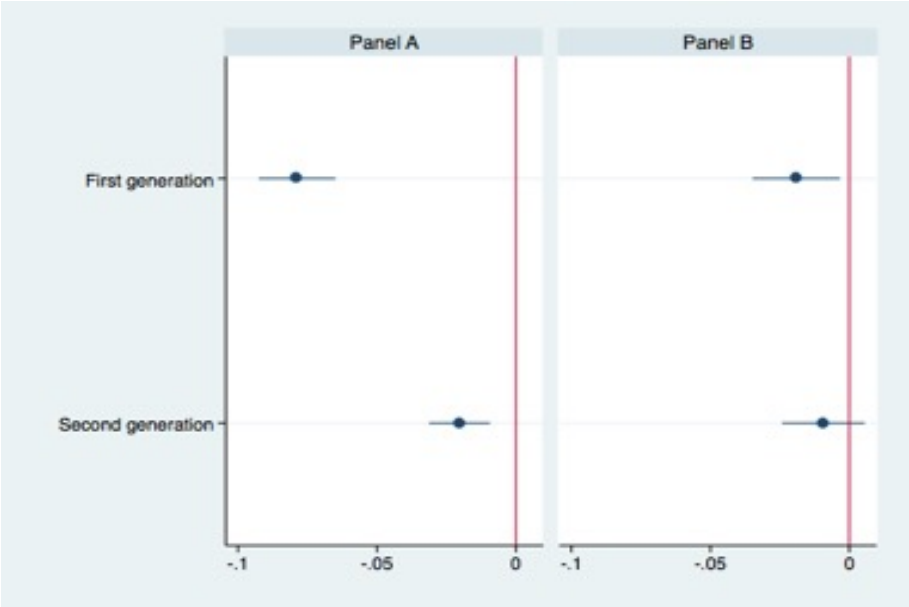
	(1)	(2)	(3)	(4)
First generation	-0.079***	-0.044***	0.021***	-0.019***
	(0.007)	(0.007)	(0.007)	(0.008)
Second generation	-0.020***	0.008	0.037***	-0.009
	(0.006)	(0.006)	(0.005)	(0.008)
Literacy 8th grade test score	0.119***	0.076***	0.032***	0.042***
	(0.002)	(0.002)	(0.001)	(0.001)
Numeracy 8th grade test score	0.028***	0.038***	0.021***	0.025***
	(0.002)	(0.002)	(0.001)	(0.001)
Observations	258,047	258,047	258,047	258,047
Individual controls		√	√	√
School and class characteristics			√	√
Macro area dummies			√	√
Parents place of birth				√

Notes: This table reports differences in educational aspiration for first and second-generation immigrant students. The dependent variable is defined equal to 1 for students that indicate to aim at achieving a qualification higher than the upper secondary school diploma and 0 otherwise. Robust standard errors (adjusted for clustering at the school level) are in parenthesis, *** p<0.01, **<0.05, * p<0.1.

We summarize our main findings of Table 1.11 in Figure 1.3 where we plot the estimated coefficients from regressing immigrant students' generational status on students' aspiration of achieving a university level qualification, conditional on students' past achievements (eighth grade INVALSI test scores). In Panel A we control for students' generational status and past performances in both literacy and numeracy INVALSI standardized test scores. In Panel B we additionally control for the entire set of students', families', schools and classes' characteristics (see model 4 section 4).

Figure 1.3 shows that educational aspirations of first-generation immigrant students differ significantly from those of native students while for second-generation immigrant students we do not find any significant effect. In Panel A, where we control for students' past achievements only, the aspiration gap is particularly noticeable for first-generation immigrant pupils. However, once we control for the entire set of control variables as well as students' past achievements, the difference shrank substantially, turning not significant for second-generation immigrant students.

Figure 1.3: First and second-generation immigrant studentsâĂŹ aspiration gap



In Table 1.12 we use our most fully parametrized specification (model 4 in section 4) to investigate how and whether students' educational aspirations affect the immigrant-native gap in literacy (columns 1-2) and numeracy (3-4). In particular we control for a set of dummy variables identifying students' educational aspiration among achieving a vocational training diploma, a high school diploma, a qualification equivalent to those issued by universities, a bachelor degree or a master degree. The excluded category is children with no aspiration. As a comparison, in columns 1 and 3 we report same specification without controlling for students' educational aspirations. Interestingly, columns 2 and 4 reports that once we control for educational aspirations, the immigrant students' disadvantage shrinks.[11] Both in literacy and numeracy, students' aspiration coefficients show a positive and significant relationship with students' performance with the magnitude getting larger the higher the student's educational target.

[11] As previously underlined, our analysis has no ambition to provide causal estimates.

Table 1.12: Literacy and numeracy standardized test score gaps in tenth grade controlling for studentsâĂŹ educational aspirations.

	LITERACY		NUMERACY	
	(1)	(2)	(3)	(4)
First generation	-0.075***	-0.069***	-0.080***	-0.072***
	(0.013)	(0.013)	(0.012)	(0.012)
Second generation	-0.095***	-0.086***	-0.110***	-0.101***
	(0.012)	(0.012)	(0.012)	(0.012)
Literacy 8th grade test score	0.300***	0.286***	0.056***	0.042***
	(0.004)	(0.004)	(0.004)	(0.003)
Numeracy 8th grade test score	0.092***	0.081***	0.383***	0.371***
	(0.003)	(0.003)	(0.004)	(0.004)
Vocational training		0.071***		0.052***
		(0.017)		(0.017)
High school diploma		0.212***		0.139***
		(0.013)		(0.012)
Qualification equivalent to those issued by universities		0.269***		0.176***
		(0.014)		(0.013)
Bachelor degree		0.371***		0.295***
		(0.014)		(0.013)
Master degree		0.503***		0.445***
		(0.014)		(0.013)
Observations	258,476	258,047	258,476	258,047

Notes: This table reports literacy (columns 1-2) and numeracy test (columns3-4) score gaps for first and second-generation immigrant students. In all columns we control for student's gender, preschool attendance, quarter of birth and parents' educational level and working status, share of girls at the class level, share of retained students at the class level, share of low educated parents at the class level, school size and its average, class size and its average, share of immigrant students at the class level, time of instruction, ESCS at the school level, school funding type, school track and in forth column we additionally control for parents' area of birth. Robust standard errors (adjusted for clustering at the school level) are in parenthesis, *** p<0.01, **<0.05, * p<0.1.

All in all, our descriptive analysis underlines that the weak integration of students' with an immigrant background in the host country educational system might be also correlated to their lack of educational expectations that is likely to translate into lack of motivation and effort, leading to lower academic performances compared to native students.

1.5 Discussion and conclusion

Immigrant students represent an increasing share of the students' population in most of the OECD countries and their successful integration in the host country educational system is an issue of first order importance. Immigrant children face several challenges in order to integrate that if not properly addressed might translate in a persistent educational disadvantage.

In this study we investigate the immigrant-native gaps in literacy and numeracy at different stages of students' educational career (second, fifth, eighth and tenth grade) using INVALSI data, a rich and detailed data set covering the entire population of Italian students for the school year 2016/17. Differently from countries with a long immigration tradition such as the United Kingdom, Germany and the Netherlands where the immigrant-native gap and its determinants have been largely investigated, for new immigration countries there is scant evidence on the topic. Our paper contributes providing up-to-date evidence on one of the most important recent immigration destination country, Italy. Further, we complement some of the existing evidence using the largest, more detailed and recent data set on Italian and immigrant students' educational achievement, INVALSI.

In our empirical analysis we focus on the differences between first and second-generation immigrant students and on understanding which factors mostly affect immigrant students' disadvantage. Further, we explore the role played by children age at arrival, upper secondary school track choice and educational aspirations.

In each of the analysed grade, our results show that even after controlling for a growing number of observables such as students' socio-economic background, parents' area of birth and school and class' characteristics, the immigrant-native gap does not close. The largest disadvantage is observed in literacy for first-generation immigrant students and especially among those arriving late in the host country. Second-generation immigrant students tend to perform better than first-generation immigrant students but still worse than native students.

Several factors explain the emergence and persistence of performance differences between immigrant and native children but a prominent role seemed to be played by factor associated with language acquisition such as whether the child mostly speaks another language at home, parents' place of birth and age at arrival in the host country. However, other factors can shape the immigrant student disadvantage. We find descriptive support for the importance of educational aspiration as well for the choice of the upper secondary school track. From our work we conclude that the Italian educational system is still unable to nurture immigrant student talent and to help them in successfully overcome their social, cultural and linguistic barriers.

Chapter 2

Impact of Early Childcare on Immigrant Children's Educational Performance[1]

Abstract

This paper investigates the impact of attending early childcare on immigrant children's cognitive outcomes. Our analysis draws on administrative data on the entire population of students in fifth grade collected by the Italian Institute for the Evaluation of the Educational System (INVALSI) for school years 2014/2015 to 2016/2017 matched to unique administrative records on the early childcare available slots at the municipal level. Our identification strategy exploits cross-sectional and time series variation in the provision of early childcare service across Italian municipalities as an instrument for individual early childcare attendance. Our results point out that the effect of early childcare attendance differs between native and immigrant children. Although we find no effects for Italian children, our estimates show a positive and significant effect on literacy test scores for immigrant children of low educated parents, which suggests that early childcare may be particularly relevant for immigrant children from a disadvantaged background.

Keywords: Childcare, Cognitive skills, Immigrant children, IV.

JEL Classification Numbers: J13, J15, H75, I20, I28.

2.1 Introduction

In recent years, immigrant inflows to OECD countries increased substantially, leading to rising number of immigrant children in European school systems: more than one-quarter of the school-aged population in Europe will have a migrant background by the early 2020s, according to estimates of the Migration Policy Institute Europe (see Ahad and Benton (2018)).

[1]This chapter is based on joint work with Elena Meschi and Luca Corazzini.

[1]We would like to thank Orazio Attanasio, Emanuele Bracco, Giorgio Brunello, Elena Fumagalli, Irene Mammi, Paolo Pinotti, Lorenzo Rocco, Marianne Simonsen for useful comments and discussions. Special thanks go to Patrizia Falzetti and Michele Cardone (INVALSI) for giving us access to INVALSI microdata and to Veronica Grembi for kindly providing us data on childcare coverage at the municipal level. We also thank the conference participants at Societá Italiana Economia Pubblica, Padova (2018) and Invalsi seminar, Bari (2018).

Children who are migrants or have immigrant parents face significant educational barriers, such as lack of language proficiency or limited knowledge of the school system in host countries, which may lead to significant educational disadvantage relative to native students, as documented by the recent economic literature (see for example Alesina et al. (2018) , Dustmann et al. (2012)). Performance gaps at school translate in persistent differences in literacy levels, dropout rates and eventually in labour market outcomes between immigrant students and their native peers, thus perpetuating inequalities and slowing the integration of migrants in host countries. Therefore, addressing the needs of diverse learners and fostering the school performance of immigrant students are key challenges for European school systems.

Our paper aims at estimating the impact of early childcare on second-generation immigrant children's cognitive outcomes. The focus on early education traces back to the findings of Heckman and co-authors suggesting that ability gaps between individuals and socioeconomic groups open up at early ages for both cognitive and non-cognitive skills. Given the high degree of brain plasticity, investments made early in life show both higher returns as well as dynamic complementarities with respect to investments made later in life (Cunha and Heckman (2007) and Heckman and Masterov (2007)). The latter was shown to be particularly true for children from disadvantaged backgrounds taking part to targeted interventions (Blau and Currie (2006)).

However, the evidence on the effects of untargeted publicly provided early childcare programmes is less conclusive, relatively scarce and not specifically focused on children with an immigrant background.

This paper makes use of novel administrative data on the entire population of several cohorts of primary school students in Italy to investigate the impact of attending early childcare on later cognitive outcomes. We exploit a rich dataset on children's cognitive skills administered yearly to the entire population of students in second, fifth, eighth and tenth grade by the Italian Institute for the Evaluation of the Educational System (INVALSI henceforth) for the school years 2014/2015 to 2016/2017, merged with unique administrative records on early childcare public available slots at the municipal level, collected by Antonelli et al. (2011). In the INVALSI dataset, pupils' cognitive skills are measured by standardized and externally marked tests in literacy and numeracy. Together with test scores, INVALSI collects information on students', families' and schools characteristics.

We believe that the focus on Italy is particularly appropriate for our analysis: Italy only recently became a destination for international migration together with being one of the OECD countries with the highest educational gap between native and non-native students (OECD (2012)). The combination of these two features offers an invaluable setting for our analysis.

We contribute to the existing literature along several dimensions. First, while there is an extensive literature looking at interventions toward children aged 3-5 (preschool programmes), only few studies focus on children 0-2 (early childcare) and the evidence they provide is mixed. Some studies find positive effects (Felfe and Lalive (2018) and Drange and Havnes (2018) Cornelissen et al. (2018), among others) while others find negative or no effects (Herbst (2017); Carta and Rizzica (2018) and Fort et al. (2019)). Second, we focus on students of immigrant background and in particular on second-generation immigrants, a growing and relatively under-investigated group. Third, thanks to the rich set of information available in our dataset, we make use of two alternative measures of students' performance: INVALSI standardized test scores and oral marks assigned by teachers. The two measures are likely to capture different dimensions of students' ability providing additional understanding of the impact of attending the early childcare service. Additionally, we can perform several tests of heterogeneity and thus identify some of the channels at work, such as

the role of linguistic distance of immigrants' native language from Italian.

The identification of the causal effect of early childcare attendance on immigrant children's cognitive and non-cognitive skills is challenging. It involves both the decision of parents to enrol children to the service as well as the choice of nurseries to accept those children who can potentially benefit the most by attending the service. The variables underlying these decision processes - the one of parents and the one of nurseries - are neither entirely observable nor measurable. Consequently, selection of children into early childcare is not random.

To deal with non-random sorting of children into early public childcare, we exploit the cross-sectional and time series exogenous variation in early childcare supply across Italian municipalities as an instrument for individual attendance.

Our results point out that the effect of early childcare attendance differs between native and immigrant children. While we find no effects for Italian children, our estimates show a positive and significant effect of early childcare attendance on INVALSI literacy test scores for immigrant children of low educated parents, which highlights the potential of these programs to improve outcomes for young children, particularly for those from disadvantaged families and reduce inequality in child development.

To further investigate the channels driving our results, we explore whether the effect differs within the group of immigrant children. In particular, we analyse the role played by the linguistic proximity of immigrant children's own language to the host-country one. To the best of our knowledge, this is the first time that such investigation is applied in the context of early education. Our findings highlight that children speaking a language that differs significantly from Italian capture larger benefits from attending early childcare. Overall, our results suggest that attending early childcare is an effective tool to foster immigrant children achievement helping closing existing gaps with respect to native children.

The structure of the paper is as follows. In Section 2.2 we provide a summary of the existing literature on early childcare and children outcomes together with underlining the contributions of our paper. In Section 2.3 we describe the Italian system of public early childcare. We then present our data and provide a descriptive analysis (Section 2.4). In Section 2.5 we illustrate our identification strategy and the threats to its validity running some relevant robustness checks (Section 2.7). We discuss our results and offer some conclusions (Sections 2.6 and 2.8).

2.2 Literature review

This paper contributes to the literature on the impact of early life experiences and early interventions on children's cognitive skills along several dimensions.

The literature distinguishes between interventions toward children aged 0-2 and interventions toward children aged 3-5. Interventions targeting the second of the two groups have been extensively examined in the literature where most of the studies find a positive impact of the service on children from disadvantaged background (see Havnes and Mogstad (2015), Felfe et al. (2014), and Berlinski et al. (2009) among others).

On the contrary, there is lack of consensus on the effects of programmes involving children aged 0-2. As matter of fact, the few studies on the issue provide mixed evidence.

Desirable effects on cognitive and social skills from attending early care are stronger and robust in countries with high quality and large availability of the early childcare service, as in the northern European countries. By using administrative data from a large West German state, Felfe and Lalive (2018) develop a marginal treatment effect framework to assess the effect of early childcare on children's school readiness. They find that early childcare is particularly beneficial for children with low educated mothers or foreign-born parents. Drange and Havnes (2018) provide evidence on the impact of early childcare enrolment on children educational attainments at age 7 in Norway. Their identification strategy exploits a randomized lottery used in the city of Olso to allocate slots as an instrument for the age of the child, when he first attends childcare. Getting a lottery implies attending the service about four months earlier. Their results point out that children entered early in day care facilities perform better on both the literacy and numeracy test when 7 years old, with the effect driven by children from economically disadvantaged families.

However, the evidence of desirable effects is hardly equivocal. Evidence of negative effects emerged in many seminal studies evaluating the universal early childcare expansion occurred in Quebec during the '90. In this group stands out the work of Baker et al. (2008) that, exploiting a difference-in-difference strategy to compare children's outcomes before and after the reform, find that childcare utilization is detrimental for children's behavioural and health outcomes after the policy change. These negative outcomes are confirmed in a subsequent study of the same authors that also find little impact on cognitive test score (Baker et al. (2015)). Similar results have been found by other studies, such as Herbst (2017) Havnes and Mogstad (2015) and Herbst (2013) for children from more advantaged families.

With reference to Italy, only recently early childhood interventions received some research attention, probably because of the greater availability of reliable data on children's educational outcomes.

Mixed evidence on the impact of early childcare on children's development emerged also in the literature focusing on Italy. Brilli et al. (2016) find a positive impact of early childcare availability on children's language cognitive outcome with the effect driven by areas with a higher level of rationing. Same conclusions are reached by Del Boca et al. (2016) who, implementing an instrumental variable approach, provide evidence that early childcare attendance has a positive effect on children later educational achievements. Carta and Rizzica (2018) exploiting a reform introducing the possibility to enter earlier the fully-subsidized preschool service, outline that the entering in preschool at younger age has no significant effect on children cognitive outcomes at age 7. On the contrary, implementing a regression discontinuity design, Fort et al. (2019) find that early childcare has a detrimental effect on cognitive and non-cognitive outcomes of girls coming from more affluent families.

Our focus on immigrant children is the second contribution to the existing literature.

Despite of the growing share in all OECD countries, very few studies investigated the impact of early childhood programmes on children with an immigrant background. In this group, Dustmann et al. (2013) evaluate the impact of a universal childcare programme in Germany using unique administrative data and exploiting the staggered implementation of a federal policy reform across municipalities that entitles every child to a slot when turned 3 until school entry at age 6. They find that early childcare has a positive impact on children with immigrant ancestry, reducing their language and motor skills problems, while no significant effect emerges for native children. In the same vain, the study of Drange and Telle (2015) takes advantage of a targeted intervention providing 4 hours of free childcare in some district of Olso to estimate the impact of early childcare on

children's enrolment. Their results suggest that the intervention succeeded in increasing childcare enrolment and improved immigrant children's cognitive development, especially if coming from a disadvantaged background.

Our paper contributes extending the scarce literature on the impact of early childhood programmes and focusing on immigrant children, a fast-growing and little investigated group. Further, given the uniqueness of our data, we are able to analyse several channels through which the effect of the day-care service may operate such as mother's education, child's gender and immigrant children's linguistic proximity to the host-country language. To the best of our knowledge, no other studies investigated the role of the linguistic distance in shaping immigrant children's early education experience.

2.3 Background

2.3.1 Immigrant children in Italy

Over the past three decades, Italy became target of a massive inflow of immigrants. In 2017, the share of immigrants represent 10% of the total population and their number increased by more than 30% between 2009 and 2017, going from 4.5 million to 5.9 million. Most immigrants come from European countries and main countries of origin are Romania, Albania, Morocco, China and Ukraine. [2] They are typically characterized by low educational levels and are mostly concentrated at the bottom of the native wage distribution. Relative to Italians, they tend to have a lower socio-economic and cultural background (Frattini and Vigezzi (2018)).

The surge in migration has deeply affected the Italian educational system. In the academic year 2016/2017 the number of immigrant children represents 10.8% of students in Italian primary school.[3] Figure 2.1 shows the number of immigrant children in primary Italian school from the school year 2010/11 to 2016/2017 and it highlights the continual and rapid growth of non-native students.

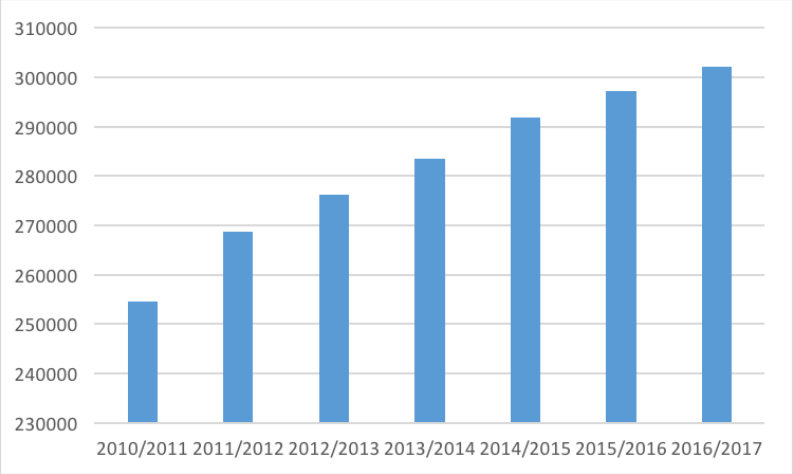


Figure 2.1: Number of immigrant children in Italian primary schools for the academic years 2010/2011 - 2016/2017. Source: elaborazione su dati MIUR - Ufficio Statistica e studi

[2] Istat, "Demografia in cifre" (www.demo.istat.it).
[3] Miur, "Portale dei dati sulla scuola" (www.dati.istruzione.it).

One of the most relevant aspects in the evolution of this phenomenon is the stable growth of second-generation immigrant students. In the five academic years 2012/13-2016/2017 this group of students rose from 371.000 to 503.000 units with an increase of 35.4% across all the school levels and represent 61% of the total number of children without Italian citizenship.

In terms of the geographical distribution, Veneto, Umbria, Piemonte and Lombardia are the regions that host the higher number of second-generation immigrant students out of the total number of students without Italian citizenship in elementary schools (between 57 and 61%).[4] In Figure 2.2 we show second-generation immigrant students geographical distribution at the municipal level for the 2016/17 academic year. Looking at the figure, it is apparent that most of second-generation immigrant students are concentrated in Northern and Central regions.

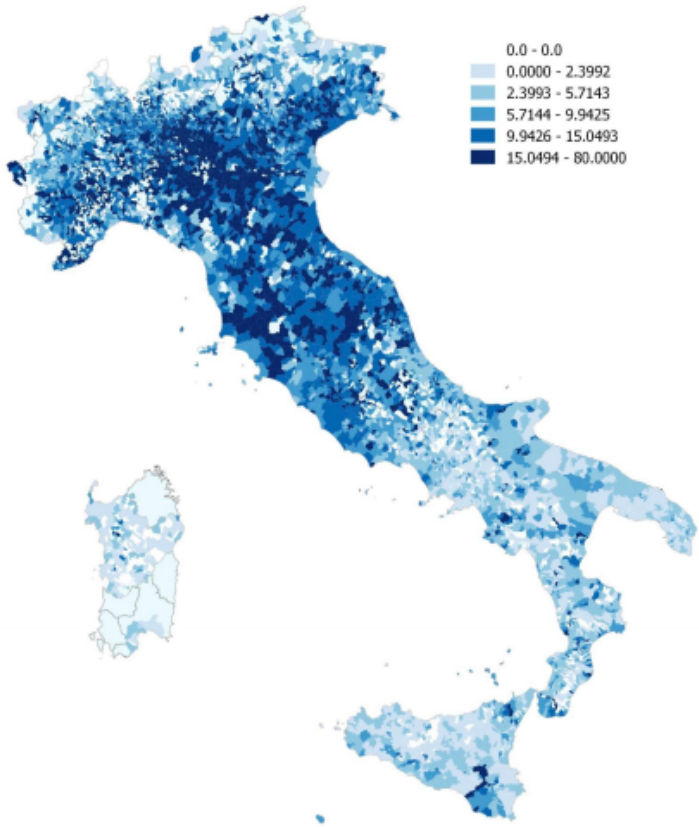


Figure 2.2: Geographic distribution of immigrant students in Italian primary schools for the academic year 2016/2017 at the municipal level (percentage values on the total number of students). Source: MIUR - Ufficio Statistica e studi.

2.3.2 Early Childcare in Italy

Formal education in Italy is compulsory from age six, when children start primary school, until age sixteen. For children younger than six, the provision of childcare is split into two stages: early childcare (nurseries) that is offered for children between three months and three years and preschool that is available for children aged three to six. There is no legal entitlement to childcare provision

[4] See MIUR (2018).

and while the access to the preschool service is almost universal and provided free of charge, early childcare is highly rationed and exhibits substantial cost variability across all Italian regions.
The early childcare service is decentralized at the municipal level, provided by both public and private bodies and, differently from preschool and formal schooling, is not under the responsibility of the Italian Ministry of Education. Municipalities handle the direct provision of the service, and depending on the available budget and their (social and political) preferences, decide the number of slots to offer and the eligibility requirements used to allocate such slots.[5] The other tiers of government are responsible for more general issues. Regions establish the criteria for construction standards, management and appropriateness of personnel qualifications. The central government is only responsible for the definition of common standards and resources allocation among regions. Both municipalities and families contribute to the total cost of public early childcare. [6] Fees are means-tested against the family income (ISEE, Index of Equivalent Economic Status). In the school year 2005/06 an average household composed of three members (two parents and a child under three years old) with a yearly gross income of 44,200 Euro spent 281 Euro per month. Table 2.1 reports the monthly average cost of the early childcare service across Italian regions for the school years 2005/06-2007/08 and the corresponding cost variation (in percentage points). It emerges clearly that there is substantial heterogeneity in early childcare monthly average cost across Italian regions and it follows different trends over time, increasing in some regions while decreasing in others. The cheapest region is Calabria while the most expensive is Lombardia (Cittadinanzattiva (2017), Cittadinanzattiva (2010)).

[5]There is high degree of variability in the criteria established by each municipality to assign the available slots. Besides the absolute priority given to children with disabilities, some municipalities benefit more families with disadvantaged socio-economic conditions, others parents' employment status (e.g. whether one or both parents are employed or not) and others family's composition (whether the child is orphan or has siblings).

[6]The minimum level of contribution required to users is 50%. The lower the resources available to the municipality the higher the contribution required to users.

Table 2.1: Early childcare monthly average cost s.y. 2005/06 and 2007/08

Regions	**Monthly average cost 2005/06** (1)	**Monthly average cost 2007/08** (2)	**% variation between 2005/06-2007/08** (3)
Abruzzo	229	255	11.3%
Basilicata	301	3015	0 %
Calabria	129	120	-7%
Campania	186	213	14.5%
Emilia-Romagna	303	311	2.6%
Friuli-Venezia Giulia	334	373	11.7%
Lazio	269	264	-1.8%
Liguria	322	331	2.8%
Lombardia	390	403	3.33%
Marche	246	287	16.7%
Molise	190	208	9.5%
Piemonte	346	346	0%
Puglia	196	226	15.3%
Sardegna	239	237	-0.8%
Sicilia	180	188	4.44%
Toscana	298	313	5%
Trenitino A.A.	410	406	-1%
Umbria	252	255	1.2%
Valle d'Aosta	318	358	12.6%
Veneto	366	369	0.81%
Italia	281	293	4.2%

On average, children spend 30.6 hours per week in early childcare and concerning the educational staff, the minimum qualification requirement is an upper secondary school diploma or a master degree in pedagogy.

Early childcare supply is very heterogeneous across regions and municipalities and accommodates 22.8 % of the potential demand (children under age 3) with relevant differences between northern and southern regions. While public and private childcare facilities in the North cover about 30% of 0–2 years old children, in the South the same figure drops to 10% (Figure 2.3).[7]

[7]ISTAT 2015, The municipal early childcare supply and other early childhood services.

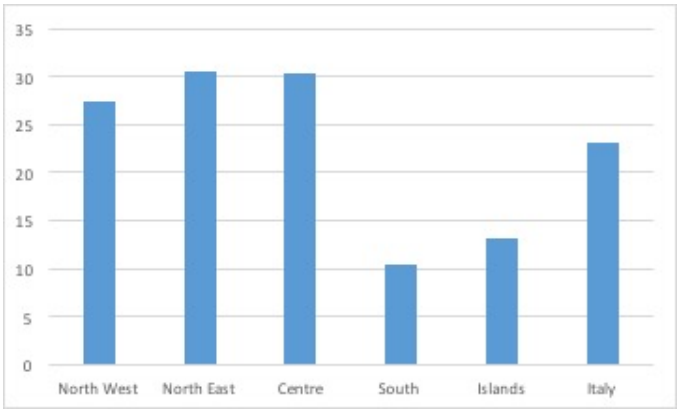


Figure 2.3: Early childcare coverage, year 2015. Notes: the coverage rate is provided by ISTAT as the number of early childcare authorized spots divided by the number of children 0-2

2.4 Data

2.4.1 INVALSI data

Our analysis draws on administrative data from INVALSI, the national agency that carries out a yearly testing of students' attainment in literacy and numeracy. Standardized tests are administered every year to the entire population of students in second, fifth, eighth and tenth grade. We focus our analysis on students in the fifth grade (last year of primary school) from the school years 2014/2015 to 2016/2017, the most recent ones.

The tests administered by INVALSI are standardized and are compulsory for all Italian schools and students attending the grades of interest. As all standardized tests, they have to satisfy two conditions. First, all students are required to answer the same questions during the same time interval. Second, correction and grading of the test follow standardized procedures that are set a priori and independently from who makes the actual correction of the tests. In other words, tests are anonymously and externally marked. These features of the INVALSI tests make students' results fully comparable across Italian schools and guarantee the tests to be objective.

All students take a test in Literacy and Numeracy in their own classroom on two different dates, typically in late May. The literacy test aims at assessing students' proficiency in reading comprehension that involves grammatical, lexical and pragmatic competences. The numeracy test evaluates students' knowledge and mastering of mathematics specific contents such as geometry, probability and algebra. Both tests consist of multiple-choice and open-ended questions. Test scores are adjusted by a cheating factor directly provided by INVALSI taking into account the probability that student's class was involved in cheating behaviours during the test.[8]

INVALSI also provides marks assigned by teachers in math and reading at the end of the first term. Marks are distinguished in written and oral marks. We regard oral marks to be particularly interesting. Differently from INVALSI test scores, they are non-blind marks that reasonably take into account more than just cognitive skills of students since teachers' marks are relative and likely to be affected by the class and students' behaviour.

[8]For further details see Quintano et al. (2009).

Together with test scores, INVALSI provides detailed information on families', students' and schools' characteristics. These additional information is collected by means of a "Family Questionnaire" sent to each family before the test, a "Student Questionnaire" compiled by each student in the fifth and tenth grade on the same day of the literacy or numeracy test, and a number of general information concerning students' performances and characteristics provided by the school administrative staff.

In our analysis, we use information on a rich set of individual and family characteristics such as parents' education and working status and students' gender, month of birth, citizenship (native and second-generation immigrant children), attendance to pre-school and a synthetic index of Economic, Social and Cultural Status (ESCS index).[9] We also add a set of school and class characteristics such as the average size and their squares, the school average ESCS index, the share of female per class, the fraction of immigrant and retained students per class and the proportion of poorly educated parents per class. The data allow us to distinguish between Italian and non-Italian students. In Italy, this distinction is made according to the *Ius sanguinis* principle by which citizenship is determined by having one or both parents who are Italian citizens and not by place of birth. Concerning immigrant students, we can distinguish between first-generation immigrant children, foreign-born students whose parents were also foreign-born and, second-generation immigrant children, students born in Italy whose parent were foreign-born. This study focuses on second-generation immigrant children, only. Available data do not allow us to properly take into account first-generation immigrant children age at arrival and therefore, to assess whether or not, they had the chance to attend early childcare in Italy.

2.4.2 Data on early childcare provision

We match INVALSI data with unique administrative records on the early childcare public available slots at the municipal level, collected by Antonelli et al. (2011) Antonelli and Grembi (2014). Administrative records were collected using municipal final balances provided by the Ministry of Interior. They refer to the availability of all the early childcare public spots directly and indirectly provided by Italian municipalities for the years 2005, 2006, 2007. Information is available for more than 700 hundred Italian municipalities with the number of residents above the threshold of 10,000.[10] This data set allows us to assign to each student observed in the three cohorts, the actual childcare provision available in his municipality when he was 1 year old.

As we will discuss in next section, we use this detailed information on early childcare supply as an instrument for the children's attendance rate to the early childcare service.

Figure 2.4 shows our instrument variability across Italian regions and over time and points out that there is substantial variability between regions, with the lowest supply in Calabria and Campania and the highest in Emilia-Romagna and Provincia Autonoma di Trento. Such territorial differences have different trends in time. In fact, while some regions between 2005 and 2007 increased their

[9] The ESCS index is built applying principal component analysis using the information provided by students in the Questionnaire and by schools about families' cultural resources, such as internet connection and the number of books, and parents' educational level and working status. By construction, the index has null mean and unit standard deviation. It implies that a student with a strictly positive individual value of the ESCS index has a socio-economic-cultural background more favourable than the Italian average. The index is provided at the individual, class and school level.

[10] In the original data set, for municipalities under the 10,000 threshold was not possible to proceed at the integration of some relevant pieces of information.

supply of early childcare spots others shorten it. Molise is the most striking example, with a decrease in the supply of about 30%. The supply of childcare is heterogeneous not only across regions but also within regions across different provinces and municipalities. Table 2.2 shows some descriptive statistics of the supply of early childcare spots by regions in 2007. Noticeably, apart from Valle d' Aosta[11], the standard deviation relative to the mean shows that there is substantial variation within most of the regions in our analysis. There are many factors that might explain early childcare supply territorial differences across time ranging from variability of fundings at the central and local level as well as political variables like policy maker preferences. In section 2.5.1 and 2.7 we address at lenght whether these elements might threat our identification assumption.

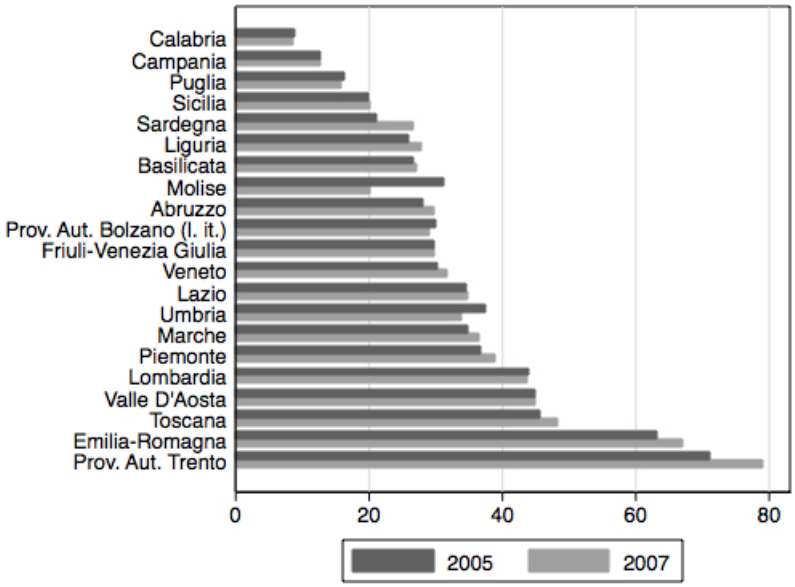


Figure 2.4: Variability of public childcare provision across regions - 2005 and 2007. The instrument is defined as the number of municipal early childcare public spots normalized by 10,000 residents.

[11] Aosta is the only city in Valle d'Aosta having a number of residents higher that 10,000, thus the only one included in our analysis.

Table 2.2: Descriptive evidence of the supply of early child care spots by regions in 2007.

Regions	**N**	**Mean**	**Sd**	**Min**	**Max**
	(1)	(2)	(3)	(4)	(5)
Abruzzo	3,728	29.98	22.96	7.823	141.1
Basilicata	1,166	27.15	5.279	16.64	33.24
Calabria	3,278	8.650	4.130	2.659	14.26
Campania	8,035	12.85	5.885	4.6	39.28
Emilia-Romagna	17,185	67.13	20.42	15.13	119.1
Friuli-Venezia Giulia	2,869	29.98	6.384	19.67	38.32
Lazio	13,946	34.99	11.05	6.540	48.31
Liguria	4,207	27.98	8.246	15.77	46.60
Lombardia	25,447	43.83	15.83	13.57	74.12
Marche	3,819	36.64	14.55	14.75	62.10
Molise	498	20.35	4.467	13.78	23.38
Piemonte	12,555	39.00	10.14	16.29	61.09
Prov. Aut. Bolzano	266	28.95	5.561	24.41	36.52
Prov. Aut. Trento	450	79.06	1.653	64.35	91.91
Puglia	7,278	15.87	9.574	3.258	46.42
Sardegna	2.148	27.02	13.76	12.40	74.53
Sicilia	8,770	20.29	12.17	2.992	65.85
Toscana	9,406	48.54	18.26	9.923	94.04
Umbria	3,479	33.97	12.20	15.60	75.19
Valle d'Aosta	268	44.92	0	44.92	44.92
Veneto	11,801	31.88	13.07	11.71	67.25

Overall, our final dataset covers 391,098 students (361,236 natives and 29,862 immigrants) 702 municipalities and 30865 schools located in the 20 Italian regions. For each academic year in the analysis, the share of immigrant population residing in these municipalities is about 60 % of the total immigrant population residing in Italy.[12]

Table 2.3 summarises all variables included in our empirical analysis.

[12]This percentage is calculated merging our data with yearly data on the number of immigrant residents per municipality available at "http://dati.istat.it/".

Table 2.3: Definition of variables and sources.

Variable	Description	Source
Outcome variables		
Literacy test score	Percentage of correct answers in Language test	INVALSI
Numeracy test score	Percentage of correct answers in Math test	INVALSI
Reading oral grade	Oral grade got past academic year	INVALSI
Math oral grade	Oral grade got past academic year	INVALSI
Childcare variable		
Childcare coverage	Public childcare slots over pop 0-2 by municipality	Antonelli et al. (2011)
Endogenous variables		
Childcare attendance	dummy=1 if the child attended to early childcare	INVALSI
Control variables (individual level)		
Female	dummy=1 if female	INVALSI
Immigrant I generation	dummy=1 if child is Immigrant II generation	INVALSI
Immigrant II generation	dummy=1 if child is Immigrant I generation	INVALSI
Age	child year of birth	INVALSI
II quarter month of birth	dummy=1 if the child is born in second quarter	INVALSI
III quarter month of borth	dummy=1 if the child is born in third quarter	INVALSI
Low level of paternal/maternal education	dummy=1 if mother/father has an educ. level lower or equal to middle school	INVALSI
Medium level of paternal/maternal educ.	dummy=1 if mother/father has an educ. level higher than middle school or equal to high school	INVALSI
High level of paternal/maternal educ.	dummy=1 if mother/father has an educ. level higher than high school	INVALSI
Mother's working status	dummy=1 if the mother works	INVALSI
Father's working status	dummy=1 if the father works	INVALSI
Language mostly spoken at home	dummy=1 if the child mostly speaks a language different from italian at home	INVALSI
Pre-school attendance	dummy=1 if the child attend the pre-school service	INVALSI
Students average characteristics		
Share of female	Share of female in each fifth grade class	INVALSI
Late students	Share of retained students in each class	INVALSI
School and class characteristics		
Immigrant stdudents	Share of immigrant students per class	INVALSI
School size	Total number of students in fifth grade per school	INVALSI
School size sq.	School size squared	INVALSI
Average class size	Average number of students in each fifth grade cass	INVALSI
Average class size sq.	Average class size squared	INVALSI
Low educated parents share	Share of low educated parents per class	INVALSI
ESCS School	Average ESCS per school	INVALSI

2.4.3 Descriptive evidence

As a preliminary descriptive analysis, in Figure 2.5 and 2.6 we provide the kernel density estimation of the probability density function of the literacy and numeracy test score, respectively. Each figure reports the distribution of standardised test scores in literacy (Figure 2.5) and numeracy (Figure 2.6) by immigrant status and early childcare attendance. The figures highlight the substantial achievement gap between native and immigrant students. In fact, the distribution for Italian children is left-skewed and has a higher mode compared to the distribution of immigrants, which in turn appears rather symmetric and with a higher variance. These differences are more pronounced in the literacy test score distribution. For both natives and immigrant students, there seems to be a positive difference between the performances of children attending the early childcare and not attending it, which is a first signal of children positive selection into the service.

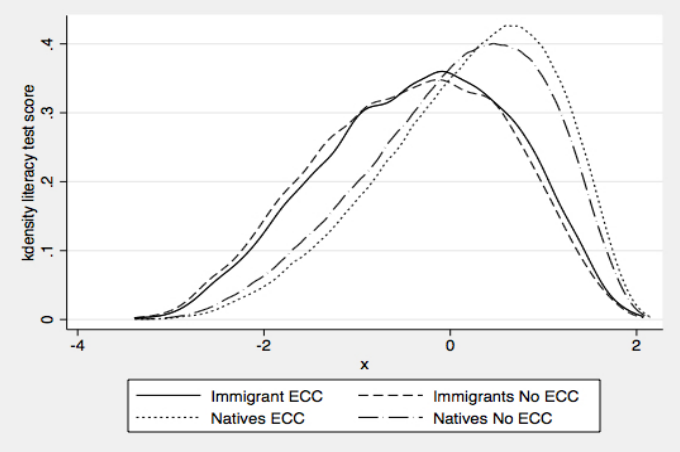


Figure 2.5: Kernel density literacy test score by early childcare attendance.
Source: INVALSI

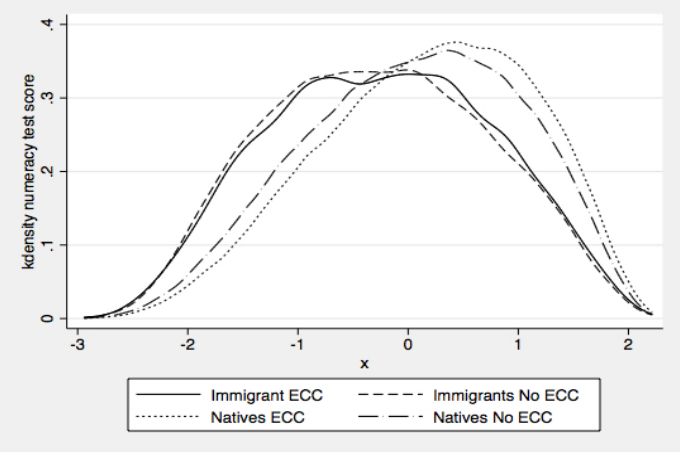


Figure 2.6: Kernel density numeracy test score by early childcare attendance.
Source: INVALSI.

Table 2.4 presents descriptive statistics of the individual and mean characteristics of children in our sample. Columns (2)-(5) refer to native children, while columns (6)-(9) refer to immigrant ones. Columns (2) and (6) report values for children who attended the early childcare service (ECC),

the treated group, while columns (3) and (7) refer to children who did not attend the service (No ECC), the control group.

For both native and immigrant children, we find significant differences in all the observable characteristics included in our analysis (Columns (3) and (6)), which is a preliminary signal of the endogeneity of the process behind the attendance to the daycare service.

On average, children enrolled in early childcare come from a more advantaged background than children not enrolled, independently from nationality. They are more likely to have a working mother, parents with a high educational level and higher values for the ESCS index. In terms of observable individual and parental background characteristics, descriptive evidence suggests children's positive selection into early childcare. This positive selection seems to be less pronounced for immigrant children than for native ones.

Table 2.4: Descriptive statistics and balancing test.

	Natives			**Immigrants**		
	(1)	(2)	(3)	(4)	(5)	(6)
Variable	**ECC**	**No ECC**	**p-value**	**ECC**	**No ECC**	**p-value**
Background characteristics						
Female	0.483	0.502	0.000	0.495	0.505	0.066
Father compolsury education	0.235	0.341	0.000	0.336	0.429	0.000
Father high school	0.478	0.462	0.000	0.485	0 .443	0.000
Father higher education	0.285	0.195	0.000	0.177	0.127	0.000
Mother compolsury education	0.146	0.258	0.000	0.34	0.441	0.000
Mother high school	0.486	0.506	0.000	0.451	0.408	0.000
Mother higher education	0.366	0.235	0.000	0.208	0.15	0.000
Father employed	0.958	0.944	0.000	0.876	0.884	0.027
Mother employed	0.818	0.632	0.000	0.528	0.361	0.000
Preschool	0.98	0.945	0.000	0.976	0.914	0.000
Late students	0.005	0.01	0.000	0.038	0.056	0.000
ESCS students	0.548	0.232	0.000	-0.271	-0.44	0.000
Outcome variables						
Literacy test score	0.193	0.072	0.000	-0.33	-0.411	0.000
Numeracy test score	0.17	0.043	0.000	-0.24	-0.28	0.000
Language oral mark	0.22	0.11	0.000	-0.423	-0.485	0.000
Math oral mark	0.212	0.086	0.000	-0.309	-0.356	0.000
Observations	203,291	157,945		12,947	16,915	

Notes: the table reports means of covariates by nationality and by whether the child attended the early child care service (ECC). Column (3) and (6) report the p-value of the t-statistic for equality of means in the treated and untreated group.

2.5 Identification strategy

We start our analysis by estimating the following linear model that links child's cognitive outcomes (Y^j_{imt}) to her early childcare attendance ($Earlychildcare_{imt}$) while controlling for characteristics of the child, the family, the class, the school as well as provincial fixed effects.

$$Y^{j}_{imt} = \gamma_0 + \gamma_1 Earlychildcare_{imt} + \gamma_2 YEAR_t + \gamma_3 PROV_{im} + \mathbf{X'}_{imt}\gamma + \epsilon_{imt} \quad (2.1)$$

where i indexes individuals, m indexes municipalities, t indexes cohorts, and j literacy/numeracy test score/oral mark), $Earlychildcare$ is the variable indicating whether or not the child attended the childcare service, $YEAR$ and $PROV$ are year and province dummies, $\mathbf{X}$ is a vector of baseline controls and ϵ_{imt} is the error term. In particular, we control for preschool attendance, gender, quarter of birth, studies regularity, mother's and father's education and employment condition, share of female and late students per class, school size and its square, average class size and its square, share of migrants per class, low educated parents' share and ESCS per school. The choice of control variables is motivated by the literature related to children's human capital production function (Cunha and Heckman (2007), Todd and Wolpin (2003)).

We consider four dependent variables: literacy and numeracy standardized test scores, language and math oral marks assigned by teachers. Test scores are defined as the fraction of correct answers and they range from 0 to 100, while marks assigned by teachers range from 0 to 10, where 6 is the passing grade.[13] To increase comparability across cohorts we standardized literacy and numeracy test scores as well as oral marks to have mean equal to 0 and standard deviation equal to 1 in each cohort and subject. All the specifications are run separately for Italian and second-generation immigrant students.[14] The parameter of interest is γ_1 that captures the impact of early childcare attendance.

Clearly, the problem with estimating this linear regression by OLS is the non-random sorting of children into early childcare. In fact, parents voluntarily decide to enrol children to the service based on their observable and unobservable characteristics and preferences. Therefore, comparing outcomes of children that attended and did not attend the service would result in biased estimates, even conditionally on a rich set of control variables.

The literature addressed this endogeneity issue using different strategies. The most common methodologies rely on difference in differences approach exploiting reforms in the provision of childcare (see for instance Baker et al. (2008), Havnes and Mogstad (2011), and Felfe et al. (2014)), regression discontinuity design around the admission treshold Fort et al. (2019)) or an instrumental variable method (Del Boca et al. (2016), Felfe and Huber (2017), and Drange and Havnes (2018)). Given the absence of a major reform affecting the early childcare service in Italy, we implement an instrumental variable strategy. In particular, we exploit cross-sectional and longitudinal variation in the early childcare supply across Italian municipalities as an instrument for children's probability to attend the nursery service. In a context where childcare provision is highly rationed, childcare availability clearly affects the probability of individual childcare attendance, and is arguably exogenous to children's characteristics and to unobservables in the model (we will discuss this point in more detail in Section 2.5.1). This approach is consistent with the evidence of Del Boca and Vuri (2007) showing that attendance to early childcare in Italy is mostly driven by the supply - rather than the demand- for the service. However, our instrument does not affect parents that are not interested in enrolling their children to the early childcare service.

[13] Due to the high number of missing observations, we are not able to use teachers' written marks.

[14] In order to test the hypothesis that regressors slopes are different across native and immigrant students, we run a Chow test that strongly rejected the data poolability assumption suggesting that in our framework separate regressions provide a better fit.

Our instrumental variable is defined as the number of early childcare publicly provided spots normalized for 10,000 residents. Equation (2) describes the first stage of our IV-model:

$$Earlychildcare_{imt} = \beta_0 + \beta_1 COVER_{mt} + \beta_2 YEAR_t + \beta_3 PROV_{im} + \mathbf{X}_{imt}\beta + \omega_{imt} \qquad (2.2)$$

where $COVER_{mt}$ is the public childcare coverage at the municipal level at time t and ω_{imt} is the error term. Standard errors of both the first and second stage are clustered at the municipality level.

We contribute to the existing IV literature in this field, by adopting a tighter identification strategy that exploits variation in the instrument not only across local areas (the main variation used in previous studies) but also across cohorts, thus enabling us to control for time constant unobserved area characteristics. Moreover, our instrument is defined on a much finer geographical aggregation compared to existing studies in the literature (see for instance Del Boca et al. (2016) that instrumented early childcare with the regional supply of childcare).

In Figure 2.7 we report a graphical representation of the first stage that illustrates the relationship between the supply of early childcare spots and the average early childcare attendance by municipality. It emerges clearly the existence of a positive linear relationship between the two variables which suggests that our instrument is valid. In our case, it implies that there are at least some parents that are affected in their enrolment decision by the public early childcare supply of the municipality. We will further check the validity of our IV, by examining the first stage of the instrument to be significantly different from zero. In section 2.6, tables of results provide the first stage instrument coefficient estimates, as well as the Kleibergen-Paap F-statistics. Overall, our instrument shows to capture relevant variation in the early childcare attendance, the endogenous variable.

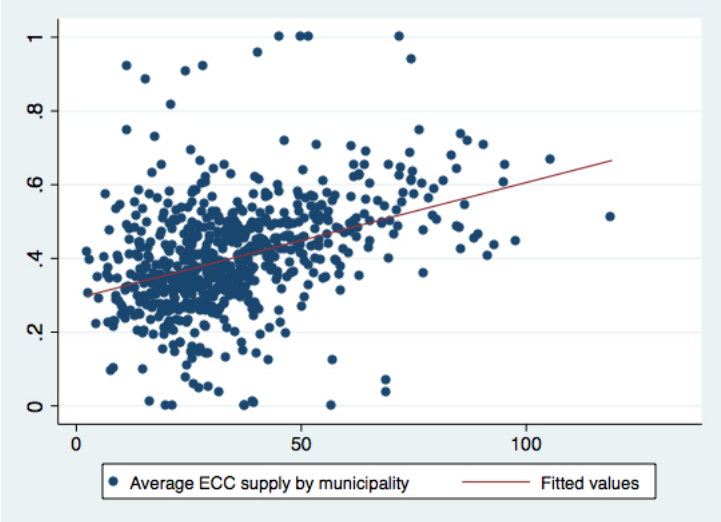


Figure 2.7: First stage graphical representation. Each dot shows the early childcare supply (ECC) by municipality.

2.5.1 Threats to identification

Our estimates identify the causal effect of early childcare attendance on children's cognitive outcomes if the supply of early childcare spots at the municipal level is uncorrelated with the unobserved child's characteristics conditional on a rich set of observable covariates ($\mathbf{X}_{imt}\gamma$) ,provincial ($\gamma_3 PROV_{im}$) and cohort fixed effects ($\gamma_2 YEAR_t$). In other words, public supply of early childcare spots must not have a direct effect on cognitive children's outcome and should be uncorrelated with any characteristics determining children's early childcare attendance and/or cognitive outcomes. While it seems plausible to assume the public supply of early childcare spots not to have a direct effect on cognitive children's outcome, a major concern is the existence of an association between the instrument and some potential determinants of early childcare attendance. In particular, there are three key reasons that might lead the exclusion restriction not to hold. First, municipalities might differ along several dimensions other than the supply of early childcare spots. Second, availability of early childcare and the quality of its provision to immigrant children might be negatively affected by an active policy of local politicians to hinder immigrant families to reside in their municipality. Third, immigrant families might choose to settle down in a municipality where the supply of early childcare spots is higher. We address in turn each point.

Regarding the first concern, we use provincial fixed effect in order to remove systematic differences between provinces in time. It is noteworthy to underline that we look at municipalities with a number of residents greater than 10,000 in the same province. [15] We expect municipalities with a number of residents greater than 10,000 in the same province to be characterized by a high level of internal homogeneity both in terms of social and economic characteristics. As showed in Figures 2.2 and 2.4, our instrument captures between municipalities and over time variation but the latter is not enough to allow us to use municipality fixed effects. Indeed, the variation we exploit is not generated by a sharp policy change or a reform able to produce sizeable changes over time. Thus, a threat to our identification may still derive from the existence of characteristics that correlate with both the outcome variable and the instrument that are not captured by the province fixed effects. In particular, one may argue that more resourceful municipalities supply a higher number of early childcare spots together with providing more opportunities for children's cognitive development. We deal with this potential threat by including in our specification an additional variable that aim to capture possible remaining heterogeneity between municipalities within the same provinces, which may affect the availability of childcare spots and may also be correlated with unobservable factors in the model that may influence children cognitive outcomes. In particular, as a robustness check we include a time varying measure of taxable income per capita at the municipal level for the years 2005-2007. [16]

Regarding the second concern of local anti-immigrant active policies, during the last two decades right parties in Italy, especially in the North, strongly supported anti-migration positions while left parties where in favour of more inclusive policies.[17] One may argue that different attitudes toward immigrants could have had spill-over effects on many social and economic aspects of immigrant families residing in the municipality. In our context different orientations toward immigrants might translate in different school environments as well as in more (less) inclusive policies for immigrant children during early childhood. Controlling in our specification for the mayor political faction, is

[15] Provinces are intermediate administrative divisions between municipalities and regions. The number of Provinces is equal to 107.

[16] Data are drawn from the Ministry of Economy and Finance "Analisi Statistiche - Open data dichiarazioni" www.finanze.gov.it

[17] For further details see Bracco et al. (2018).

intended to capture these potentially relevant differences across municipalities.

Regarding the third concern, one may inquire whether immigrant families decided to settle down in a specific municipality because of the greater availability of early childcare spots. The main drivers in immigrant families' residence decision are employment opportunities while we regard the availability of early childcare spots not to play a crucial role in their decision. In order to substantiate these points, in Section 2.7 we run a battery of robustness checks. Results are presented in Table 2.12 and 2.13.

Under our identifying assumptions, our approach identifies the `causal` effect of early childcare attendance on the child's cognitive outcomes.

2.6 Results

This section reports our main results on the effect of early childcare attendance on children cognitive outcomes. All specifications are run separately for native and immigrant students.

2.6.1 The effect of Early childcare attendance on standardized test scores

We start with the analysis of INVALSI standardized test scores. Table 2.5 reports OLS and IV estimates for literacy and numeracy test scores. In all specifications we cluster standard errors at the municipal level and we control for province and cohort fixed effects as well as for all control variables discussed in section 2.5.

As illustrated in previous sections, OLS estimates might be biased. Early childcare enrolment is the result of a set of decisions made by parents and nurseries that are based on unobserved determinants. In other words, children attending early childcare is likely to be a selected group. Our IV estimates takes into account the endogeneity of early childcare attendance and exploits only the variation in the aggregate childcare attendance rate within municipalities and across cohorts. As a consequence, the positive sign of the OLS estimates in Panel A of Table 2.5 does not necessarely imply early childcare attendance having a positive impact. In particular, the difference between IV and OLS estimates outlines a positive selection into childcare, translating in OLS estimates to be upward biased. In fact, we expect more skilled parents to be more likely to be employed in high-paying jobs and, therefore, to have higher incentives to enrol their children into early childcare in order to keep the household's income constant. Further, children of more skilled parents are more likely to grow up in stimulating and favourable environments that lead them to perform better than children coming from more disadvantaged families, independently from attending or not the early childcare service. Evidence in Table 2.5 are consistent with these considerations: OLS estimates are positive and significant, while when turning to IV estimates they are no longer significant. The only exception is represented by the OLS estimates for immigrants' numeracy test score that are negative and significant. The direction of the selection in this case is less straightforward to interpret and could be caused by unobservable characteristics that we are not able to control for. On average, we find that, neither for native children, nor for those with an immigrant background, early childcare attendance has a significant impact on literacy and numeracy test scores when the child is 10.

For the sake of brevity, we did not include in our tables of results control variables' coefficients. Reassuringly, their sign is consistent with the evidence from previous studies underpinning the

goodness of our model. In particular, having working and/or highly educated parents has a positive and significant impact on children's outcomes as well as attending preschool. Interestingly, also being born earlier (we control for children's quarter of birth) has a positive and significant effect on children's results.

In Panel B, we report first stage estimates, which show that public municipal supply of early childcare strongly determines children's attendance to the service, both for native and non-native students. First stage F-statistics indicate that the instrument is not weakly defined, implying that it is able to predict relevant variation of the endogenous variable.

Table 2.5: Effects of early childcare attendance on children's test score at grade 5.

	LITERACY				**NUMERACY**			
Panel A: Second Stage								
	Natives		Immigrants		Natives		Immigrants	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	OLS	IV	OLS	IV	OLS	IV	OLS	IV
Early childcare	0.011***	-0.080	-0.006	0.221	0.036***	-0.257	-0.047***	0.051
	(0.004)	(0.122)	(0.011)	(0.208)	(0.004)	(0.160)	(0.011)	(0.196)
Observations	361,236	361,236	29,862	29,862	361,236	361,236	29,862	29,862
Panel B: First Stage								
		(2)		(4)		(6)		(8)
		WS		WS		WS		WS
Early childcare public supply		0.002***		0.003***		0.002***		0.003***
		(0.000)		(0.000)		(0.000)		(0.000)
First stage F-stat		42.08***		38.37***		42.08***		38.37***
Observations		361,236		29,862		361,236		29,862
Province FE	√	√	√	√	√	√	√	√
Year FE	√	√	√	√	√	√	√	√
Individual controls	√	√	√	√	√	√	√	√
School and class controls	√	√	√	√	√	√	√	√

Notes: Entries in the Tabel are the estimated coefficients of early childcare attendance on standardized literacy (columns 1-4) and numeracy (columns 5-8) scores. Columns 1,3,5,7 reports OLS estimates, while columns 2,4,6 and 8 IV estimates. Columns 1-2 and 5-6 report estimates for native students, while columns 3-4 and 7-8 for immigrant students. All the specifications include province and cohort fixed effects. Control variables include individual level characteristics, students' average characteristics and school and class characteristics according to Table 2.3 in Section 2.4. Robust standard errors (adjusted for clustering at the municipal level) in parenthesis, ***p<0.01, **<0.05, *p<0.1.

2.6.2 Heterogeneous effects

Results reported in Table 2.5 are averaged on several individual characteristics. Thus, they could mask substantial heterogeneity in the effect of early childcare across different sub-groups of the population. We proceed by exploring whether attendance to early childcare is experienced differently across children from various backgrounds. In particular, we investigate whether the impact differs by children's social and cultural background and by gender.

In Table 2.6 and 2.7, we report IV estimates of the impact of early childcare on INVALSI literacy and numeracy test scores for children with high or low educated parents [18], respectively for native and immigrant children. Parents' educational level proxy children' social and cultural background.

[18] For each child we consider the highest level of education among the two parents and then we define a parent to be highly educated if she/he has an educational level equal or higher than high school diploma.

Table 2.8 suggests that parental background does not play a role in shaping the effect of childcare programs on literacy scores of native students, but interestingly highlights that for immigrant students the impact of early childcare is indeed not homogenous across parental backgrounds. In fact, when we run separate regressions by parental education, we find that the impact of early childcare is positive and significant only for imigrant children from low educated families (see column 6). [19] These results are in line with previous studies underlying that childcare attendance is particularly beneficial for children from disadvantaged backgrounds, because they would probably experience lower-quality care in the absence of formal childcare, due to worse and less stimulating home environment (see Havnes and Mogstad (2011), Drange and Havnes (2018), Felfe and Lalive (2018), Cornelissen et al. (2018)).

In terms of magnitude, early childcare utilization increases literacy test scores of immigrant children from low socioeconomic background by 87% of a standard deviation. To appreciate the size of the effect, consider that the literacy test score of immigrants students with low educated parents is 0.88 standard deviations lower than natives' students with high educated parents. Therefore, early access to preschool tend to offset the achievement gap between immigrants and natives in literacy test score. [20]

Table 2.6: Heterogeneous effects by parents' educational level, literacy

	LITERACY					
Panel A: Second Stage						
	Natives			Immigrants		
	(1)	(2)	(3)	(4)	(5)	(6)
	Whole Sample	High Edu	Low Edu	Whole Sample	High Edu	Low Edu
Early childcare	-0.080	0.061	-0.094	0.221	-0.063	0.874**
	(0.122)	(0.128)	(0.220)	(0.208)	(0.206)	(0.376)
Observations	361,236	311,441	49,795	29,862	21,168	8,694
Panel B: First stage						
	(1)	(2)	(3)	(4)	(5)	(6)
Early childcare public supply	0.002***	0.002***	0.003***	0.003***	0.003***	0.003***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.001)	(0.001)
First stage F-stat	42.12***	42.13***	38.63***	38.56***	33.20***	32.57***
Observations	361,236	311,441	49,795	29,862	21,168	8,694
Province FE	√	√	√	√	√	√
Year FE	√	√	√	√	√	√
Individual controls	√	√	√	√	√	√
School and class controls	√	√	√	√	√	√

Notes: the table shows IV estimates in which the dependent variable is the literacy test score. Columns (1)-(3) refer to native students, while columns (4)-(6) refer to immigrant ones. Column (2) and (5) refer to students with high educated parents (educational level of the parent with the highest level of education equal or higher than high school diploma), while column (3) and (6) refer to students with low educated parents (educational level of the parent with the highest level of education lower or equal to middle school diploma). All the specifications include province and cohort fixed effects. Control variables include individual level characteristics, students' average characteristics and school and class characteristics according to Table 2.3 in Section 2.4. Robust standard errors are clustered at the municipal level. First stage F-stat. refers to the Kleibergen-Paap F-statistics. The symbols ***, **, * indicate that the coefficients are statistically significant, respectively at the 1,5 and 10 percent level.

[19] Our results are consistent also when using father or mother educational level as a proxy for the child's social and cultural background.

[20] One might inquire whether the controls capturing school and class composition in our main specification are endogenous, as partially determined by parents' choice of primary school. To dispel doubts, we drop all the controls related to student' class and school characteristics from our key specifications. Reassuringly, results are mostly unaffected.

In Table 2.7 we show estimates of the impact of early childcare attendance on numeracy test scores for children with low educated parents. Regardless of the immigrant status and parents' educational level we find no effect on numeracy test scores. Interestingly, the fact that results that we observe for literacy test scores are not mirrored for numeracy test scores, suggest that early childcare is likely to function as a device to facilitate children's learning of the host country language.

Table 2.7: Heterogeneous effects by parents' educational level, numeracy.

	NUMERACY					
Panel A: Second Stage						
	Natives			Immigrants		
	(1)	(2)	(3)	(4)	(5)	(6)
	Whole Sample	High Edu	Low Edu	Whole Sample	High Edu	Low Edu
Early child care	-0.257	-0.164	-0.193	0.051	-0.049	0.266
	(0.160)	(0.166)	(0.250)	(0.196)	(0.205)	(0.359)
Observations	361,236	311,441	49,795	29,862	21,168	8,694
Panel B: First stage						
	(1)	(2)	(3)	(4)	(5)	(6)
Early child care public supply	0.002***	0.002***	0.003***	0.003***	0.003***	0.003***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.001)	(0.001)
First stage F-stat	42.19***	42.13***	38.63***	38.48***	33.32***	32.60***
Observations	361,236	311,441	49,795	29,862	21,168	8,694
Province FE	√	√	√	√	√	√
Year FE	√	√	√	√	√	√
Individual controls	√	√	√	√	√	√
School and class controls	√	√	√	√	√	√

Notes: the table shows IV estimates in which the dependent variable is the numeracy test score. Columns (1)-(3) refer to native students, while columns (4)-(6) refer to immigrant ones. Column (2) and (5) refer to students with high educated parents (educational level of the parent with the highest level of education equal or higher than high school diploma), while column (3) and (6) refer to students with low educated parents (educational level of the parent with the highest level of education lower or equal to middle school diploma). All the specifications include province and cohort fixed effects. Control variables include individual level characteristics, students' average characteristics and school and class characteristics according to Table 2.3 in Section 2.4. Robust standard errors are clustered at the municipal level. First stage F stat. refers to the Kleibergen-Paap F-statistics. The symbols ***, **, * indicate that the coefficients are statistically significant, respectively at the 1,5 and 10 percent level.

Turning on the heterogeneity by gender, we investigate whether male and female students experience early childcare attendance differently. While on average we do not find significant gender differences both for literacy and numeracy test scores, gender plays an important role in explaining our positive and significant result for immigrant children with low educated parents in the literacy test score. In particular, we find that immigrant girls with low educated parents are those gaining the largest benefit from the childcare attendance. Results are reported in Table 2.8. This finding is consistent with those in Felfe et al. (2014) and Havnes and Mogstad (2011) who report that early childcare attendance is particularly beneficial for girls. This finding is also in line with the psychological literature emphasizing girls greater capability of reaping the benefits form an early interaction with adult native speakers (see Fenson et al. (1994) Bornstein et al. (2004)).

Table 2.8: Heterogeneous effects by parents' educational level and child's gender.

	LITERACY							
Panel A: Second Stage								
	Natives				Immigrants			
	(1) High Edu Male	(2) Low Edu Male	(3) High Edu Female	(4) Low Edu Female	(5) High Edu Male	(6) Low Edu Male	(7) High Edu Female	(8) Low Edu Female
Early childcare	0.097	-0.378	0.026	0.148	-0.085	0.628	-0.054	1.070**
	(0.135)	(0.312)	(0.147)	(0.235)	(0.281)	(0.592)	(0.249)	(0.453)
Observations	157,954	24,732	153,487	25,063	10,576	4,324	10,592	4,370
Panel B: First stage								
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Early childcare public supply	0.002***	0.002***	0.003***	0.003***	0.003***	0.003***	0.003***	0.003***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.001)	(0.001)	(0.001)	(0.001)
First stage F-stat	40.02***	25.91***	41.22***	36.73***	25.04***	13.40***	25.77***	33.32***
Observations	157,954	24,732	153,487	25,063	10,576	4,324	10,592	4,370
Province FE	√	√	√	√	√	√	√	√
Year FE	√	√	√	√	√	√	√	√
Individual controls	√	√	√	√	√	√	√	√
School and class controls	√	√	√	√	√	√	√	√

Notes: the table shows IV estimates in which the dependent variable is the literacy test score. Columns (1)-(4) refer to native students, while columns (5)-(8) refer to immigrant ones. Both native and immigrant children are distinguished by gender. Column (2),(4),(6) and (8) refer to students with low educated parents (educational level of the parent with the highest level of education lower or equal than middle school diploma), while column (1),(3),(5), and (7) refer to students with high educated parents (educational level of the parent with the highest level of education equal or higher than high school diploma). All the specifications include province and cohort fixed effects. Control variables include individual level characteristics, students' average characteristics and school and class characteristics according to Table 2.3 in Section 2.4. Robust standard errors are clustered at the municipal level. First stage F stat. refers to the Kleibergen-Paap F-statistics. The symbols ***, **, * indicate that the coefficients are statistically significant, respectively at the 1,5 and 10 percent level.

On the whole, our results outline that the impact of the early childcare service varies by sub-groups with the largest benefits observed for immigrant children from more disadvantaged backgrounds. In particular, females coming from less resourceful families are those gaining the largest benefits. Further, in all the specifications analysed, we find that early childcare attendance has no impact on native children neither in literacy nor in numeracy test scores. This finding stands in contrast with part of the recent literature reporting detrimental effect for native children (see Fort et al. (2019)).

2.6.3 The effect of Early Childcare attendance on oral marks assigned by teachers

We now focus on the impact of early childcare on oral marks assigned by teachers in language and math at the end of the first term of the same academic year in which the INVALSI tests take place. We repeat the same analysis performed for INVALSI test scores but considering oral marks assigned by teachers as dependent variables. We regard oral marks to be particularly interesting because they capture something different than just cognitive skills: they are non-blind scores and are likely to be affected by teachers' evaluations regarding students behaviours and thus should grasp a mixture between cognitive and non-cognitive skills such as students' motivation, resilience and effort.

In the following tables we investigate the interplay between the effect of early childcare attendance on reading (math) oral marks and the educational level of the students' parents [21]. In Tables 2.9 and 2.10 we report results from subsamples divided by immigrant status (columns 1-3 native children and columns 4-6 immigrant children) and by high and low parents' education (columns 2 and 5 high educated parents and columns 3 and 6 low educated parents) respectively for reading and math oral marks. In both Tables columns 1 and 4 show baseline estimates for ease of comparison. Our results show that early childcare has a positive and significant impact on language and math oral marks of immigrant children with low educated parents while we find no effect on native children.

All in all, oral marks results are consistent with those in previous section analysing the impact of early childcare on INVALSI test scores, however, differently from before our results are significant for math oral marks as well. The latter it is likely not be related with children's higher ability in math but to their oral exposure competences that strongly depend on their language fluency and comprehension.

Table 2.9: Heterogeneous effects by parents' educational level, reading oral marks.

	READING ORAL MARK					
Panel A: Second stage						
	Natives			Immigrants		
	(1)	(2)	(3)	(4)	(5)	(6)
	Whole Sample	High Edu	Low Edu	Whole Sample	High Edu	Low Edu
Early childcare	0.386	0.458	0.250	0.0.435	0.379	0.719*
	(0.169)	(0.331)	(0.405)	(0.272)	(0.307)	(0.417)
Observations	356,544	307,374	49,170	29,370	20,841	8,297
Panel B: First stage						
	(1)	(2)	(3)	(4)	(5)	(6)
Early childcare public supply	0.000***	0.002***	0.003***	0.001***	0.003***	0.003***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
First stage F-stat	42.47***	42.96***	36.95***	37.04***	30.77***	30.70***
Observations	356,544	307,374	49,170	29,370	20,841	8,539
Province FE	√	√	√	√	√	√
Year FE	√	√	√	√	√	√
Individual controls	√	√	√	√	√	√
School and class controls	√	√	√	√	√	√

Notes: the table shows IV estimates in which the dependent variable is the reading oral mark assigned by teachers. Columns (1)-(3) refer to native students, while columns (4)-(6) refer to immigrant ones. Column (2) and (5) refer to students with high educated parents (educational level of the parent with the highest level of education equal or higher than high school diploma), while column (3) and (6) refer to students with low educated parents (educational level of the parent with the highest level of education lower or equal than middle school diploma). All the specifications include province and cohort fixed effects. Control variables include individual level characteristics, students' average characteristics and school and class characteristics according to Table 2.3 in Section 2.4. Robust standard errors are clustered at the municipal level. First stage F stat. refers to the Kleibergen-Paap F-statistics. The symbols ***, **, * indicate that the coefficients are statistically significant, respectively at the 1,5 and 10 percent level.

[21] As in previous subsection, for each child we consider the highest level of education among the two parents then, we define a parent to be highly educated if she/he has an educational level equal or higher than middle school diploma.

Table 2.10: Heterogeneous effects by parents' educational level, math oral marks.

	MATH ORAL MARK					
Panel A: Second stage						
		Natives			Immigrants	
	(1)	(2)	(3)	(4)	(5)	(6)
	Whole Sample	High Edu	Low Edu	Whole Sample	High Edu	Low Edu
Early childcare	0.498	0.545	0.459	0.447	0.338	0.802*
	(0.333)	(0.330)	(0.400)	(0.300)	(0.302)	(0.431)
Observations	346,358	307,195	49,141	28,545	20,831	8,539
Panel B: First stage						
	(1)	(2)	(3)	(4)	(5)	(6)
Early childcare public supply	0.002***	0.002***	0.003***	0.003***	0.002***	0.003***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.001)	(0.001)
First stage F-stat	42.71***	43.03***	31.17***	37.38***	42.60***	36.78***
Observations	345,336	298,600	47,758	29,370	20,255	8,290
Province FE	√	√	√	√	√	√
Year FE	√	√	√	√	√	√
Individual controls	√	√	√	√	√	√
School and class controls	√	√	√	√	√	√

Notes: the table shows IV estimates in which the dependent variable is the reading oral mark assigned by teachers. Columns (1)-(3) refer to native students, while columns (4)-(6) refer to immigrant ones. Column (2) and (5) refer to students with high educated parents (educational level of the parent with the highest level of education equal or higher than high school diploma), while column (3) and (6) refer to students with low educated mother (educational level of the parent with the highest level of education lower or equal than middle school diploma). All the specifications include province and cohort fixed effects. Control variables include individual level characteristics, students' average characteristics and school and class characteristics according to Table 2.3 in Section 2.4. Robust standard errors are clustered at the municipal level. First stage F stat. refers to the Kleibergen-Paap F-statistics. The symbols ***, **, * indicate that the coefficients are statistically significant, respectively at the 1,5 and 10 percent level.

As in previous sub-section, we investigate whether the positive effect found for immigrant children with low educated parents shows significant gender differences. For both males and females with low educated parents, we detect a positive and significant effect (at the 10 percent level) of early childcare attendance on children language oral mark, with the effect being not mediated by gender.[22]

2.6.4 The role of language proximity

To explore a possible channel at work in determining the effect of early childcare on second generation immigrant children, we expand our investigation to another dimension that might help us explain our results on cognitive skills, namely the linguistic proximity of immigrant children's language to Italian Frattini and Meschi (2019). Indeed, one may inquire about the impact of early childcare attendance being experienced equally by diverse groups of immigrant children, identified according to their linguistic proximity to Italian. We expect children whose native language differs significantly from Italian to benefit the most from the attendance to early childcare being in there highly exposed to the Italian language. To the best of our knowledge, no other studies on early child development focused on this relevant dimension.

In order to carry out this analysis we make use of a linguistic proximity index, INDEX, based on

[22]Our results are consistent also when using father or mother educational level as a proxy for the child's social and cultural background.

information from Ethnologue (see Adsera and Pytlikova (2015)). INVALSI data contain unique information about the language children mostly spoken at home. [23] We restrict the sample to second generation immigrant children and we match the individual information about the language children mostly speak at home with Ethnologue data. In our data, the index ranges between 0 and 1. It is set equal to 0 if the two languages do not share a common language family and equal to 1 if they do share one. Thus, the higher is the number of linguistic family tree's branches that two language share the higher is the index. In our sample the index ranges between 0 and 0.7 and has four unique values.

While on average we find no effect on children speaking a language more (less) distant from Italian, we report significant heterogeneity for children with low educated parents speaking a languange distant from Italian. Result are reported in Table 2.11. We run separate regressions for second generation immigrant students whose language is more (less) distant from Italian on the basis of INDEX being above (below) the median and with low (high) educated parents. As in previous section we focus on our main outcome variables: INVALSI literacy and numeracy test scores.

As expected, our results confirm no effect for children speaking a language with low dissimilarity with respect to Italian both when they have high or low educated parents (see Columns 3 and 4). However, consistently with our results in previous sections, we find that early childcare attendance has a positive and significant impact on literacy test scores for children speaking a language distant from Italian with low educated parents (see Column 2). [24] We find no effect on numeracy test scores.

Table 2.11: Heterogeneous effects by child's linguistic proximity and parents' educational level.

	Low linguistic proximity (LLP)		**High linguistic proximity (HLP)**	
Panel A: Second Stage				
	(1) High Edu	(2) Low Edu	(3) High Edu	(4) Low Edu
Early childcare	0.324	2.384*	-0.200	-0.436
	(0.408)	(1.449)	(0.274)	(0.571)
Observations	5,556	3,779	3,305	657
Panel B: First Stage				
	(1)	(2)	(3)	(4)
Early childcare supply	0.003***	0.002**	0.005***	0.005***
	(0.001)	(0.001)	(0.001)	(0.002)
First stage F-stat	15.00***	5.00**	27.17***	8.35**
Observations	5,556	3,779	3,305	657
Province FE	√	√	√	√
Year FE	√	√	√	√
Individual controls	√	√	√	√
Class controls	√	√	√	√

Notes: Columns (1)-(2) refer to immigrant students speaking a language with a low level of proximity with respect to Italian (LLP). Columns (3)-(4) refer to immigrant student speaking a language with high level of linguistic proximity with respect to Italian (HLP). All the specifications include province and cohort fixed effects. Column 1 and 3 refer to children with high educated parents. Columns 2 and 4 refer to children with low educated parents. Control variables include individual level characteristics, students' average characteristics and class characteristics according to Table 2.3 in Section 2.4. Robust standard errors are clustered at the municipal level. First stage F stat. refers to the Kleibergen-Paap F-statistics. The symbols ***, **, * indicate that the coefficients are statistically significant, respectively at the 1,5 and 10 percent level.

In Figure 2.8 we plot the marginal effect of attending early childcare on literacy test scores by

[23] INVALSI data do not provide immigrant children's country of origin.

[24] Results on linguistic distance should be interpreted cautiously due to weak IV first-stages. The latter is presumably due to the strong reduction in the sample size.

linguistic proximity at the 90% significant level. It emerges clearly that the effect is positive and significant with low levels of linguistic proximity and decreases, turning not significant, as the two languages become more similar.

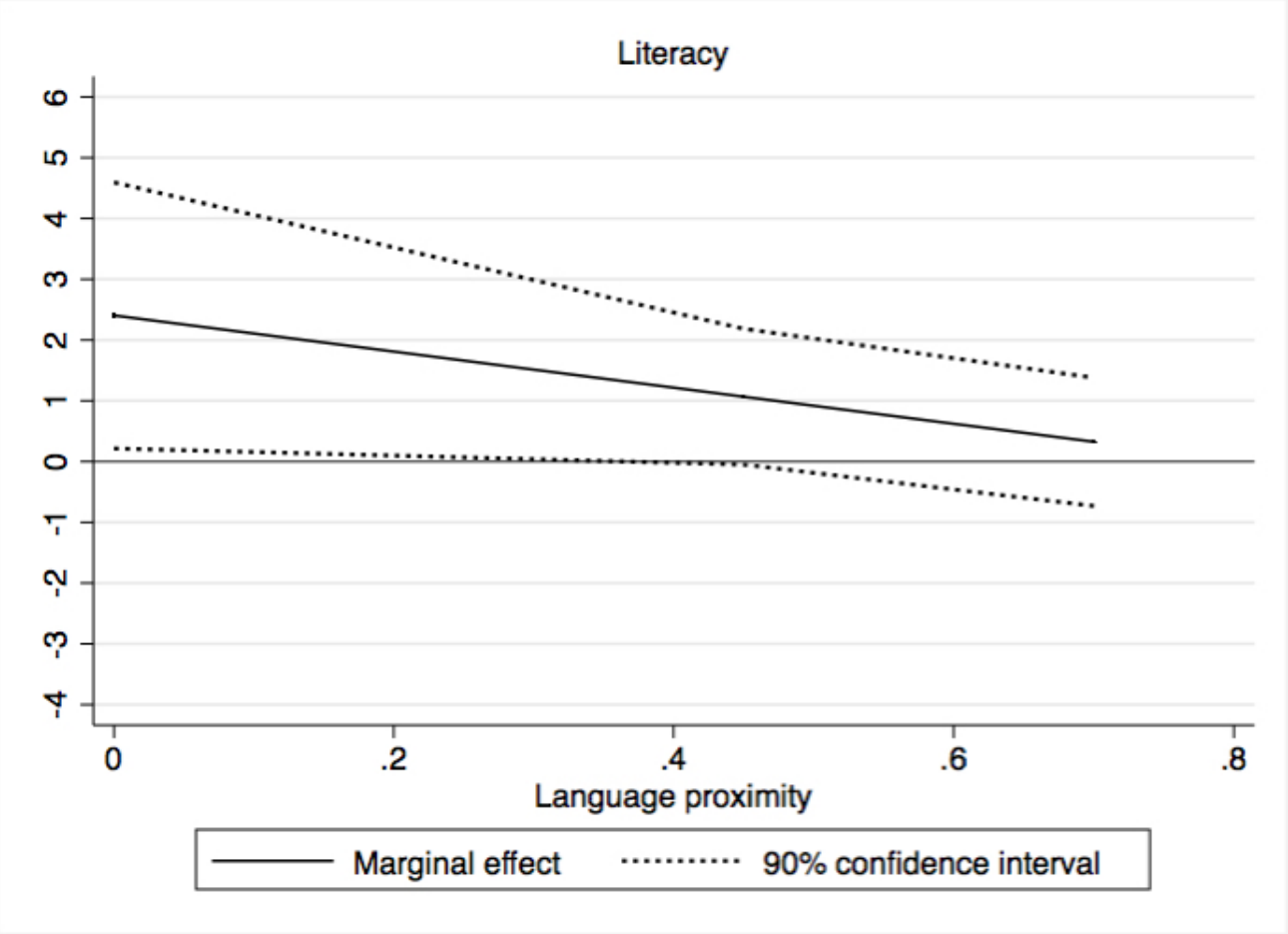


Figure 2.8: Marginal effect of early childcare attendance on literacy test score by language proximity and parents' low educational level.

Overall, results are consistent with those in previous sections, namely early childcare exerts positive effects on litearcy outcomes of immigrant children with low educated parents. As a consequence, linguistic distance might well considered a valid channel through which the effect operates.

2.7 Robustness checks

In this section we perform several robustness checks in order to support the validity of our identification strategy together with showing the robustness of our estimates to the potential threat associated with missing values in the variable `Early childcare`.

2.7.1 Robustness checks on IV assumptions

A key assumption for the validity of our IV strategy is the exclusion restriction, which implies the effect of the supply of early childcare spots to affect children's cognitive outcomes only through the

children's attendance to the early childcare service. In section 2.5.1 we discussed in detail some potential threats to our identification strategy and in what follows we provide empirical evidence of the validity and robustness of our assumptions addressing most relevant issues.

Dealing with the fact that municipalities might differ on other dimensions rather than supply of early childcare spots, in Table 2.12 we estimate the same specification as in Table 2.6 but controlling also for taxable income per capita at the municipal level. We expect taxable income to proxy several types of resources provided by the municipality as well as the local labour market conditions. As we can see in Table 2.12 results are mostly unchanged and point in the direction of an even stronger positive impact of early childcare on immigrant children cognitive outcomes once we control for municipality taxable income.

Table 2.12: Heterogeneous effects by parents' educational level controlling for taxable income per capita.

	LITERACY					
Panel A: Second Stage						
	Natives			Immigrants		
	(1)	(2)	(3)	(4)	(5)	(6)
	Whole Sample	High Edu	Low Edu	Whole Sample	High Edu	Low Edu
Early childcare	-0.080	-0.030	0.28	0.221	0.117	1.614**
	(0.122)	(0.174)	(0.296)	(0.208)	(0.490)	(0.799)
Observations	361,236	311,441	49,795	29,862	21,168	8,694
Panel B: First stage						
	(1)	(2)	(3)	(4)	(5)	(6)
Early childcare public supply	0.002***	0.002***	0.002***	0.003***	0.002***	0.002***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.001)	(0.001)
First stage F-stat	42.12***	31.33***	33.56***	38.56***	9.44**	10.17***
Observations	361,236	311,441	49,795	29,862	21,168	8,694
Province FE	√	√	√	√	√	√
Year FE	√	√	√	√	√	√
Individual controls	√	√	√	√	√	√
School and class controls	√	√	√	√	√	√

Notes: the table shows IV estimates in which the dependent variable is the literacy test score. Columns (1)-(3) refer to native students, while columns (4)-(6) refer to immigrant ones. Column (2) and (5) refer to students with high educated parents (educational level of the parent with the highest level of education equal or higher than high school diploma), while column (3) and (6) refer to students with low educated parents (educational level of the parent with the highest level of education lower or equal to middle school diploma). All the specifications include province and cohort fixed effects. Control variables include individual level characteristics, students' average characteristics, taxable income per capita and school and class characteristics according to Table 2.3 in Section 2.4. Robust standard errors are clustered at the municipal level. First stage F-stat. refers to the Kleibergen-Paap F-statistics. The symbols ***, **, * indicate that the coefficients are statistically significant, respectively at the 1,5 and 10 percent level.

As an additional robustness check, we control for the municipalities' political orientation looking at whether the incumbent mayor was supported by a left or a right party when elected [25]. We merge our data set with elections data at the municipality level collected by Bracco et al. (2018) from the Italian Ministry of the Interior.[26]. We use same specification as in Table 2.6 controlling also for the incumbent mayor political faction: a dummy variable coded equal to 1 if the mayor was endorsed by left parties or equal to 0 in case it was supported by right parties. Results are

[25] In smaller municipalities it is common that mayors are endorsed by ad hoc unitary lists not directly related to national parties or that are grouped so that it is not possible to state neatly the political orientation. In our data mayors supported by unitary lists are coded as 0s.

[26] Data are presented in Bracco et al. (2018) Elaborated data in this paper are kindly provided by the authors.

shown in Table 2.13. It emerges clearly that our main findings remain unaltered compared to our main specification both in terms of magnitude and significance.

Table 2.13: Heterogeneous effects by parents' educational level controlling for municipality political orientation.

	LITERACY					
Panel A: Second Stage						
	(1) Whole Sample	(2) High Edu	(3) Low Edu	(4) Whole Sample	(5) High Edu	(6) Low Edu
Early childcare	-0.080	0.073	-0.004	0.221	-0.120	0.899**
	(0.122)	(0.127)	(0.235)	(0.208)	(0.204)	(0.377)
Observations	361,236	283,721	42,475	29,862	19,975	8,190
Panel B: First stage						
	(1)	(2)	(3)	(4)	(5)	(6)
Early childcare public supply	0.002***	0.002***	0.003***	0.003***	0.003***	0.003***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.001)	(0.001)
First stage F-stat	42.12***	36.92***	31.82***	38.56***	28.98***	33.27***
Observations	361,236	283,721	42,475	29,862	19,975	8,190
Province FE	√	√	√	√	√	√
Year FE	√	√	√	√	√	√
Individual controls	√	√	√	√	√	√
School and class controls	√	√	√	√	√	√

Notes: the table shows IV estimates in which the dependent variable is the literacy test score. Columns (1)-(3) refer to native students, while columns (4)-(6) refer to immigrant ones. Column (2) and (5) refer to students with high educated parents (educational level of the parent with the highest level of education equal or higher than high school diploma), while column (3) and (6) refer to students with low educated parents (educational level of the parent with the highest level of education lower or equal to middle school diploma). All the specifications include province and cohort fixed effects. Control variables include individual level characteristics, students' average characteristics, municipalities' political orientation and school and class characteristics according to Table 2.3 in Section 2.4. Robust standard errors are clustered at the municipal level. First stage F-stat. refers to the Kleibergen-Paap F-statistics. The symbols ***, **, * indicate that the coefficients are statistically significant, respectively at the 1,5 and 10 percent level.

In sub-section 2.5.1 we argued that municipalities in the same province with a number of residents greater than 10,000 are likely to be characterized by a high level of internal homogeneity. However, one may consider the provincial capital of the municipality to be economically, culturally and socially different with respect to the other municipalities in the same province. Provincial capitals are usually the largest municipality in the province with a prominent economic and cultural role. In our framework, a provincial capital may provide better resources to parents and children together with a more vibrant environment potentially benefitting children's test outcomes. In order to address this potential threat to identification, we run same specification as in Table 2.6 but controlling also for a dummy equal to 1 if the municipality is a provincial capital and 0 otherwise. Results are again consistent with those in Table 2.6, pointing to an even larger effect of early childcare attendance on immigrant children's coming from a disadvantage background.

Table 2.14: Heterogeneous effects by parents' educational level controlling for provincial capital.

	LITERACY					
Panel A: Second Stage						
	(1)	(2)	(3)	(4)	(5)	(6)
	Whole Sample	High Edu	Low Edu	Whole Sample	High Edu	Low Edu
Early childcare	-0.080	0.076	0.015	0.221	-0.022	1.537*
	(0.122)	(0.149)	(0.253)	(0.208)	(0.410)	(0.816)
Observations	361,236	311,441	49,795	29,862	21,168	8,694
Panel B: First stage						
	(1)	(2)	(3)	(4)	(5)	(6)
Early childcare public supply	0.002***	0.002***	0.002***	0.003***	0.002***	0.002***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.001)	(0.001)
First stage F-stat	42.12***	37.54***	35.06***	38.56***	12.60***	9.30***
Observations	361,236	311,441	49,795	29,862	21,168	8,694
Province FE	√	√	√	√	√	√
Year FE	√	√	√	√	√	√
Individual controls	√	√	√	√	√	√
School and class controls	√	√	√	√	√	√

Notes: the table shows IV estimates in which the dependent variable is the literacy test score. Columns (1)-(3) refer to native students, while columns (4)-(6) refer to immigrant ones. Column (2) and (5) refer to students with high educated parents (educational level of the parent with the highest level of education equal or higher than high school diploma), while column (3) and (6) refer to students with low educated parents (educational level of the parent with the highest level of education lower or equal to middle school diploma). All the specifications include province and cohort fixed effects. Control variables include individual level characteristics, students' average characteristics, provincial capital and school and class characteristics according to Table 2.3 in Section 2.4. Robust standard errors are clustered at the municipal level. First stage F-stat. refers to the Kleibergen-Paap F-statistics. The symbols ***, **, * indicate that the coefficients are statistically significant, respectively at the 1,5 and 10 percent level.

As an additional robustness check, we control for taxable income per capita, mayor political faction and provincial capital dummy in the same specification at the same time. Results reported in Table 2.17 are again consistent to those in the main analysis and point to an even stronger effect of the early childcare attendance on immigrant children coming from disadvantaged social and cultural backgrounds.

Table 2.15: Heterogeneous effects by parents' educational level controlling for provincial capital, municipalities' political orientation and taxable income.

	LITERACY					
Panel A: Second Stage						
	(1) Whole Sample	(2) High Edu	(3) Low Edu	(4) Whole Sample	(5) High Edu	(6) Low Edu
Early childcare	-0.081	0.014	0.136	0.162	-0.159	1.927**
	(0.119)	(0.189)	(0.342)	(0.201)	(0.591)	(0.969)
Observations	361,236	283,050	42,345	29,862	19,912	8,163
Panel B: First stage						
	(1)	(2)	(3)	(4)	(5)	(6)
Early childcare public supply	0.002***	0.002***	0.002***	0.003***	0.002***	0.002***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.001)	(0.001)
First stage F-stat	42.12***	25.54***	28.25***	38.56***	6.70**	8.27**
Observations	361,236	283,050	42,345	29,862	19,912	8,163
Province FE	√	√	√	√	√	√
Year FE	√	√	√	√	√	√
Individual controls	√	√	√	√	√	√
School and class controls	√	√	√	√	√	√

Notes: the table shows IV estimates in which the dependent variable is the literacy test score. Columns (1)-(3) refer to native students, while columns (4)-(6) refer to immigrant ones. Column (2) and (5) refer to students with high educated parents (educational level of the parent with the highest level of education equal or higher than high school diploma), while column (3) and (6) refer to students with low educated parents (educational level of the parent with the highest level of education lower or equal to middle school diploma). All the specifications include province and cohort fixed effects. Control variables include individual level characteristics, students' average characteristics, municipalities' political orientation, taxable income per capita, provincial capital dummy and school and class characteristics according to Table 2.3 in Section 2.4. Robust standard errors are clustered at the municipal level. First stage F-stat. refers to the Kleibergen-Paap F-statistics. The symbols ***, **, * indicate that the coefficients are statistically significant, respectively at the 1,5 and 10 percent level.

In Table 2.4 we show that the offer of early childcare spots varies substatially between regions across time following different trends. In order to control for the possible confounding effect of trends, in Table 2.16 we include province dummies interacted with year dummies in our main specification. The trend-adjusted estimates yields very similar results and confirm the overall picture from Table 2.6.

Table 2.16: Heterogeneous effects by parents' educational level controlling for trends at the local level.

	LITERACY					
Panel A: Second Stage						
	(1)	(2)	(3)	(4)	(5)	(6)
	Whole Sample	High Edu	Low Edu	Whole Sample	High Edu	Low Edu
Early childcare	-0.081	0.027	-0.104	0.162	-0.112	0.879**
	(0.119)	(0.130)	(0.210)	(0.201)	(0.193)	(0.392)
Observations	361,236	311,441	49,795	29,862	21,168	8,694
Panel B: First stage						
	(1)	(2)	(3)	(4)	(5)	(6)
Early childcare public supply	0.002***	0.003***	0.003***	0.003***	0.003***	0.003***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.001)	(0.001)
First stage F-stat	42.12***	43.31***	38.47***	38.56***	31.11***	31.82***
Observations	361,236	311,441	49,795	29,862	21,168	8,694
Province FE	√	√	√	√	√	√
Year FE	√	√	√	√	√	√
Individual controls	√	√	√	√	√	√
School and class controls	√	√	√	√	√	√

Notes: the table shows IV estimates in which the dependent variable is the literacy test score. Columns (1)-(3) refer to native students, while columns (4)-(6) refer to immigrant ones. Column (2) and (5) refer to students with high educated parents (educational level of the parent with the highest level of education equal or higher than high school diploma), while column (3) and (6) refer to students with low educated parents (educational level of the parent with the highest level of education lower or equal to middle school diploma). All the specifications include province fixed effects, cohort fixed effects and province by year fixed effects. Control variables include individual level characteristics, students' average characteristics, municipalities' political orientation, taxable income per capita, provincial capital dummy and school and class characteristics according to Table 2.3 in Section 2.4. Robust standard errors are clustered at the municipal level. First stage F-stat. refers to the Kleibergen-Paap F-statistics. The symbols ***, **, * indicate that the coefficients are statistically significant, respectively at the 1,5 and 10 percent level.

Taken together, these findings reassure us that our instrument is not capturing other dimensions that are potentially correlated to children's cognitive outcomes and provides support for our identifying assumption.

2.7.2 Missing values

A potential concern with the use of the variable *early childcare* is the high incidence of missing values in this variable (31.05, 30.85 and 31.26 percent in the academic years 2017,2016,2015 respectively). In order to assess the relevance of this missing piece of information we include in our baseline IV specification (see Table 2.5) a dummy variable called `Missing` that takes values 1 when the information about student's early childcare attendance is not available and 0 otherwise.

Table 2.17: Missing values

	LITERACY		NUMERACY	
Panel A: Second Stage				
	(1)	(2)	(3)	(4)
	Native	Immigrant	Native	Immigrant
Early childcare	-0.096	0.236	-0.235	0.097
	(0.131)	(0.216)	(0.170)	(0.197)
Missing	-0.045	0.058	-0.085	0.033
	(0.051)	(0.098)	(0.064)	(0.086)
Observations	410,867	33,023	410,867	33,023
Panel B: First Stage				
	(1)	(2)	(3)	(4)
Early childcare public supply	0.002***	0.003***	0.002***	0.003***
	(0.000)	(0.001)	(0.000)	(0.001)
First stage F-stat	42.85***	34.78***	42.86***	34.77***
Observations	410,867	33,023	410,867	33,023
Province FE	√	√	√	√
Year FE	√	√	√	√
Individual controls	√	√	√	√
School and class controls	√	√	√	√

Table 2.18: Notes: Columns (1) to (4) report IV estimates for native and immigrant students where the dependent variables are literacy and numeracy test score. All the specifications include province and cohort fixed effects. Control variables include individual level characteristics, students' average characteristics and school and class characteristics according to Table 2.3 in Section 2.4. Robust standard errors are clustered at the municipal level. First stage F stat. refers to the Kleibergen-Paap F-statistics. The symbols ***, **, * indicate that the coefficients are statistically significant, respectively at the 1,5 and 10 percent level.

As shown in Table 2.17 the variable `Missing` is not statistically significant and coefficients estimates are mostly unchanged, thus confirming reliability of our results.

2.8 Conclusions

The successful integration of immigrant children into the educational system is one of the most important challenges for many European countries. Children who are migrants or have immigrant parents face significant educational barriers which may lead to substantial educational disadvantages relative to native students. Performance gaps at school translate in persistent differences in literacy levels, drop-out rates and eventually in labour market outcomes between immigrant students and their native peers, thus perpetuating inequalities and slowing the integration of migrants in the host country.

In this paper, we analysed the impact of early childcare attendance on second-generation immigrant children's cognitive outcomes. In particular, we investigated whether childcare provided at very young age is an effective policy to close the existing performance gap between immigrant and native children. To carry out our analysis we drew on novel Italian administrative data and we make use of a neat IV identification strategy in order to deal with children's non-random sorting into early childcare.

While we find no significant effect for native children, our results point out to a positive and significant impact of early childcare attendance on immigrant children coming from a disadvantaged background, with the effects being stronger for female students. Further, we find that the impact

of childcare is stronger for immigrant children whose mother tongue is further from Italian, which suggests that access to childcare may be a relevant policy tool to improve language proficiency of immigrant children, thus fostering their integration and assimilation in the host country.

Our findings provide empirical support to the renewed interest of social scientists and policy makers in the attendance to early childcare and pre-primary school programs as an effective tool to facilitate immigrant children's integration and close their educational gap.[27] Unfortunately, despite of the encouraging empirical evidence and the rich policy debate, the access of children with immigrant background to early childcare facilities (and other pre-primary school programs) is still very limited in OECD countries (including Italy, the country where the data used in this study come from).[28] Institutional and economic factors play a crucial role in determining the limited access of immigrant children to these precious social services. In Italy, for instance, municipal authorities are responsible for administering early childcare programs and defining the rules to allocate the limited available slots over families. In some cases, this institutional situation has translated into inefficient and discretionary allocation rules, such as those restricting the access to early childcare programs to families satisfying time requirements with their legal residence in the municipality.[29] Our results strongly question the desirability and appropriateness of such legal requirements, as they are very likely to reduce the social benefit of early childcare programs and limit the effective integration of immigrant children in the education system of the host country.

[27] See, for instance, the recent OECD (2018).

[28] For Europe, see CoE (2017). According to OECD (2015), first-generation immigrant students are almost half as likely as non-immigrant students to have attended pre-primary education, with significant exceptions such as Belgium Austria, Slovenia, Canada, and Norway where immigrant students are more likely than non-immigrant to have attended pre-primary school education.

[29] For instance, in 2018 Veneto introduced the requirement of 15 years of legal residence in the municipality to get access to early childcare programs. This requirement was declared unconstitutional after few months.

Chapter 3

Ability composition in the class and the school performance of immigrant students

Abstract

Using longitudinal data from the Italian National Institute for the Evaluation of the Education System (INVALSI) this paper empirically investigates whether the ability of native and immigrant peers affects immigrant students' educational achievements in the classroom. We focus on the impact of peers' average ability and the fraction of peers at the extreme tails of the ability distribution. We address students' endogenous sorting and the simultaneity problem exploiting the within-pupil across subjects variation in achievements and predetermined peers' ability measures. Our results show that peers' ability matters and within-group effects are stronger than across group effects, especially for native students.

Keywords: Peer effects, Immigrant children, Integration.

JEL Classification Numbers: J15, I21.

3.1 Introduction

During the last decades, the rapid growth of immigrants in most European countries has called for investigation in many directions, ranging from the impact of immigrants on local labour markets (e.g. Dustmann et al. (2005), Cohen-Goldner and Paserman (2011) and Card (2001)) to, more recently, the consequences for the educational systems of the host countries. In particular, a number of studies in the educational literature has investigated how immigrant children affect native children learning and achievements (Frattini and Meschi (2019); Ballatore et al. (2018); Tonello (2016) among others). In most European countries such interest was motivated by the concerns that immigrant students may be detrimental to native students. In fact, on average immigrant children are disadvantaged students. They tend to come from lower socio-economic backgrounds, learn in a new language and face unfamiliar institutions and thus they typically

exhibit large performance gaps. This academic disadvantage may negatively affect the achievements of peers.

In this paper, we challenge the existing approach of looking at the impact of immigrant children on native children's outcomes and we focus instead on how immigrant children are affected by their school environment and by the achievement of their native and immigrant peers. We build on the burgeoning literature of peer effects in education and investigate how and to what extent the ability of native and immigrant classmates affects their immigrant peers' educational outcomes. In particular, we estimate the impact of the average peer quality in the class and further investigate which part of the ability distribution of peers drives the effect, by looking at the role played by the extreme tails of the ability distribution. In other words, we ask whether is the average quality of peers that matters for immigrant students' achievement, or rather the presence in the class of very good and very bad peers.

Our empirical analysis is based on administrative data collected by the Italian National Institute for the Evaluation of the Education System (INVALSI henceforth) on two entire cohorts of students who completed lower secondary education in the academic years 2015/16 and 2016/17. The data at hand have a longitudinal structure so that we are able to track students over time and observe their prior achievements at the end of primary school. This will allow us to construct indicators of peer achievement in lower secondary schools, based on predetermined measures of ability that are not simultaneously determined with students' own achievements.

Our identification strategy follows Lavy et al. (2012) and exploits the within-pupil across subjects variation in achievement, as a way to solve the non-random sorting of students across schools and classes, that may bias the estimation of peer effects.

Our study contributes to the existing literature along several dimensions. First, in contrast to the extant literature where the attention is drawn on the potential negative effect of immigrants on native learning and behaviour, we focus on understanding the peer effects mechanisms that affect `immigrant` children performance. Shifting the focus on immigrant children, we provide new insights on how class composition may help narrowing the gap between immigrant and native children and thus improve immigrants' integration in the host countries' school system, which is a timely question in all OECD countries, given the sharp increase in migration pressure occurred in the last decade. Second, our identification strategy addresses some of the most severe problems in peer effects identification such as students' endogenous sorting and peer's ability measurement, exploiting both the within-pupil variation across subjects and the longitudinal structure of the data. Lastly, differently from Lavy et al. (2012) we are able to define the peer group very precisely thanks to the fact that our data provide class identifiers (rather than `school` identifiers). This unique feature allows us to draw a more accurate picture of students' interactions with respect to studies carried out at a broader level (i.e. using peers' measures at the school level) that might fail to capture some relevant effect. [1]

Our results suggest the basic but important finding that peer quality matters. In particular peers' average ability has a positive and significant effect on both native and immigrant students. Additionally, we show that native children are not affected by the quality of immigrant children and that peer effect are stronger within the same group than across groups, especially for native students. In other words, native students have a greater influence on native students than on immigrant students. For immigrant students this result is less strong but points in the same

[1] As many studies in the peer effects literature, we do not aim at separately identify endogenous and exogenous peer effects (Manski (1993)).

direction. This evidence is in line with the findings in the literature on racial peer effects where the largest impacts are observed intra-race with little or no spillovers on the other racial groups (Fruehwirth (2013); Hoxby (2000)).

The remainder of this paper proceeds as follows. Section 3.2 reviews the relevant literature on ability peer effects, together with discussing the main difficulties in the identification and discusses our contribution to the existing literature. Section 3.3 describes data. Section 3.4 outlines the empirical analysis and explains our identification strategy. Section 3.5 provides some descriptive statistics, while Section 3.6 present the results, while Section 3.7 report a number of sensitivity checks to address potential threats to identification. Finally, Section 3.8 concludes the paper providing some possible policy implications.

3.2 Literature review

The importance of peer effects in learning in schools has drawn the attention of many researchers. The intuition motivating this stream of research is that peers matter in determining students' performance and behaviour.
However, identification of both the size and nature of peer effects entails many difficulties.
The main two challenges for identification of peer effects derive by the endogenous selection of students into a specific group and the simultaneous determination of students' outcomes belonging to the same group (simultaneity).
Firstly, students are not randomly allocated. They self-select into schools and classrooms on the basis of their unobservable characteristics. In our context, for instance, the immigrant children status is correlated with low socio-economic background implying that immigrant children are usually clustered in lower quality schools.
Secondly, the measurement of peer ability is simultaneously determined with own achievement so that causal inference is only possible if peer group's predetermined ability measures are available.
In the last decade, in order to deal with the crucial issue of sorting, economists have proposed different methods for the identification of peer effects. A number of studies exploits the exogenous variation in student' assignment to school and classroom (Duflo et al. (2011); Carrell et al. (2009); Sacerdote (2001) among others), other rely on the exogenous variation within school either across classes (Frattini and Meschi (2019); Ohinata and Van Ours (2013); Contini (2013) or adjacent cohorts (Hoxby (2000); Ammermueller and Pischke (2009); Lavy et al. (2011), Tonello (2016), Gibbons and Telhaj (2016)), Goux and Maurin (2007) implement an IV strategy while Ballatore et al. (2018) and Angrist and Lang (2004) exploits subgroup reassignment. These studies find a spectrum of results from modest to no effects. As argued by Hoxby and Weingarth (2005) this lack of compelling evidence could be due to the common use of linear in means models that restrict the effect to be homogeneous (each student to have same effect on each other student).
While advances have been made to overcome peer-group endogeneity, there are only few studies using credible measurements of peer ability. For instance, Hoxby (2000) and Ammermueller and Pischke (2009) proxy peer ability with socioeconomic background characteristics. However, as underlined by Hoxby and Weingarth (2005) students' background attributes have little or no effect on students' outcomes once peers' achievements are properly controlled for. As an alternative, several studies use students' past achievements to measure peer ability. However, if the peer group remain constant in the period of analysis, even this measure is not immune from the simultaneity problem as peer ability is not exogenous with respect to current outcomes (Hanushek et al. (2003)).

The studies of Lavy et al. (2011) and Lavy et al. (2012) stand out in this literature for having proposed closer proxy of peer ability arguably not affected by the simultaneity problem. Lavy et al. (2011) use a definition of low-achieving peers taking advantage of a predetermined measure of peer ability. In particular, low-ability peers are defined as those who were held back in previous grades and are now enrolled in a grade that is one year below their expected one. In a similar spirit, Lavy et al. (2012) define 8th grade peer ability using their 5th grade test score. Taking advantage of the compulsory transition between primary and lower secondary school leading to a huge peer reshuffling, these measures are conceivably exogenous to 8th grade outcomes.
Together with the one of Duflo et al. (2011) these two studies, are also the first ones to go beyond peer effect existence and measurement, shedding light on the mechanisms at work for the effect to happen.
Lavy et al. (2011) find that a high fraction of low-achieving students lowers classmates' educational outcomes with the effect operating by diverting teachers' attention to struggling students and raising the level of violence and disruption within the class.
Studying an intervention in Kenyan schools in which students were randomly allocated on the basis of their initial achievement, Duflo et al. (2011) find that tracking of students benefits students along the entire ability distribution. Lavy et al. (2012), the study closest to ours, investigating both the size of ability peer effect and the segments of the distribution driving the effect in English secondary schools, find that a large fraction of low-achieving peers lowers the educational performance of the other schoolmates.
Our paper contributes to the existing literature in three important and distinct ways. First, in comparison to most of the existing studies, data at hand are remarkably rich and detailed. In particular, the longitudinal structure of the data allows us to follow students over time so that we are able to construct measures of peer quality based on past achievement and solve the simultaneity problem. Further, our data provide class identifiers so that we single out student's relevant peer group in a more accurate way compared to the existing literature (Gibbons and Telhaj (2016); Lavy et al. (2012)). Second, this study adopts a neat identification strategy relying on within-pupil variation that solves problems of endogenous selection of pupils into schools and classes.
Third and perhaps most important, to the best of our knowledge this is the first study that focuses on peer effect and immigrant children educational achievements. Despite the increasing number of immigrant students in all OECD countries' educational systems, there is scarce evidence on which policies to implement in order to foster their integration and learning.

3.3 Data

3.3.1 INVALSI data

Our analysis relies on administrative data on 8th grade students collected by the INVALSI, a public agency in charge of monitoring students' achievements in literacy and numeracy. The evaluation of students' attainments is carried out yearly at the end of 2nd, 5th, 8th and 10th grade. The entire population of students attending the selected grades are required to take part to the assessment. The test is administered on the same day to all students attending one of the monitored grades and is standardized, implying that students in the same grade answer the same questions in the same amount of time and test's correction is made externally, following a predetermined marking scheme. This feature of the data makes students' performances entirely comparable across

schools and classes. The test consists of both multiple choice and open-ended questions aimed at assessing students' key competences in literacy and numeracy. In particular, literacy test evaluates students' mastering of grammar and reading comprehension while the numeracy test includes questions designed to measure students' skills on problem solving, logic and interpretation of quantitative phenomena. Students' final test score in each subject corresponds to the fraction of correct answer.
Our outcome variables are numeracy and literacy standardized test scores. Test scores are standardized to have mean 0 and standard deviation equal to 1 for each subject and cohort.
Together with test scores, INVALSI collects information on a number of background characteristics of children and their families such as gender, ethnicity, parents' educational level, working condition and the ESCS index (index of Economic Social and Cultural status) [2].

Children are defined to be immigrant if both parents are non-Italian citizens regardless of their place birth (in Italy, citizenship is acquired according to the Ius sanguinis principle), while native children are those who have at least one parent with Italian citizenship. INVALSI data adopt the same classification for the identification of immigrant and native students.

In this study, our focus is on children that pass from primary to lower secondary education. We observe same child in two separate point in time: 5th and 8th grade. We have data on two cohorts of students who finished primary education in the academic years 2012/13 to 2013/14 and finished lower secondary education in the academic years 2015/16 to 2016/17. We restrict our data to public school only. Our data set includes 600,421observations in 49,003 classes: 560,972 natives and 39,449 immigrant students.

Table 3.1 summarises all variables included in our empirical analysis.

[2]The ESCS (Economic Social and Cultural status) index describes the socio-economic and cultural status of students' families. It is developed using information from the students' and schools questionnaires regarding parents' educational level and working status as well as the material possession of some specific goods as books, internet connections and a personal computer. The index is calculated using a principal component analysis and by construction has mean zero and unitary variance. (Interpretation: a student with a strictly positive ESCS index value is a student with a socio-economic background more favourable than the national average)

Table 3.1: Definition of variables and sources.

Variable	Description	Source
Outcome variables [a]		
5th grade Literacy test score	Percentage of correct answers in Literacy test	INVALSI
5th grade Numeracy test score	Percentage of correct answers in Numeracy test	INVALSI
8th grade Literacy test score	Percentage of correct answers in Literacy test	INVALSI
8th grade Numeracy test score	Percentage of correct answers in Numeracy test	INVALSI
Control variables (individual level)		
Female	dummy=1 if female	INVALSI
Immigrant I generation	dummy=1 if child is Immigrant II generation	INVALSI
Immigrant II generation	dummy=1 if child is Immigrant I generation	INVALSI
Age	child year of birth	INVALSI
II quarter month of birth	dummy=1 if the child is born in second quarter	INVALSI
III quarter month of borth	dummy=1 if the child is born in third quarter	INVALSI
Low level of paternal/maternal education	dummy=1 if mother/father has an educ. level lower or equal to middle school	INVALSI
High level of paternal/maternal educ.	dummy=1 if mother/father has an educ. level higher than middle school	INVALSI
Mother's working status	dummy=1 if the mother works	INVALSI
Father's working status	dummy=1 if the father works	INVALSI
Student ESCS	Student's economic social and cultural status	INVALSI

[a] All test scores are standardized to have 0 mean and standard deviation equal to 1

3.3.2 Italian school system

Compulsory education in Italy starts at age-6 until age-16 and it is organized in two cycles. The first cycle is made up of primary and lower secondary education. Primary education lasts for five years while lower secondary education starts at age-11 and lasts for three years. Between primary and lower secondary education students pass from one level to the next one with a huge peer reshuffling and without any examination. In most of the cases in the transition from primary to lower secondary school students change also the school's venue.

The school's principal is in charge of allocating children to classes. Formation criteria are established at the central level but each school provides information on official documents available on its website. At large, these criteria establish that students should be equally distributed by ability, gender, economic and social background.

Importantly, the Italian school system does not allow to use the "setting" practice. Pupils with similar ability or attainments cannot be grouped together for specific subjects, such as mathematics or science. In fact, children are assigned to the same class for all the subjects and are taught by the same teachers for the three school years' period of primary as well as lower secondary school.The latter implies that children stay with the same peers throughout the entire period. Concerning lower secondary school, teachers are usually common to several classes. The size of the class ranges from a minimum of 18 students to a maximum of 27 and the weekly class schedule is of 30 hours with literacy and numeracy being the subjects with the highest number of instruction hours. Disciplines of study, time of instruction, educational programmes and their content are common across all Italian schools and are defined by the Ministry of Education.
The Italian schooling system is mainly public and does not allow to track students by ability. [3]

3.4 Empirical strategy and identification

Our identification strategy relies on the within-pupil variation across two compulsory subjects tested when the child is in 8th grade (last year of the secondary school).
We define peers as classmates assuming that peer effect operates at the class level.
We estimate the following regression equation:

$$Y_{isct} = \alpha_i + \gamma_{st} + \beta_s + \beta_s x Gender + \delta_1 P_{sct} + \delta_2 P^h_{sct} + \delta_3 P^l_{sct} + \epsilon_{isct} \tag{3.1}$$

where the dependent variable Y_{isct} measures 8th grade achievements of child `i` in subjects `s` in lower secondary school class `c` in cohort `t`. Specifically, each child is tested on two compulsory subjects: literacy and numeracy. Our main variables of interest are P_{sct}, P^h_{sct} , and P^l_{sct} that respectively capture the average ability in 5th grade in subjects `s` of 8th grade peers in class `c`, and the fraction of very high and very low ability peers in class `c`. In particular, we define high-ability and low-ability peers as the top and bottom 5 percent students of the cohort specific national distribution of 5th grade INVALSI test scores. [4] Individual, subjects and subject by cohort fixed effects are captured respectively by α_i, β_s, γ_{st}. Further, we include subject by gender fixed effects,$\beta_s x Gender$, to account for the bulk of evidence describing gender difference across subjects that might potentially affect sorting of students into lower secondary schools (Fryer Jr

[3] Eurydice (2013).
[4] Our results are consistent using different thresholds, results are available upon request.

and Levitt (2010)). Finally, ϵ_{isct} is the error term. Teachers are likely to be the same across multiple classes, then in all specifications standard errors are clustered at the school level to allow for shocks common to children who are in the same school.

The parameters of interest are δ_1, δ_2 and δ_3 that capture respectively the effect of average ability of 8th grade peers and the impact of the fraction of high and low-achieving peers on students' outcomes. Because it is plausible that low-achieving and high-achieving peers do not affect classmates purely through their effect via the mean, we relax the linear-in-means specification to include two additional moments: the fraction of 5 percent top and bottom students.

As argued in section 3.2, two main issues arise for the identification of these parameters: the non-random sorting of student into a specific group and the simultaneity problem.
To address these identification problems, we adapt the strategy designed by Lavy et al. (2012) [5] to the Italian context.
Firstly, to address potential sorting of students across lower secondary schools we use within-pupil regressions that exploit the within-students across subjects variation to study whether it is systematically associated with differences in peers' ability across subjects. In other words, we examine whether for a student being exposed to high (low) achieving peers in a subject translates in his performance to improve (decrease) in that subject.

The intuition behind our approach is that, for each student, the only difference across the two subjects is attributable to student's exposition to different (subject-specific) quality of peers, while student's background, ability and class environment remain constant. At the school and class level, quality of peers is likely not to be random. For instance, a student coming from an affluent family might be placed in a school and in a class where other students from an advantaged background are also enrolled. However, selection across school and classes is common to all students in each school and in each class and does not vary within each student.

The advantage of implementing this strategy is that we are able to control for individual time invariant characteristics equally affecting the two subjects in which each student is tested together with students' cultural and socio-economic background and schools' resources and characteristics. Additionally, peer quality variation across subjects allows us to investigate whether the effect of peers operates non- linearly and whether it differs according to some relevant students' characteristics.

On the other hand, this identification approach makes some necessary assumptions. First, peer effects are assumed to be the same for the two subjects. Second, the effect we are considering excludes potential spillovers across subjects. For instance, having high-achieving peers in math could affect students' literacy test scores. However, if this was the case, we would be bound to find no peer effects. Third, a potential concern is the presence of some residual subject-specific sorting of peers across school and classes. The latter could happen if a specific school or class focuses on math attracting students on the basis of their greater ability in numeracy or literacy. However, as explained in previous section, setting is not permitted and subjects, time of instruction and educational programmes are all set nationally by the Ministry of Education so that schools are not allowed to tailor their educational offer or to specialize in a specific subject. Further, following Lavy (2015) it is unlikely that schools that do not use ability as an admission criterion are going to select students on subject-specific considerations.

The longitudinal structure of our data allow us to observe the same student in two separate point

[5] See also Lavy (2015) and Dee (2007) for similar strategies that exploit within-student across subject variation.

in time: at the end of 5th and 8th grade. As described in sub-section 3.3.2 at the end of 5th grade children make a compulsory transition between primary and lower secondary school that implies a significant changes to the class group composition. On average, in our data, 71% of 8th grade students in the same class did not attend the same primary school thus, they mutually could not have affected their 5th grade test scores.
We exploit this high inter-school mobility to build separate measures of peer quality for new and old peers. [6] In our empirical analysis we focus on new peer quality measures given that they are immune to the simultaneity problem. In fact, Student `i` 5th grade test scores is predetermined and thus not affected by 8th grade new peers' outcomes. Differently from Lavy et al. (2012) we define peers at the class level. In Italy peer group composition is constant throughout the lower secondary school period and most of the students' interactions happen within classes more than across classes (students are forced to spend time together). With respect to the existing literature, this framework provides a more accurate picture on the existence, magnitude and potential mechanisms behind peer effect.

3.5 Descriptive statistics

Table 3.2 presents mean and standard deviation of main variables in our analysis. Column 1 presents statistics for "regular" students, Column 2 for "top" students and Column 3 for "bottom" students. Regular students are defined as those who achieved both in literacy and numeracy an age-11 test score above the 5th percentile and below the 95th percentile while top and bottom students are the ones that achieved at least in a subject an age-11 test score respectively above the 95th percentile and below the 5th one. By construction, regular students' 5th and 8th grade test scores are concentrated around zero while those of pupils in the top and bottom 5 percent outperform and fall behind any other student, respectively. Concerning students' background characteristics, there are stark differences across the three groups. For instance, it is immediately apparent that bottom students are less likely to have highly educated and working parents with respect to the other two categories. Also, they are more likely to have lower ESCS values and to be migrants both of first and second generations. A reversed picture emerges for top students who generally have higher ESCS, better-educated parents and are more likely to be native.

[6] Gibbons and Telhaj (2016) are the first one to make this empirical distinction. New peers are defined as peers who are in a student's 8th grade class but were not in his 5th grade class. Old peers are students who are together in the 8th grade and were in the same 5th grade class as well.

Table 3.2: Descriptive statistics

	Regular	**Top**	**Bottom**
Panel A: Students' outcomes			
8th grade literacy test scores	0.054	0.753	-1.033
	(0.908)	(0.826)	(0.979)
5th grade literacy test scores	0.070	1.190	-1.670
	(0.767)	(0.482)	(0.925)
8th grade numeracy test scores	0.030	0.825	-0.902
	(0.930)	(0.924)	(0.854)
5th grade numeracy test	0.036	1.375	-1.583
	(0.791)	(0.503)	(0.676)
Panel B: Students' background characteristics			
Female	0.508	0.500	0.514
	(0.499)	(0.500)	(0.499)
Father high education	0.609	0.722	0.434
	(0.487)	(0.447)	(0.495)
Mother high education	0.689	0.787	0.494
	(0.462)	(0.408)	(0.499)
ESCS	0.127	0.439	-0.330
	(0.969)	(0.995)	(0.950)
Working Father	0.942	0.952	0.899
	(0.233)	(0.213)	(0.300)
Working Mother	0.606	0.652	0.453
	(0.488)	(0.476)	(0.497)
Natives	0.936	0.969	0.879
	(0.244)	(0.170)	(0.326)
Immigrant First Generation	0.019	0.008	0.046
	(0.137)	(0.091)	(0.211)
Immigrant Second Generation	0.044	0.021	0.074
	(0.206)	(0.145)	(0.261)
N	488211	58858	53352

Notes: The table shows means and standard deviation in parenthesis. Panel A displays students' outcomes and Panel B students' background characteristics. To keep the sample constant, we restrict the sample to students that have INVALSI test scores not missing both in 5th and 8th grade.

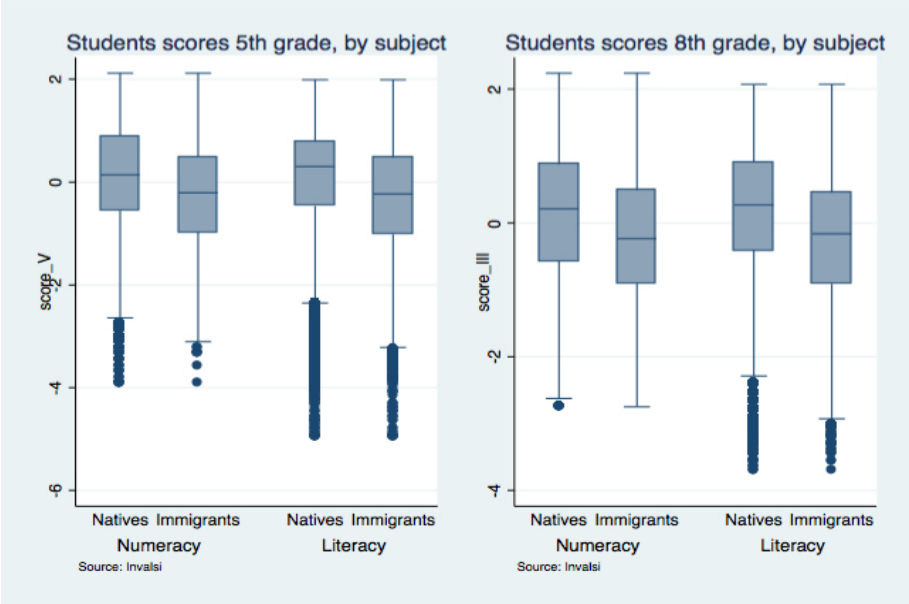
Table 3.3 shows the share of first and second-generation immigrant students by macro-area in 8th grade of 2015/16 and 2016/17 school years, according to INVALSI data. In both school years on average immigrant students represent about 7% of the entire student population but in northern regions, where they are more concentrated, they reach 10%. The majority of immigrant students in 8th grade are second-generation immigrants, they account for 70% of the immigrant students population.

Table 3.3: Student population (in percentage points) by immigrant status and macro-area

	School year 2016			**School year 2017**		
Macro Area	**Natives**	**First generation**	**Second generation**	**Natives**	**First generation**	**Second generation**
North West	89.89	3.38	6.73	90.22	2.68	7.10
North East	90.21	3.34	6.46	90.05	2.86	7.09
Centre	92.02	2.64	5.33	92.03	2.16	5.82
South	97.92	0.76	1.33	97.92	0.75	1.33
Islands	97.85	0.91	1.23	98.13	0.63	1.24
Total	93.43	2.24	4.32	93.42	1.89	4.69

To substantiate our claim on the existing educational gap between native and immigrant children in Figure 3.1 we present 8th (left panel) and 5th (right panel) grade average students test score by immigrant status and subject. It stands out from the figure that both in 5th and 8th grade immigrant students perform worse than native students in literacy as well as in numeracy.

Figure 3.1: Immigrant students' gap in 8th and 5th grade by subject



In our study identification of peer effect is based on the comparison of the performance of the same student in two different subjects. Hence, identification is possible only if, for each student, there is substantial variation across subjects associated with peer variation across subjects.

In Figure 3.2 we show correlations between students' own test scores in literacy and numeracy and correlations between peer's test scores across subjects. Correlations are showed both for the 5th and the 8th grade. It emerges clearly that, despite all correlations are high and positive, there is no perfect correlations across variables.

Figure 3.2: Correlations between students' own test scores and peer's test scores across subjects

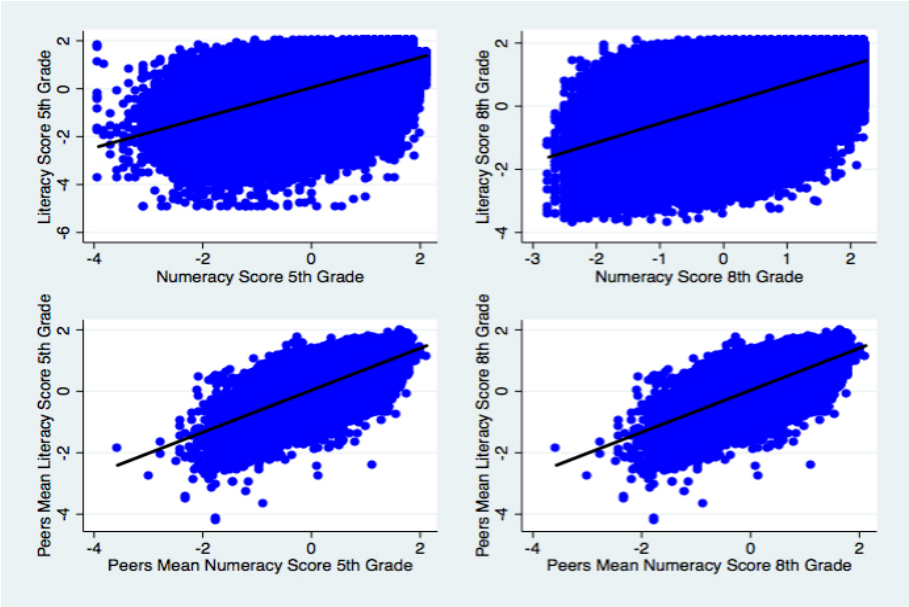


Table 3.4 reports mean and standard deviation decomposed into between and within student variation of 5th and 8th grade test scores and peers' measures across literacy and numeracy, respectively, for the entire sample, native students and immigrant students (see panel A-C). Although, as expected, most of the variation is explained by the between students variation, Table 3.4 shows that there is substantial within-students variation across subjects: this evidence confirms that test scores for the same student are not perfectly correlated across subjects and that there is enough variation. As shown in Panel B and C, the latter holds for native as well as for immigrant students.

Descriptive evidence in this section provides support for our identification strategy showing that there is substantial within-student variation in test scores and peers' quality as well as for our working hypothesis that immigrant students are the most disadvantaged group both in terms of educational achievements and background characteristics.

3.6 Results

This section reports the results of a number of regressions on the effect of peer quality on students' performances in 8th grade. We first present results for the specifications where peer ability measures are built jointly for immigrant and native children then, we conduct our analysis distinguishing between native and immigrant students. As outlined in previous sections, our empirical analysis focuses on new peers, i.e. the peer group of student `i` that were not attending his/her same primary school. In each table, we report estimates for three specifications: (1) we include the peer's average score only; (2) we include the fraction of top and bottom 5 percent students only; and (3) we jointly include the peer's average score and the fraction of top and bottom 5 percent students in the same regression. Our outcome variables are literacy and numeracy standardized test scores. Test scores are standardized to have mean 0 and standard deviation equal to 1 for each subject and cohort.

Table 3.4: Within and between students' variation of test scores and peers' measures

	Mean	Overall s.d.	Between s.d.	WIthin s.d.
Panel A: All students				
8th grade scores	0.025	0.991	0.897	0.420
5th grade scores	0.024	0.987	0.897	0.412
Peer mean score	-0.004	0.474	0.442	0.173
Fraction top 5%	0.055	0.094	0.085	0.051
Fraction bottom 5%	0.055	0.094	0.079	0.050
N	1,200,842	1,200,842	1,200,842	1,200,842
n	600,421	600,421	600,421	600,421
T	2	2	2	2
Panel B: Immigrant students				
8th grade scores	-0.328	0.993	0.884	0.452
5th grade scores	-0.360	1.003	0.929	0.449
Peer mean score	-0.034	0.438	0.406	0.165
Fraction top 5%	0.046	0.085	0.071	0.046
Fraction bottom 5%	0.056	0.089	0.074	0.048
N	78,898	78,898	78,898	78,898
n	39,449	39,449	39,449	39,449
T	2	2	2	2
Panel B: Native students				
8th grade scores	0.050	0.986	0.893	0.418
5th grade scores	0.051	0.978	0.888	0.409
Peer mean score	-0.002	0.477	0.444	0.173
Fraction top 5%	0.055	0.100	0.086	0.051
Fraction bottom 5%	0.055	0.094	0.080	0.051
N	1,112,944	1,112,944	1,112,944	1,112,944
n	560,972	560,972	560,972	560,972
T	2	2	2	2

3.6.1 Baseline estimates

In table 3.5 we display baseline estimates of the impact of peer ability on 8th grade standardized test scores of native and immigrant students in Panel A and B, respectively. In order to provide direct comparison, the estimates presented in Columns 1, 3, and 5 are OLS estimates, while in columns 2, 3 and 6 pupil fixed effects are added. The OLS estimates for the impact of the peer average quality show a positive and significant correlation with native and immigrant students' test scores both when analysed separately and jointly in the same specification (see column 1-2 and 5-6). Regarding the effect of the fraction of top and bottom peers, when analysed separately, OLS estimates point out to a positive impact of the fraction of high-achievers in the class and to a negative impact of the fraction of low-achievers. In the specification where all peer quality measures are jointly included, most of the effect is captured by the peer average ability, while the fraction of top and bottom classmates turn not significant.

Once we add pupil fixed effects, the point estimates obtained from OLS reduce sharply. This drop in estimates is due to the fact that the inclusion of pupil fixed effect take into account unobserved

students' family background, average ability and other constant cognitive and non-cognitive skills together with netting out across-subjects spillovers and students' endogenous sorting across schools and classes.

For native students, pupil fixed effect estimates show a similar pattern to OLS estimates, although estimated coefficients are smaller in magnitude. Columns 2 and 6 report that the peers' average ability has a positive and significant impact on students' outcomes both when analysed separately and in the same regression. Column 4 outlines that the fraction of bright peers has a positive impact on native students' achievements while the fraction of bottom students is detrimental to native classmates. However, the effect of the extreme tails of the distribution is no more significant when all the treatments are analysed jointly in the same regression. Turning to immigrant students, we find that the peers' average quality has a positive and significant impact on test scores (Columns 2 and 4), but differently from native students, the share of both top and bottom peers does not affect immigrant students' educational achievements.

In terms of magnitude, looking at column 6, we find that a 1 percent increase in peers' average quality increases native students' INVALSI test scores by 72 percent of a standard deviation and by 75 percent of a standard deviation for immigrant students.

These results are interesting for several reasons. Differently from many studies in the peer effect educational literature that find weak or no effect (Tonello (2016); Imberman et al. (2009), Burke and Sass (2008), Angrist and Lang (2004)) our estimates underline that quality of peers matters both for native and immigrant students. A potential explanation for the lacking of compelling evidence on the effect of peers on educational outcomes, might derive by carrying out the analysis on a too broad level, for instance, defining peers at the school rather than at the class level. As highlighted by Hoxby and Weingarth (2005), the class is a good environment where to study the structure of peer effects especially because classmates are forced to pass a large amount of time together. As we show in Section 3.7, the latter does not necessarily hold when defining peers as schoolmates. Second, our estimates underline that the way ability peer effects affect native and immigrant students' outcomes is different: natives are affected by the share of peers at the extreme of the ability distribution while immigrants are not.

Table 3.5: Impact of peer quality on 8th grade outcomes by immigrant status.

Panel A: Natives						
	(1) OLS	(2) Pupil FE	(3) OLS	(4) Pupil FE	(5) OLS	(6) Pupil FE
Mean score	0.130***	0.072***			0.135***	0.072***
	(0.006)	(0.009)			(0.007)	(0.010)
Fraction top			0.266***	0.064*	-0.029	-0.015
			(0.027)	(0.029)	(0.027)	(0.030)
Fraction bottom			-0.353***	-0.116***	0.021	-0.011
			(0.026)	(0.029)	(0.026)	(0.032)
Observation	1,121,944	1,121,944	1,121,944	1,121,944	1,121,944	1.121,944
Panel B: Immigrants						
	(1) OLS	(2) Pupil FE	(3) OLS	(4) Pupil FE	(5) OLS	(6) Pupil FE
Mean score	0.112***	0.073***			0.100***	0.075***
	(0.011)	(0.022)			(0.014)	(0.024)
Fraction top			0.261***	0.031	0.043	-0.050
			(0.053)	(0.074)	(0.058)	(0.078)
Fraction bottom			-0.339***	-0.124***	-0.070	-0.016
			(0.050)	(0.078)	(0.059)	(0.082)
Observation	78,898	78,898	78,898	78,898	78,898	78,898
Subject FE	√	√	√	√	√	√
Gender x subj FE	√	√	√	√	√	√
Cohort FE	√		√		√	
Cohort x subj FE	√	√	√	√	√	√
Individual controls	√		√		√	
Pupil FE		√		√		√

Notes: The table shows the effect of average peer quality, fraction of top and bottom peers on students' 8th grade standardized test scores. Panel A refers to native students and Panel B refers to immigrant students. The dependent variables are the INVALSI standardized test scores in literacy and numeracy. The fraction of top (bottom) peers is defined as the top (bottom) 5 percent students of the cohort-specific national distribution of 5th grade INVALSI test scores. All specifications include subject fixed effects, gender by subject fixed effects and cohort by subject fixed effects. The OLS specifications (Columns 1,3 and 5) control for students' age, gender, immigrant status, ESCS index and parents' education and working status. Robust standard errors (adjusted for clustering at the school level) are in parenthesis, *** p<0.01, **<0.05, * p<0.1.

3.6.2 Heterogeneous effects

In this sub-section we investigate whether the impact of class composition on students' achievements differs by some relevant dimensions. In particular, we explore whether the effect is heterogeneous with respect to students' gender and parents' educational level.

In Table 3.6 and 3.7 we unpack results in Table 3.5 to allow ability peer effects to differ by gender and socio-economic background as proxied by parents' educational level. [7]

In line with previous tables, results in Table 3.6 report that the most relevant parameter is peers' average ability showing a positive and significant impact on students' test score outcomes. In terms of magnitude, Table 3.6 suggests that average peer effects are stronger for females. The latter holds both for native and immigrant female students. Interestingly, columns 3 and 4 outline that among native students when treatments are analysed separately, girls are more sensitive to the fraction of top peers while for male students the fraction of bottom peers has a larger detrimental effect. This finding is line with Lavy et al. (2012) results. Similarly to us, first they find that both boys and girls are adversely affected by the share of bottom peers consistently with the

[7] We define parents to be low (high) educated if the lowest educational level between the two of them is lower or equal (higher) to lower secondary school diploma.

prediction of the "bad apple" model suggesting that most relevant peer effect are originated by least academically able students Lazear (2001); second, they detect that girls, especially in the bottom part of the ability distribution, are positively affected by the fraction of high-achieving classmates. The latter evidence, might find explanation in the "shining light" model in which the example of brilliant students has positive externalities on all other classmates (Hoxby and Weingarth (2005); Sacerdote (2011)).

Table 3.6: Impact of peer quality on 8th grade outcomes by gender.

Panel A: Natives						
	(1)	(2)	(3)	(4)	(5)	(6)
	Males	Females	Males	Females	Males	Females
Mean score	0.063***	0.082***			0.059***	0.085***
	(0.010)	(0.011)			(0.011)	(0.012)
Fraction top			0.051	0.076**	-0.014	-0.017
			(0.032)	(0.036)	(0.033)	(0.038)
Fraction bottom			-0.124***	-0.109***	-0.037	-0.016
			(0.033)	(0.034)	(0.036)	(0.037)
Observation	552,886	569,058	552,886	569,058	552,886	569,058
Panel B: Immigrants						
	(1)	(2)	(3)	(4)	(5)	(6)
	Males	Females	Males	Females	Males	Females
Mean score	0.058**	0.087***			0.060*	0.088***
	(0.029)	(0.028)			(0.033)	(0.032)
Fraction top			0.033	0.029	-0.031	-0.065
			(0.099)	(0.104)	(0.105)	(0.110)
Fraction bottom			-0.091	-0.156	-0.005	-0.028
			(0.103)	(0.103)	(0.111)	(0.112)
Observation	37,404	41,494	37,404	41,494	37,404	41,494
Subject FE	√	√	√	√	√	√
Gender x subj FE	√	√	√	√	√	√
Cohort x subj FE	√	√	√	√	√	√
Pupil FE	√	√	√	√	√	√

Notes: The table shows pupil fixed effects estimates of the effect of average peer quality, fraction of top and bottom peers on students' 8th grade standardized test scores by immigrant status and gender. Panel A refers to native students while Panel B to immigrant students. The dependent variables are the INVALSI standardized test scores in literacy and numeracy. The fraction of top (bottom) peers is defined as the top (bottom) 5 percent students of the cohort-specific national distribution of 5th grade INVALSI test scores. All specifications include subject fixed effects, gender by subject fixed effects and cohort by subject fixed effects. Robust standard errors (adjusted for clustering at the school level) are in parenthesis, *** p<0.01, **<0.05, * p<0.001.

Table 3.7 reports results for the impact of peer quality on students' outcomes by parents' educational level. We define parents to be (high) low educated if the education of the parent with the highest educational level is (higher) lower or equal to lower secondary school diploma. The estimates outline that the effect of peer ability differs between children coming from different socioeconomic backgrounds. In particular, column 3 of Panel B shows that immigrant children coming from families that are more resourceful are adversely affected by the share of low-achieving peers. The latter might be due to immigrant students with high-educated parents being more similar to native students.

Table 3.7: Impact of peer quality on 8th grade outcomes by immigrant status and parents' educational level.

Panel A: Natives						
	(1)	(2)	(3)	(4)	(5)	(6)
	High Educ.	Low Educ.	High Educ.	Low Educ.	High Educ.	Low Educ.
Mean score	0.073***	0.063***			0.073***	0.059***
	(0.009)	(0.014)			(0.010)	(0.017)
Fraction top			0.063**	0.065	-0.017	0.001
			(0.029)	(0.047)	(0.030)	(0.051)
Fraction bottom			-0.116***	-0.118***	-0.009	-0.031
			(0.030)	(0.045)	(0.032)	(0.050)
Observation	875,104	246,840	875,104	246,840	875,104	246,840
Panel B: Immigrants						
	(1)	(2)	(3)	(4)	(5)	(6)
	High Educ.	Low Educ.	High Educ.	Low Educ.	High Educ.	Low Educ.
Mean score	0.077***	0.051			0.081***	0.049
	(0.023)	(0.042)			(0.027)	(0.045)
Fraction top			0.007	0.074	-0.079	0.020
			(0.080)	(0.142)	(0.086)	(0.149)
Fraction bottom			-0.144*	-0.066	-0.026	0.002
			(0.084)	(0.150)	(0.091)	(0.157)
Observation	56,702	22,196	56,702	22,196	56,702	22,196
Subject FE	√	√	√	√	√	√
Gender x subj FE	√	√	√	√	√	√
Cohort x subj FE	√	√	√	√	√	√
Pupil FE	√	√	√	√	√	√

Notes: The table shows pupil fixed effects estimates of the effect of average peer quality, fraction of top and bottom peers on students' 8th grade standardized test scores by immigrant status and parents' educational level. Panel A refers to native students while Panel B refers to immigrant students. We define parents to be (high) low educated if the education of the parent with the highest educational level is (higher) lower or equal to lower secondary school diploma. The dependent variables are the INVALSI standardized test scores in literacy and numeracy.The fraction of top (bottom) peers is defined as the top (bottom) 5 percent students of the cohort-specific national distribution of 5th grade INVALSI test scores. All specifications include subject fixed effects, gender by subject fixed effects and cohort by subject fixed effects. Robust standard errors (adjusted for clustering at the school level) are in parenthesis, *** p<0.01, **<0.05, * p<0.1.

In Table 3.8 we explore whether the effect differs among first and second-generation immigrant students. It emerges clearly that the average ability of peers has a positive and significant effect, while the extreme tails of the distribution are not significant. In terms of magnitude, peer effects are stronger for first-generation immigrant students with the difference between coefficients being statistically different from zero (see Columns 3 and 6). The stronger impact of ability peer effects on the first generation might derive by second-generation immigrant students being more similar to native students both in terms of performance as well as of background characteristics. We also investigated whether the effect between first and second-generation differs by gender. Subgroup analysis reveals that the impact of peers' average ability is mainly present among girls.

Table 3.8: Ability peer effect for first and second generation immigrant students.

	First generation			Second generation		
	(1)	(2)	(3)	(4)	(5)	(6)
Mean score	0.091***		0.114***	0.064**		0.056***
	(0.034)		(0.040)	(0.026)		(0.028)
Fraction top		-0.073-0.195		0.083	0.022	
		(0.123)	(0.131)		(0.086)	(0.090)
Fraction bottom		-0.120	0.049		-0.125	-0.045
		(0.122)	(0.134)		(0.092)	(0.096)
Observation	24,804	24,804	24,804	54,094	54,094	54,094
Subject FE	√	√	√	√	√	√
Gender x subj FE	√	√	√	√	√	√
Cohort x subj FE	√	√	√	√	√	√
Pupil FE	√	√	√	√	√	√

Notes: The table shows pupil fixed effects estimates of the effect of average peer quality, fraction of top and bottom peers on students' 8th grade standardized test scores for first and second generation immigrant students. Columns 1-3 refer to first-generation immigrant students while Columns 4-6 to second-generation immigrant students. The dependent variables are the INVALSI standardized test scores in literacy and numeracy. The fraction of top (bottom) peers is defined as the top (bottom) 5 percent students of the cohort-specific national distribution of 5th grade INVALSI test scores. All specifications include subject fixed effects, gender by subject fixed effects and cohort by subject fixed effects. Robust standard errors (adjusted for clustering at the school level) are in parenthesis, *** p<0.01, **<0.05, * p<0.1.

Overall, heterogeneous effects point in the same direction of the results for the entire sample: peer effects appear to mostly operate through the peers' average ability, especially for immigrant children.

Interestingly, we find that the effect of the average ability of peers is stronger among first-generation immigrant children and among girls. Larger benefits for female students are observed both for immigrant and native students. Looking at the impact of having classmates in the extreme tails of the ability distribution, for native students we find that the fraction of high-achieving peers has a positive impact while the fraction of low-achieving ones is detrimental to students' performance. This result is consistent across all the investigated specifications. Concerning immigrant students, we report a negative and significant impact of low-achieving peers for children with low-educated parents. We shed light on this result in the next sub-section.

3.6.3 Peer quality measures for immigrant and native students

In previous sections, we analysed the impact of peer quality on students' performance building peer ability measures on the basis of the 5th grade national and cohort-specific distribution of test scores. However, there are valid motives to build measures of peers' quality separately for immigrant and native students. First, as discussed in Section 3.5, scores distribution of immigrant and native children differ considerably: in the fraction of top peers there is an under representation of immigrant children while they are more heavily concentrated in the lower tails of the ability distribution. Second, it is reasonable to investigate whether immigrant and native students have different reference groups (Fordham and Ogbu (1986)). As a consequence, results reported in previous subsections might mask substantial heterogeneity.

In Table 3.9 we run the same specification as in Table 3.5 but we define our measures of peer average ability, the fraction of top and bottom peers separately for immigrant and native students. This

distinction sheds light on potential differences about the influence exerted by immigrant and native students' academic quality on their peers. In Panel A we use separate ability distributions for native and immigrant students while in Panel B we use the same ability distribution. Estimates in Table 3.9 provide evidence in line with those in previous sub-section, but they enrich our understanding of the contribution of immigrant and native children to the resulting effects. In fact, looking at native children (see columns 1-3), we find that the average peer ability of native students plays an important role on native students' outcomes: estimates are positive and significant both when analysed separately and together in the same specification. Moreover, when we exclude the average peer ability (Column 2), we find that the fraction of high-achieving native peers has a positive and significant effect while the fraction of native low-ability peers has a negative and significant one. Interestingly, in all specifications immigrant students' average ability, as well as their fraction of top and bottom peers, does not affect native students' achievements. Concerning immigrant students, estimates in Table 3.9 illustrate that immigrant students are positively affected by the average ability of both immigrant and native students. The effect remains fairly large and significant also in the specifications where we include all treatments together (Column 6).

Results for both native and immigrant students are consistent across Panel A and B and underline that the impact of peers is stronger for students that belong to the same group, especially for native students. In particular, we observe that native students mostly affect native students.
This finding might consistently result from the fact that the majority of students in the class are natives. [8] However, in the light of the extensive research devoted investigating whteher immigrant students are detrimental to native students' educational attainments, this evidence should not be taken for granted.

[8] On average, we have 1.87 immigrant students per class.

Table 3.9: Impact of peer quality on 8th grade outcomes by immigrant status.

	Natives			Immigrants		
	(1)	(2)	(3)	(4)	(5)	(6)
Panel A: Separate ability distribution						
Mean score Natives	0.072***		0.073***	0.045**		0.044*
	(0.009)		(0.010)	(0.021)		(0.024)
Mean score Immigrants	0.003		0.002	0.036***		0.040***
	(0.005)		(0.005)	(0.012)		(0.013)
Fraction top Natives		0.060**	-0.018		0.040	-0.012
		(0.027)	(0.028)		(0.066)	(0.069)
Fraction bottom Natives		-0.112***	-0.005		-0.092	-0.029
		(0.028)	(0.03)		(0.073)	(0.079)
Fraction top Immigrants		0.016	0.011		-0.034	-0.072
		(0.018)	(0.019)		(0.044)	(0.045)
Fraction bottom Immigrants		-0.015	-0.009		-0.052	-0.003
		(0.016)	(0.017)		(0.037)	(0.038)
Panel B: Common ability distribution						
Mean score Natives	0.072***		0.073***	0.045**		0.043*
	(0.008)		(0.09)	(0.021)		(0.024)
Mean score Immigrants	0.003		0.002	0.036***		0.042***
	(0.005)		(0.005)	(0.012)		(0.013)
Fraction top Natives		0.061**	-0.017		0.039	-0.012
		(0.027)	(0.028)		(0.066)	(0.069)
Fraction bottom Natives		-0.115***	-0.009		-0.096	-0.035
		(0.028)	(0.03)		(0.073)	(0.079)
Fraction top Immigrants		0.003	-0.002		-0.030	-0.069
		(0.022)	(0.023)		(0.054)	(0.055)
Fraction bottom Immigrants		-0.013	-0.007		-0.038	0.015
		(0.013)	(0.014)		(0.029)	(0.032)
Observation	1,121,944	1,121,944	1,121,944	78,898	78,898	78,898
Subject FE	√	√	√	√	√	√
Gender x subj FE	√	√	√	√	√	√
Cohort x subj FE	√	√	√	√	√	√
Pupil FE	√	√	√	√	√	√

Notes: The table shows pupil fixed effects estimates of the effect of average peer quality, fraction of top and bottom peers on students' 8th grade standardized test scores by immigrant status. Peer measures are reported separately for immigrant and native children. In Panel A they are built using separate ability distributions for immigrant and native students while in Panel B they are built using the same ability distribution. Columns 1-3 refer to native students while Columns 4-6 to immigrant students. The dependent variables are the INVALSI standardized test scores in literacy and numeracy. The fraction of top (bottom) peers is defined as the top (bottom) 5 percent students of the cohort-specific national distribution of 5th grade INVALSI test scores. All specifications include subject fixed effects, gender by subject fixed effects and cohort by subject fixed effects. Robust standard errors (adjusted for clustering at the school level) are in parenthesis, *** p<0.01, **<0.05, * p<0.1.

Building peer measures separately for immigrant and native students provides new insights also for interpreting evidence in Table 3.7 where we analyse the impact of peer quality by immigrant status and parents' educational level. Results are showed in Table 3.10. Most interesting evidence, with respect to Table 3.7, emerges for immigrant children with low-educated parents (see Columns 2, 4 and 6 in Panel B): we find a positive and significant effect of immigrant peer average ability and a negative and significant impact of the fraction of immigrant low-achieving peers. This result is in line with the evidence that peer effects are stronger within rather than across groups. Panel A reports that native students mostly affect native student. Panel B points out that the effect of peers differ between immigrant students with high and low educated parents. On the one hand, students with high educated parents are mostly affected by native students. On the other hand, immigrant students with low educated parents are mostly affected by immigrant students. In other words,

the greater the distance between native and immigrant children in terms of socio-economic and cultural background the lower is the influence exerted by the quality of native peers on immigrant students.
Evidence for disadvantaged immigrant students underlines that they are more sensitive to the lower extreme of the ability distribution and that their reference group is definitely represented by other immigrants.

Table 3.10: Impact of peer quality on 8th grade outcomes by immigrant status and parents' educational level.

	(1)	(2)	(3)	(4)	(5)	(6)
Panel A: Natives						
	High Educ.	*Low Educ.*	*High Educ.*	*Low Educ.*	*High Educ*	*Low Educ.*
Mean score Natives	0.072***	0.065***			0.073***	0.062***
	(0.008)	(0.014)			(0.009)	(0.016)
Mean score Immigrants	0.004	0.001			0.004	-0.003
	(0.005)	(0.009)			(0.006)	(0.010)
Fraction top Natives			0.059**	0.066	-0.019	-0.000
			(0.026)	(0.043)	(0.027)	(0.047)
Fraction bottom Natives			-0.115***	-0.112**	-0.010	-0.021
			(0.028)	(0.045)	(0.031)	(0.049)
Fraction top Immigrants			0.005	-0.005	-0.001	-0.005
			(0.022)	(0.043)	(0.023)	(0.044)
Fraction bottom Immigrants			-0.011	-0.021	-0.004	-0.021
			(0.013)	(0.022)	(0.014)	(0.025)
Observations	875,104	246,840	875,104	246,840	875,104	246,840
Panel B: Immigrants						
	High Educ.	*Low Educ.*	*High Educ.*	*Low Educ.*	*High Educ*	*Low Educ.*
Mean score Natives	0.075***	-0.025			0.072***	-0.026
	(0.022)	(0.041)			(0.025)	(0.047)
Mean score Immigrants	0.016	0.075***			0.027*	0.068***
	(0.013)	(0.023)			(0.015)	(0.026)
Fraction top Natives			0.027	0.059	-0.050	0.074
			(0.073)	(0.128)	(0.077)	(0.136)
Fraction bottom Natives			-0.183**	0.074	-0.082	0.045
			(0.081)	(0.131)	(0.087)	(0.142)
Fraction top Immigrants			-0.066	0.076	-0.093	0.015
			(0.059)	(0.110)	(0.060)	(0.113)
Fraction bottom Immigrants			0.001	-0.118**	0.037	-0.034
			(0.032)	(0.056)	(0.037)	(0.062)
Observation	56,702	22,196	56,702	22,196	56,702	22,196
Subject FE	√	√	√	√	√	√
Gender x subj FE	√	√	√	√	√	√
Cohort x subj FE	√	√	√	√	√	√
Pupil FE	√	√	√	√	√	√

Notes: The table show pupil fixed effects estimates of the effect of average peer quality, fraction of top and bottom peers on students' 8th grade standardized test scores by immigrant status and parents' educational level. Panel A refers to native students while Panel B to immigrant students. We define parents to be (high) low educated if the education of the parent with the highest educational level is (higher) lower or equal to lower secondary school diploma. The dependent variables are the INVALSI standardized test scores in literacy and numeracy. The fraction of top (bottom) peers is defined as the top (bottom) 5 percent students of the cohort-specific national distribution of 5th grade INVALSI test scores. All specifications include subject fixed effects, gender by subject fixed effects and cohort by subject fixed effects. Robust standard errors (adjusted for clustering at the school level) are in parenthesis, *** p<0.01, **<0.05, * p<0.001.

For the sake of brevity, we do not report all the corresponding tables but the result that intra-group effects are stronger within groups than across groups is corroborated in all the specifications analysed in section 3.6.1 once we build separate measures for immigrant and native children.

Evidence from this subsection reinforces the findings in the main analysis. Further, building separate measures of peers' quality for immigrant and native students, we shed light on the distinct contribution of the two groups on the effects discussed in previous section. For native and immigrant children most of the ability peer effect is conveyed by the average ability of students belonging to the same group.
Interestingly, in the case of immigrant students, we find that their ability has no effect on native students while for native students we find that their average ability has a positive and significant impact on immigrant children's educational achievements with the effect being stronger for immigrant children that are more similar to native students in terms of socio-economic background. Our results are in line with the contributions of the literature on racial peer effects where most of the studies suggest that peer effects are larger within the same racial group than between groups (Hoxby (2000); Hanushek et al. (2003); Hanushek et al. (2009)). As suggested by Fordham and Ogbu (1986) and Fryer Jr and Levitt (2010), these findings might be interpreted as students placing different weights on peers from different backgrounds. In our context, immigrant (native) students might value more immigrant (native) peers than natives (immigrants) ones. In other words, stronger within-group spillovers might reflect the fact that students' respond more to peers who are more similar to them.

3.7 Sensitivity checks

In this section we test the sensitivity of our results under some relevant dimensions. First, we include in our most complete specification students' 5th grade test score and secondly, we add gender by subject by cohort fixed effects. Third, we define peers at the school level. Lastly, we break down our sample into three geographical areas: North, Centre and South.

Despite the fact that our specification controls for students' average ability across subjects, is still possible that some residual correlation is left between the subject-specific 5th grade within-student across subjects variation and the variation of peers' quality across subjects in 8th grade. In order to take into account this concern, in Table 3.11 we include student's own 5th grade test score in the same specification as in Panel B of Table 3.9, our most complete specification. [9] Although pupil fixed effect estimates in Table 3.11 are slightly smaller in terms of magnitude, results are mostly unchanged and point out in the same direction as estimates in Table 3.9.

[9] Results are unaltered using separate ability distributions for immigrant and native students.

Table 3.11: Impact of peer quality on 8th grade outcomes controlling for students 5th grade test scores.

	Natives			**Immigrants**		
	(1)	(2)	(3)	(4)	(5)	(6)
Mean score Natives	0.036***		0.036***	0.014		0.014
	(0.009)		(0.010)	(0.020)		(0.023)
Mean score Immigrants	0.001		0.000	0.025**		0.031**
	(0.005)		(0.006)	(0.011)		(0.012)
Fraction top Natives		0.014	-0.024		-0.025	-0.044
		(0.027)	(0.028)		(0.063)	(0.066)
Fraction bottom Natives		-0.072**	-0.020		-0.068	-0.047
		(0.028)	(0.031)		(0.069)	(0.075)
Fraction top Immigrants		0.001	-0.001		-0.022	-0.049
		(0.022)	(0.022)		(0.051)	(0.052)
Fraction bottom Immigrants		-0.007	-0.005		-0.018	0.020
		(0.012)	(0.014)		(0.027)	(0.030)
5th grade score x literacy	0.237***	0.237***	0.237***	0.322***	0.322***	0.322***
	(0.003)	(0.003)	(0.003)	(0.009)	(0.009)	(0.009)
5th grade test score x numeracy	0.225***	0.226***	0.225***	0.291***	0.292***	0.292***
	(0.004)	(0.004)	(0.004)	(0.009)	(0.009)	(0.009)
Observations	1,121,944	1,121,944	1,121,944	78,898	78,898	78,898
Subject FE	√	√	√	√	√	√
Gender x subj FE	√	√	√	√	√	√
Cohort x subj FE	√	√	√	√	√	√
Pupil FE	√	√	√	√	√	√

Notes: The table shows the effect of average peer quality, fraction of top and bottom peers on students' 8th grade standardized test scores. Peer measures are defined using the same ability distribution for immigrant and native students. The dependent variables are the INVALSI standardized test scores in literacy and numeracy. The fraction of top (bottom) peers is defined as the top (bottom) 5 percent students of the cohort-specific national distribution of 5th grade INVALSI test scores. All specifications include subject fixed effects, gender by subject fixed effects and cohort by subject fixed effects and students' 5th grade test scores. Robust standard errors (adjusted for clustering at the school level) are in parenthesis, *** p<0.01, **<0.05, * p<0.001.

In Table 3.14 we augment the specification in Table 3.9 with gender by subject by cohort fixed effects to take into account the possibility of gender subject-specific periodic shocks. Table 3.14 shows that our results are mostly unchanged by the inclusion of gender by subject by cohort fixed effects.

Table 3.12: Impact of peer quality on 8th grade outcomes by immigrant status.

	Natives			**Immigrants**		
	(1)	(2)	(3)	(4)	(5)	(6)
Mean score Natives	0.073***		0.076***	0.045**		0.045*
	(0.009)		(0.010)	(0.021)		(0.024)
Mean score Immigrants	0.003		0.003	0.036***		0.038***
	(0.005)		(0.005)	(0.012)		(0.013)
Fraction top Natives		0.045	-0.036		0.026	-0.025
		(0.029)	(0.030)		(0.072)	(0.074)
Fraction bottom Natives		-0.111***	0.003		-0.084	-0.018
		(0.029)	(0.031)		(0.076)	(0.082)
Fraction top Immigrants		0.023	0.016		-0.017	-0.053
		(0.024)	(0.024)		(0.060)	(0.061)
Fraction bottom Immigrants		-0.003	0.005		-0.049*	-0.001
		(0.013)	(0.014)		(0.029)	(0.032)
Observation	1,121,944	1,121,944	1,121,944	78,898	78,898	78,898
Subject FE	√	√	√	√	√	√
Gender x subj FE	√	√	√	√	√	√
Cohort x subj FE	√	√	√	√	√	√
Pupil FE	√	√	√	√	√	√
Gender x subj x cohort FE	√	√	√	√	√	√

Notes: The table shows pupil fixed effects estimates of the effect of average peer quality, fraction of top and bottom peers on students' 8th grade standardized test scores by immigrant status. Peer measures are reported separately for immigrant and native children. Columns 1-3 refer to native students while Columns 4-6 to immigrant students. The dependent variables are the INVALSI standardized test scores in literacy and numeracy. The fraction of top (bottom) peers is defined as the top (bottom) 5 percent students of the cohort-specific national distribution of 5th grade INVALSI test scores. All specifications include subject fixed effects, gender by subject fixed effects, cohort by subject fixed effects and gender by subject by cohort fixed effects. Robust standard errors (adjusted for clustering at the school level) are in parenthesis, *** p<0.01, **<0.05, * p<0.1.

In Table 3.13 we run same specification as in Panel B of Table 3.9 but defining peer measures at the school level. Concerning native students, estimates in Table 3.13 for the impact of peers' average ability point in the same direction as the ones at the class level but are smaller in magnitude. Further, we find no effect of high and low-achievers on native students' outcomes, both when analysed separately and in the same specification.

As reported in columns 4-6, we do not find any significant effect of peers' ability on immigrant students educational outcomes.

All in all, results in Table 3.13 are in line with the idea that peer effects mostly operates at the class level whereas they attenuate at the school level, especially in a school system as the Italian one where the group of peer is the same for all subjects and for the entire duration of the lower secondary school period. [10] This evidence underlines that analysing peer effect at the school level might fail to capture substantial effects because of the lack of granularity in the peer group definition.

[10] I consider both the entire sample and the sample without municipality with only a lower secondary school but results do not substantially differ. In this file I use regression from the entire sample.

Table 3.13: Impact of peer quality on 8th grade outcomes defining peer measures at the school level.

	Natives			**Immigrants**		
	(1)	(2)	(3)	(4)	(5)	(6)
Mean score Natives	0.035***		0.041***	-0.002		-0.001
	(0.010)		(0.012)	(0.022)		(0.024)
Mean score Immigrants	0.002		0.004	0.015		0.014
	(0.007)		(0.008)	(0.016)		(0.018)
Fraction top Natives		-0.013	-0.047		-0.023	-0.024
		(0.033)	(0.034)		(0.062)	(0.065)
Fraction bottom Natives		-0.033	0.019		0.011	0.010
		(0.028)	(0.031)		(0.064)	(0.069)
Fraction top Immigrants		-0.001	-0.008		-0.069	-0.081
		(0.032)	(0.033)		(0.065)	(0.066)
Fraction bottom Immigrants		0.002	0.009		-0.042	-0.022
		(0.017)	(0.019)		(0.047)	(0.051)
Observations	1,121,944	1,121,944	1,121,944	78,898	78,898	78,898
Subject FE	√	√	√	√	√	√
Gender x subj FE	√	√	√	√	√	√
Cohort x subj FE	√	√	√	√	√	√
Pupil FE	√	√	√	√	√	√

Notes: The table shows the effect of average peer quality, fraction of top and bottom peers on students' 8th grade standardized test scores. Peer measures are defined at the school level using the same ability distribution for immigrant and native students. The dependent variables are the INVALSI standardized test scores in literacy and numeracy. The fraction of top (bottom) peers is defined as the top (bottom) 5 percent students of the cohort-specific national distribution of 5th grade INVALSI test scores. All specifications include subject fixed effects, gender by subject fixed effects and cohort by subject fixed effects. Robust standard errors (adjusted for clustering at the school level) are in parenthesis, *** p<0.01, **<0.05, * p<0.1.

As an additional sensitivity check, we investigate whether our estimates are consistent across macro-areas. Italy has been historically characterized by a sharp and persistent duality between the more developed northern-central regions and the under-developed southern regions. These geographical disparity ranges from the labour market opportunities to the availability and quality of public services such as healthcare and education. In order to take into account these substantial territorial differences, we run the same specification as in Panel B of Table 3.9 breaking down the sample into the three most relevant macro-areas: North, Centre and South. By the sake of brevity, for each macro-area we only report the specifications where we include peers' quality measure separately. Both for immigrant and native students, estimates across the three different macro-areas are consistent with results in Table 3.9.

Taken together, our sensitivity checks reassure us about the consistency and robustness of our results.

Table 3.14: Impact of ability peer effect on 8th grade outcomes by macro-areas.

	North				**Centre**				**South**			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
	Natives		**Immigrants**		**Natives**		**Immigrants**		**Natives**		**Immigrants**	
Mean score Natives	0.071***		0.048*		0.035*		0.026		0.059***		0.037	
	(0.011)		(0.026)		(0.019)		(0.053)		(0.014)		(0.049)	
Mean score Immigrants	0.004		0.025*		-0.001		0.053*		0.003		0.092**	
	(0.005)		(0.013)		(0.011)		(0.031)		(0.013)		(0.040)	
Fraction top Natives		0.091***		0.048		0.077**		0.063		0.040		-0.039
		(0.022)		(0.052)		(0.035)		(0.095)		(0.032)		(0.132)
Fraction bottom Natives		-0.087***		-0.101		-0.043		-0.011		-0.105***		-0.070
		(0.023)		(0.059)		(0.040)		(0.0115)		(0.033)		(0.116)
Fraction top Immigrants		-0.006		-0.021		0.019		0.074		0.030		0.095
		(0.015)		(0.040)		(0.030)		(0.070)		(0.036)		(0.120)
Fraction bottom Immigrants		-0.005		-0.045		0.013		-0.027		0.001		-0.105
		(0.010)		(0.024)		(0.021)		(0.053)		(0.027)		(0.083)
Observations	526,896	526,896	54,740	54,740	185,730	185,730	15,784	15,784	457,728	457,728	9,638	9,638
Subject FE	√	√	√	√	√	√	√	√	√	√	√	√
Gender x subj FE	√	√	√	√	√	√	√	√	√	√	√	√
Cohort x subj FE	√	√	√	√	√	√	√	√	√	√	√	√
Pupil FE	√	√	√	√	√	√	√	√	√	√	√	√

Notes: The table shows the effect of average peer quality, fraction of top and bottom peers on students' 8th grade standardized test scores. Peer measures are defined using the same ability distribution for immigrant and native students. The dependent variables are the INVALSI standardized test scores in literacy and numeracy. Columns 1- 4 report estimates for the northern area, columns 5 - 8 for the central area and columns 9-12 for the southern area. The fraction of top (bottom) peers is defined as the top (bottom) 5 percent students of the cohort-specific national distribution of 5th grade INVALSI test scores. All specifications include subject fixed effects, gender by subject fixed effects and cohort by subject fixed effects. Robust standard errors (adjusted for clustering at the school level) are in parenthesis, *** p<0.01, **<0.05, * p< p<0.1.

3.8 Conclusions

In recent years there has been growing interest in estimating the impact of immigrant children proportion and ability on native children outcomes; however, very little research has been carried out on how to promote and foster immigrant students' learning. Surprisingly, no studies have explicitly explored the impact of native and immigrant students' ability on immigrant children's educational outcomes. In fact, it is an open question under which circumstances immigrant students' performances are promoted in the class environment.

This article provides an empirical investigation of the way the ability of immigrant and native classmates affects the educational achievements of immigrant students in Italy. In particular, making use of an identification strategy exploiting within-pupil across subjects variation, we explore the role played by the peers' average ability and by the fraction of peers' at the extreme tails of the national cohort-specific ability distribution. Our empirical analysis is based on the 8th grade INVALSI data set from the school years 2015/16 and 2016/17.

Importantly, our results show that both native and immigrant students are affected by the educational performance of their peers. The average ability of peers is the most relevant parameter that is shown to have a positive and significant impact on classmates' outcomes. However, it is worth underlying that even if we find little evidence for peer effects to be highly non-linear, we find that peer effects are stronger among students belonging to the same group, especially for native students. The latter plausibly suggests that immigrant and native students have different reference groups. These results are in line with the literature on racial peer effect emphasizing that peer effects are grater intra-race than across races (Hoxby (2000); Hanushek et al. (2003); Hanushek et al. (2009)).

From a policy perspective, results in this paper are important to answer questions such as, âĂIJWhen regulating composition of classes, which characteristics we expect to be important in order to have higher achievements for immigrant children?âĂİ. Our findings underline that in order to foster immigrant children learning, in the class composition process, peersâĂŹ ability should be taken into account. Unfortunately, data at hand do not allow us to properly identify the behavioural mechanisms behind the underlined effects, thus, further investigation is needed to fully understand which is the class composition that maximise the learning of immigrant students.

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Estratto per riassunto della tesi di dottorato

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Ciclo: XXXII

Titolo della tesi : Topics in the Economics of Education and Immigration

Abstract: This doctoral thesis is divided into three distinct chapters empirically examining some of the most relevant aspects concerning immigrant children's integration in the Italian school system. The administrative data in this dissertation are drawn from the Italian National Institute for the Evaluation of the Education System on the entire population of students. First chapter presents and discusses comparative evidence on the performance of first and second-generation immigrant students with respect to that of native students, providing up-to-date evidence on the main factors driving immigrant students' disadvantage. Second chapter investigates the impact of early childcare attendance on immigrant students' educational performance. The final chapter explores whether the ability of native and immigrant peers affects immigrant students' educational achievement in the classroom. Overall, this dissertation sheds light on the determinants of the immigrant students' educational disadvantage suggesting educational policies that might positively affect immigrant students' educational outcomes and integration.

Abstract: Questa tesi di dottorato è suddivisa in tre distinti capitoli che studiano empiricamente alcuni degli aspetti più importanti riguardanti l'integrazione degli studenti immigrati nel sistema scolastico italiano. I dati utilizzati in questa tesi sono stati forniti dall' Istituto nazionale per la valutazione del sistema educativo di istruzione e di formazione italiano e comprendono l'intera popolazione studentesca. Il primo capitolo presenta e compara i risultati degli studenti immigrati di prima e seconda generazione con quelli degli studenti italiani, fornendo un quadro completo sui fattori che maggiormente influenzano lo svantaggio educativo degli studenti immigrati. Il secondo capitolo esamina l'impatto di aver frequentato l'asilo nido sui risultati scolastici dei bambini immigrati al termine della scuola primaria. Il capitolo conclusivo investiga se l'abilità dei compagni di classe nativi e immigrati influenza i risultati scolastici degli studenti immigrati.
Nell'insieme, questa tesi illustra quali sono i fattori che maggiormente determinano la difficile integrazione scolastica degli studenti immigrati e suggerisce alcune politiche educative che potrebbero positivamente influenzare i risultati scolastici e l'integrazione degli studenti immigrati.

Firma dello studente