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## **Ethnic Peer Pressure or School Inequalities? Ethnic Concentration and Performance in Upper-Secondary Schools**

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# **Ethnic Peer Pressure or School Inequalities? Ethnic Concentration and Performance in Upper-Secondary Schools**

*Simone Virdia\**

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*Abstract:* This article provides empirical evidence for the ethnic concentration effect on natives' and non-natives' performance in mathematics and reading in upper secondary schools in the North and Center of Italy, where the large majority of immigrants is concentrated. Once schools and compositional controls are included in the models, results show that the ethnic concentration effect on students' achievement is non-linear and negative effects might occur only once a rather high and empirically still rare concentration of immigrants is reached. The misspecification as linear effect will lead to wrong conclusions and consequently, to wrong policy implications. Further, it is shown how immigration affects differently natives and non-natives, only in vocational schools, where social problems and exclusion tend to concentrate. Last but not the least, results show the overrepresentation of non-native students in vocational schools, with a low quality teaching, and with a large concentration of students from the most disadvantaged social strata.

*Keywords:* Ethnic composition effect, Peer effect, Non-natives, Secondary education, Tracking

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## Introduction

Since the early 1990s, Italy has turned into an important destination for international migration. This rapid growth has enhanced the public concern over the assimilability of newcomers. Education is seen as a key factor for successful integration, thus, schools face the increasingly difficult challenge to include immigrant children, without slowing down natives' performance, at the same time. In the past years, the foreign population in Italian upper secondary schools had increased from 1.1% in 2001 to 6.6% in 2013 (MIUR 2013), with a very unequal distribution among different school types. The proportion of immigrant students in vocational schools (in 2013) is more than twice, compared to general and technical schools. In 2010, the Italian Minister of Education had established a threshold of 30% as a maximum proportion of immigrants in each classroom. Behind this threshold, there is an idea that too many immigrants within a classroom may negatively influence non-natives' as well as natives' performance, due to language and cultural barriers. Students with an immigrant background are more at risk of drop-out and they often have language problems. As a result, too many immigrant students in a classroom may slow-down the average learning of all students, both natives and non-natives (MIUR 2010). At the same time, teachers may adjust their teaching to the level of these students and use a large proportion of their time for students with extra needs, neglecting good students. The reason why this threshold was chosen is unclear and certainly not based on empirical evidence, however. This paper fills this gap by providing insights for upper secondary schools and allowing for non-linearity of the effects.

Italy is characterized by a relatively early tracking. Strong social-origin, as well as immigration status effects in the type of upper secondary school attended, are reported by many scholars (Checchi & Flabbi 2007, Azzolini & Barone 2012). The reason is that in Italy there is not a formal system of teachers' recommendation and students can choose any type of school, irrespective to previous performance. Early differentiation was also shown to negatively affect the performance of students that come to school with language and social deficits (Entorf & Lauk, 2008), exacerbating, therefore, the low school performance of the most disadvantaged, among which students with an immigrant background. To my knowledge, only two studies on the immigrant concentration effect on students' learning has been carried out in Italy, so far (Contini, 2013, Ballatore *et al.*, 2018); however, both papers focus on primary and lower secondary education, where the training offer do not change across schools, thus, were students have not been sorted into different tracks yet.

The contribution of this paper is threefold: first, it extends the existing literature with further evidence on the association between the school's eth-

nic concentration and students' performance in upper-secondary schools in the Northern and Central part of the country, where the large majority of immigrants is concentrated. Special attention will be addressed to tracking and other school and compositional inequalities. Native families are often concerned with the concentration of non-natives in certain schools, and they may try to avoid stigmatized schools, which in turn, may lead to compositional and school inequalities. While in primary and lower-secondary education the proportion of second generation immigrants prevails on newcomers, the opposite is true in upper-secondary schools (MIUR 2014).

Therefore, at this level of education there is an urgency to gain a better understanding of the effect of the school's ethnic concentration on students' performance. Second, the paper allows the school's ethnic concentration effect to be non-linear, and tests to what extent the results are driven by schools at the extremes of the ethnic concentration distribution. The non-linearity will be accounted using a piecewise regression technique. Third, it looks at whether the effect differs between native and non-native students. Students form different networks with different parts of their peers. It is, therefore, likely that the effect varies among these subgroups.

### **The Peer-Effect Literature**

The Coleman report (1966) is among the first studies to show that students' achievement and attainment are strongly related to compositional characteristics of peers in the same school/classroom. The report has a special reference to schools' socioeconomic status and ethnic segregation. Schools with higher concentration of African Americans were shown to affect negatively the performance of both white Americans and African Americans; however, most of this gap is explained by other compositional effects (such as the school's socioeconomic composition). Subsequently, many scholars have confirmed Coleman's findings. The negative correlation between the school's ethnic concentration and its students' performance is a well-documented result in the American and European literature (Hanushek *et al* 2009, Portes & Hao 2004, Cebolla-Boado 2007, Fekjær & Birkelund 2007; Cebolla-Boado & Medina 2010, Brunello & Rocco 2011); however, when it comes to the nature and magnitude of the relationship, conclusions are less straightforward. Reasons are both conceptual and methodological.

Also, the gap between natives and non-natives, in terms of educational outcomes, has been extensively investigated by scholars (Schnepf 2004, Marks 2006, Rethon 2007, Fekjaer 2007, Dronkers *et al* 2011, Azzolini *et al* 2012, for a review on second generation immigrants see Heath *et al* 2008). These findings are often consistent across countries and hold also a net of several individual and contextual characteristics. If students with an immi-

grant background tend to underperform natives, this may come also with consequences for peer effect.

While the empirical regularity is well established in the literature, things are less clear once it comes to the reasons and mechanisms of the negative effects of too high ethnic concentration. More attention has been dedicated to causality issue, but much less to the theoretical explanation of the possible effects. The literature identifies three main groups of causes that may explain why the concentration of immigrant students into classrooms and schools influence students' performance negatively (Cebolla-Boado & Medina 2010): micro-interactions, school-level effects and compositional effects. Scholars that refer to the former mechanisms (Evans *et al* 1992, Kao & Tienda 1995, Fuligni 1997, Kao 2004) would state that the effect of concentration is determined to a large extent by peers interactions and relations. Once proper measurements are included in the model other contextual – school level and compositional - effects would decrease significantly. The argument seems to assume that immigrants are less inclined towards educational success. This would result in micro-interactions, which act as disincentives to other peers, in the same classroom or school. These types of explanations often lie along social capital theories (Portes & Zhou 1993). The question whether non-native students have lower educational aspirations compared to natives is still an open debate and results are conflicting. Some scholars found that immigrant students expect to attain a university degree more often than their native colleagues, net of socioeconomic status (Kao & Tienda 1998, Lauglo 2000, Cebolla-Boado & Medina 2010). Others, on the contrary, find an opposite result (Minello & Barban 2012). Large variability was shown to exist between different ethnicities and whether the research regards old or new immigration countries.

Advocates of the school-level effect, on the other hand, state that immigrant students tend to be overrepresented in schools that differ from the rest, substantially. Schools may differ, for instance, in terms of quality of teaching, student-teacher ratios, and economic and cultural resources (Arum 2000, Opdenakker & van Damme 2001, Portes & Hao 2004, Roscigno *et al* 2006). If students with an immigrant background are segregated in disadvantaged schools, the average low performance in these schools cannot be related to the ethnic concentration, but it is related to other unequal sorting mechanisms. Once these institutional and school-level differences are taken into account, the gap between natives and non-natives in school performance and the negative effect of immigrants on students' performance would decrease respectably.

Similarly, explanations related to the compositional effects refer to socio-economic and sociocultural composition of the peer group (Coleman 1966, Kao & Thompson 2003, Cebolla-Boado 2007, Cebolla-Boado & Medina 2010).

If immigrant students are overrepresented in schools with other students from disadvantaged family backgrounds, the correlation cannot be seen as a causal relationship. Assessing peer/social interaction effects (hereafter peer effects) is a difficult attempt. One of the main challenges in the peer effect literature is that schools and classrooms are not formed randomly. Manski (1993, 1995) highlights three different hypotheses why individuals belonging to the same context/group behave in similar ways: first, the prevalence of any behaviour in a group will affect others (*endogenous effects*); hence, achievement is affected by the achievement of other peers of the same reference group; second, the probability that an individual behaves in a certain way depends on the distribution of exogenous background characteristics in the reference group (*contextual effects*); third, individuals behave similarly because they come from similar backgrounds that tend to cluster in similar contexts (*correlated effects*). Disentangling the former two effects is a difficult issue. The average characteristics of the peers could capture either exogenous (contextual) or endogenous effects. A correlated effect, on the other hand, arises when the group of peers is affected by a common influence; for instance, when non-native students are clustered in specific classes (remedial classrooms), schools, or type of schools that have fewer resources or that have less competent teachers. If these correlated effects are linked to the peer group composition and they are not observed, the peer effect will be spurious (Manski 1993, Moffitt 2001). In short, peer effect is often affected by pre-existing sorting mechanisms that, if neglected, would give rise to biased estimations.

Scholars have dealt with this issue in different ways, either by assuming that students are unevenly assigned to schools, but they are randomly assigned to classes (Ammermueller & Pischke 2009, Contini 2013, Ballatore *et al* 2013), by accounting for neighbourhood effects (Cebolla-Boado 2007), or by aggregating peer effect measurements at the country level (Brunello & Rocco 2013). Schneeweis & Winter-Ebmer (2007) investigate peer effects in upper-secondary education accounting for the school-type fixed effect, thus controlling for school types. Most studies on peer effect, however, rely on several assumptions on the distribution of individuals across social spaces. This could partially explain why in the literature there is still no agreement on whether the proportion of non-natives in the classroom or school harms students' performance.

## Secondary education in Italy and hypotheses

The Italian educational system is comprehensive, from primary to lower secondary education, until 14 years of age. Afterwards, students choose among three main options: a five-year academic oriented education (*licei*) offered by general schools; a five-year technical education (*istituti tecnici*); and

a three to five-year vocational education (*istituti professionali* or *formazione professionale*). These options clearly differ in terms of purposes, subjects, academic standards and prestige, with the academic trajectory being the most prestigious and demanding track, later followed by technical and vocational schools. The literature has widely documented how school choice is socially stratified, thus, not entirely based on meritocratic criteria (Panichella & Triventi 2014). If ascribed characteristics, such as parental background and immigration status, influence the distribution of students across school types (beyond students' ability), this would affect the educational opportunities of different social groups, as well as school segregation processes, which will further increase the inequality in educational opportunity. Even if all three branches of education (potentially) give access to higher education, the proportion of students with a vocational qualification making the transition to higher education is extremely low (Barone 2012, Azzolini & Barone 2013).

Compared to other European countries, the Netherlands and Germany for instance, parents and students in Italy are free to choose the type of the school. This aspect, according to Checchi and Flabbi (2007), increases the importance of parental background for school choice. Basically, children from socioeconomically less advantaged families are much more likely to enrol in vocational oriented tracks than their peers from higher status families. Similarly, Azzolini and Barone (2013) demonstrate how students from an immigrant background have greater risks to opt for the vocational track, rather than for the academic track compared to natives.

### ***Ethnic concentration effect across school types***

Since the choice of school is not random, this stratified process may affect the extent to which the school's ethnic concentration affects students across different types of school. Between tracks, differences will then depend on the selectivity of migrants into school types, as well as on the average students' performance. School performance, parental background, and teachers' recommendations are important determinants of school choice (Checchi & Flabbi 2007, Panichella & Triventi 2014); however, their impact was shown to vary between natives and non-native students (Barban & White 2011, Bonizzoni *et al* 2016).

On the one hand, immigrant students that opt for the general track are a selected group and this is even truer for non-natives, since the social class of origin plays a minor role among them. The selection into tracks should be to a large extent dependent on school performance, as suggested by previous studies (Barban & White 2011). Furthermore, they may be a more integrated group, compared to peers that 'opted' for a vocationally specific pathway, in terms of language proficiency and cultural norms. If only the

“very best” immigrant students enrol into general schools, then one should expect a lower ethnic concentration effect on students’ school performance in this branch of education, compared to the vocational track (*Hypothesis 1a*). On the other hand, native students are, on average, positively selected into general schools, in terms of school performance, educational aspiration and motivation, and behavioural attitudes (Barban & White 2011). If in academic oriented schools, the average performance of students is high, then there might be more room for the ethnic concentration to exert its negative effect, leading to a stronger negative effect in general, compared to vocational schools (*Hypothesis 1b*).

The school-type is an important indicator of pre-existing sorting processes; however, cross-school variability may still be large within tracks. While most neighbourhoods provide primary and lower-secondary education, upper-secondary schools are more likely to be concentrated in the urban area. The effect of pre-existing sorting process, such as neighbourhoods, should then be lower in upper-secondary, as compared to primary and lower-secondary education. In medium and medium-large cities, however, students can often choose among more than one alternative. If schools differ in terms of quality and resources, tracking is insufficient to account for selectivity. The quality of a school depends, among other things, on its teachers and on economic and instructional resources. In Italy, teachers can move from one school to another in two ways: either because they request to be transferred to another school (only tenured teachers), or because they are not yet members and thus, they are required to move from one school to another according to current vacancies. Good teachers and teachers with experience, therefore, may prefer to teach in more prestigious, well-off and less problematic schools and this would affect students with poor socioeconomic resources negatively. Empirical models include controls to account for cross-school differences in resources, quality of teaching, and the socioeconomic composition of the peer group.

### ***Ethnic concentration effect on native and non-native students***

The school’s ethnic concentration may also exert a different negative effect on school’s performance between native and non-native students. The literature has repeatedly found a preference for intra-ethnic over inter-ethnic friendships (i.e. Wade & Okesola 2002,). The preference for intra-ethnic friends is related to similarities within an ethnic group, such as sharing the language and having similar cultural and economic backgrounds (Maharaj & Connelly 1994). Social similarity facilitates communication and sense of belonging and reduces uncertainty (Reskin *et al* 1999); however, the effect on school performance may depend on the other peers belonging to the same



network and on their attitudes towards education. This may also have implications in terms of peer effect. Studies on intra and inter-ethnic friendship and its effect of school performance, however, often refer to the North American context, which has peculiarities that cannot be extended to new immigration countries such as Italy. As a result, this line of reasoning may not be entirely applicable to the Italian context, as the still low proportion of immigrant students in upper-secondary schools comes from a variety of countries of origin. Nevertheless, homogeneity may still be greater among minorities, compared to the majority. Irrespective of the country of origin, immigrant students face similar social conditions, such as language and cultural barriers, integration problems, economic precariousness, that may bring them together to an easier extent, compared to the majority. In a peer effect perspective, if immigrant students are more likely to stick together and they have language and learning problems to a larger extent than natives, they may mutually reinforce low performance. Tracking, however, may work as a 'quality' selector, as previously discussed. The effect of concentration, therefore, may affect natives and non-natives differently, in favour of natives, in vocational schools, while no differences are expected in general and technical schools (*Hypothesis 3*).

### ***The non-linearity of peer effect***

Most studies have modelled the school's ethnic concentration as a linear effect (Cebolla-Boado 2007, Fekjær & Birkelund 2007, Lee 2007, Contini 2013); however, it may be reasonable to believe that if there is an effect of concentration, this effect is non-linear. This issue is also important in order to assess the usefulness of the arbitrary 30% cut-off point established by the Italian government, as a maximum proportion of non-natives in classrooms.

The non-linearity of peer effects was raised by Crane (1991). Other scholars have addressed this issue in regard to the ethnic concentration effect (Brännström 2008, Cebolla-Boado & Medina 2011, Szulkin & Jonsson 2007). In Spain, for instance, the effect is closed to zero until a ratio of 10%, negative, but still not significant, with a share ranging between 10 and 20%, and significantly negative with a proportion higher than 20% (Cebolla-Boado & Medina 2011). However, as suggested by the authors, only few schools in Spain have a ratio of immigrants greater than 20%. A similar argument was raised by Szulkin and Jonsson (2007) with regard to Sweden. They find a negative ethnic concentration effect only in schools with a proportion of immigrants greater than 40%; however, only few schools are beyond this threshold. By neglecting the non-linearity of a peer effect variable, one could draw misleading conclusions. For instance, one could conclude that, *ceteris paribus*, the higher the ratio of immigrants - the lower the average perfor-

mance of natives. However, the negative effect could be driven by schools at the extremes of the ethnic concentration distribution and not by a real linear effect. The 30% cap established by the Italian government raises the question whether this threshold is also supported empirically. This chapter tests whether the effect is non-linear and, more precisely, whether it is driven by schools at the extremes of the ethnic distribution, by schools with a relatively large proportion of non-natives.

## Research design

### *Data and Methods*

Data derived from the 2009 and 2012 OECD Programs for International Study Assessment (PISA) was used. It is a survey that takes place every three years and assesses the performance in mathematics, reading, and science literacy of 15-year-old students. PISA uses a two-stage stratified sample design: in the first stage, the units are schools serving 15-year-old students that were randomly sampled from a comprehensive national list of all eligible schools. The second-stage sampling units are students within schools. Once schools were selected, a complete list of all 15-year-old students was collected, from which a sample of 35 students was randomly selected.

Students' performance is reported as *plausible values*, created by regressing the student ability, thus the result obtained, with several features of the student background. This is a measure mostly used in large scale assessment surveys, such as PISA, as it is believed to achieve more reliable estimates of students' competences. A correct procedure requires running the analysis for each plausible value and then computing the average of the test score and the other regressors. The standard error is not computed by calculating the average, but a more complex formula is used, where the coefficient for each plausible value is compared with the final estimation (average of the parameters for each plausible value) and the difference is squared (for more details see: *PISA 2009 Technical Report*). The value of each test is standardized across countries, with a mean score of 500 and with a standard deviation of 100.

The assumptions of Ordinary Least Square (OLS) regression are unlikely to be met when a cluster sampling method is used, such as in PISA survey. In other words, one would expect the achievement of pupils within a school to be more similar than in the case of a random sample of students, since pupils within the same school share a common environment (curriculum, teachers, resources, *etc.*) that may influence their average performance. Hence, when one expects variation across groups, Hierarchical Linear Models are better in achieving more accurate estimations. Models will be fitted using

the student-level and school-level probability weights, adjusted according to the approach suggested by Pfeffermann *et al* (1998). Since the effect of the proportion of immigrants on students' performance is expected to be non-linear, and more precisely, to be driven by schools at the extremes of the ethnic concentration distribution, a piecewise regression technique was adopted (or segmented linear regression). When analysing the relationship between two variables ( $x$  and  $y$ ) it may be that for different ranges of  $x$ , different linear relationships occur. Hence, both the single linear model and the non-linear model (quadratic) may not be appropriate. Piecewise regression is a form of regression that allows multiple linear models to be fitted for different ranges of  $x$ .

### ***Dependent and independent variables***

Pisa survey provides students' performance in mathematics, reading, and science. I focus on the former two competences to have a broader understanding on whether the school's ethnic concentration exerts a negative effect on different types of competences, namely numeracy and literacy. The school's proportion of immigrants was derived by aggregating individual-level information on whether the student is Italian or he/she has an immigrant background. It might be intuitive to believe that the peer pressure operates at the class level (Hoxby 2000, Cebolla-Boado & Medina 2010) rather than at the school level, since students spend most of the school time in the classroom. Unfortunately, PISA does not provide information on the classroom-level; however, since only 15-year-old students are interviewed, by aggregating individual information, I do not measure peer pressure at the school level either, but peer effect among peers that are most likely attending the same grade. The small number of second generation immigrants in upper-secondary schools, did not allow me to distinguish between the proportion of first and second generation immigrants. However, a control indicating the school's proportion of second generation immigrants is included in the model. Furthermore, there was no information on the country of origin of students with an immigrant background. The variable, therefore, includes both non-natives from Western, as well as from non-Western countries.

Pisa technical report (OECD 2012) suggests to exclude schools with a response rate below 50%, in order to reduce the risk of selection on respondents. To achieve a measure as close as possible to the true composition of the school, without losing too many cases, on the other hand, the minimum response rate to 70% was set, thus only school with at least 25 students. Throughout this selection, 6,178 out of 61,299 cases were deleted.

In line with previous papers (i.e. Contini 2013), Southern regions were excluded from the analysis. The reason is that immigration is not yet a rel-

evant phenomenon in the South of Italy. Furthermore, these two parts of the country are structurally different in many aspects (Bratti *et al* 2007). Since students in Southern regions, on average, underperform students in the rest of the country, and the share of schools without non-native students is much larger in the South than in the Center and North, the effect of school segregation would be affected by other structural difference, such as average students' performance. Results would be, therefore, misleading. In short, results in this paper can only be generalized to the North and the Center of Italy. In the next paragraph, some descriptive statistics show the distribution of immigrant students across the areas of residence. Without controlling for the school type, the effect will be biased upward, since immigrant students tend to be concentrated in vocational tracks, where the average performance is largely lower compared to technical and general schools.

In order to account for selectivity and possible mediating effects, controls at the individual and contextual level are included. At the individual level, gender and the student's economic, social, and cultural status (ESCS) are included in the models. The latter includes: the highest occupational status of parents, the highest educational level of parents measured through the ISCED classification; and the presence of cultural, educational, and material resources in the student's home. The index was derived from a principal component analysis of standardized variables (for more details see: *PISA 2009 Technical Report*). Contextual variables are important; however, most of the variability in students' performance is still dependent on individual level characteristics, such as the family context (Azzolini *et al* 2012). At the school level, six controls were used: the school's socio-economic composition, the proportion of fully qualified teachers (ISCED 5), whether the school lacks of teachers (teacher shortage)<sup>1</sup>, and the school's educational resources<sup>2</sup> (more details on the operationalization of these indexes are reported in the note section). Two additional controls indicate the location of the school and whether there are other schools nearby that may compete for the same student-body. These controls should partially account for selectivity problems that go beyond the school type. PISA questionnaire provides the information on whether the school is located in a small town (from 3 to 15 thousands inhabitants), in a town (from 15 to 100 thousands inhabitants), in a city (from 100 thousands to one million inhabitants) or in a large city (more than one million inhabitants). The former two and the latter two were combined, distinguishing between medium-small and medium-large urban areas. This distinction should, to some extent, account for the probability that the distribution of schools is neighbourhood-based. The probability should be higher in medium-large cities, compared to medium-small towns. If more schools compete for the same student-body, the distribution of students among them could be unequal and based on other school and peers characteristics.

## Analyses

### *Distribution of non-native students across macro areas and school types*

The presence of students with immigrant background in Italy is, on average, not only a new one but also a rather limited phenomenon: in the years 2009 and 2012 only 5 and 5.6% of students respectively come from migrant families as shown in Table 1. However, the distribution of immigrants across macro areas of residence and school types is very unequal. As emerges from Figure 1, regional differences in ethnic concentration are particularly pronounced between Northern and central regions, on the one hand, and Southern regions, on the other. The average gap is about five percentage points. Further, immigrant students are concentrated in vocationally oriented schools, where the average share reaches 8.1% in 2009, and 10% in 2012, but it reaches up to 14.1% in central regions. Table 1 displays this uneven distribution of students with an immigrant background by showing the proportion of immigrants across tracks within each macro area. The immigrant share in general schools in Central and Northern regions is 4.6%; while, in Southern regions the share drops to 1.4%. In technical and vocational schools, regional differences are even more pronounced: in the North and the Center of Italy, the average proportion of non-natives in technical and vocational schools is 7.4% and 9.1%, and 10.9% and 14.1%, respectively, but reaches only 2.4% and 3.3% in the South. This, once more, underlines how immigration in upper secondary schools is not yet a relevant phenomenon for the Southern part of the country.

The last columns in Table 1 take a different look and report the distribution of students in schools with different proportion of non-natives. While in the North and the Center of Italy, less than 20% of students attend schools without immigrants, in the South the proportion increases to almost 60%. At the same time, almost no students in the South are attending schools with an immigrant concentration greater than 20%, but it reaches around 5.5 percent in the other two macro areas.

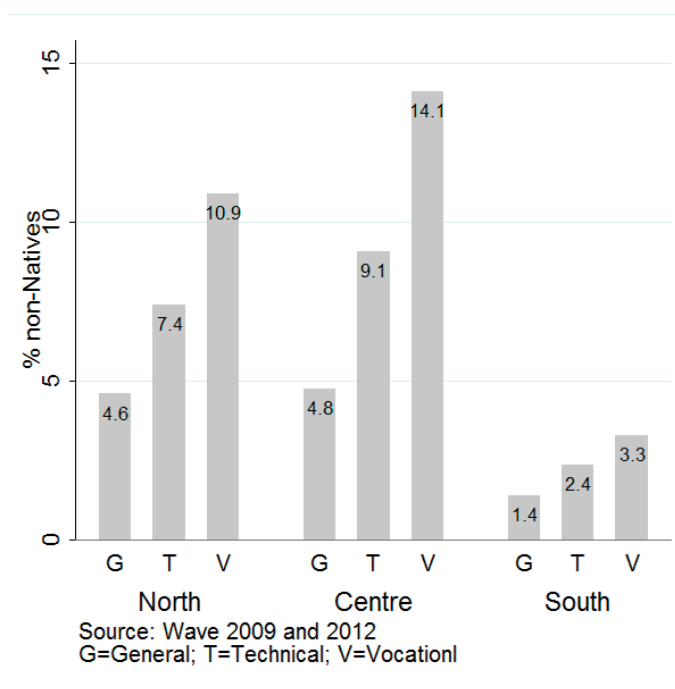
More than 40% of general schools are without immigrants and almost no general schools have a share greater than 20%. In vocationally oriented schools, on the other hand, less than one quarter of students is in schools without immigrants and more than 13% is in schools with a ratio higher than 20%.

In the following part, I will first give a more descriptive look at the association between the ethnic concentration and students' performance and then, I will present the results for the ethnic concentration effect taking into account school and compositional inequalities.

Table 1. Students' ethnic origin and schools' proportion of non-natives by macro areas and school types. Wave 2009 and 2012.

	Non-Natives (2009)	Non-Natives (2012)	School's % non-natives (categories) (2009 and 2012)				
			0	0-5	5-10	10-20	20+
Macro areas (%)							
North	6.5	7.5	19.8	25.3	32.4	17.2	5.3
Center	6.6	7.5	16.0	24.3	33.8	20.9	5.4
South	1.5	2.4	58.6	27.6	11.7	2.0	0.1
Average	5.0	5.6	33.0	25.9	25.2	12.4	3.5
School Types (%)							
General	2.9	3.8	40.2	30.6	23.3	5.8	0.1
Technical	5.0	6.8	28.0	23.7	28.3	17.2	2.7
Vocational	8.1	10.0	22.7	17.5	25.2	21.7	13.6

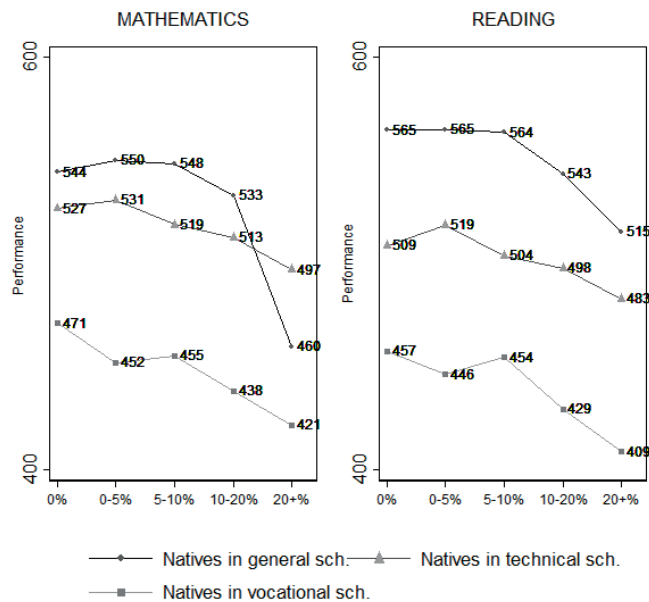
Figure 1. Percentage of non-natives across tracks and over macro are.



*Ethnic Peer Pressure or School Inequalities? A Descriptive Overview*

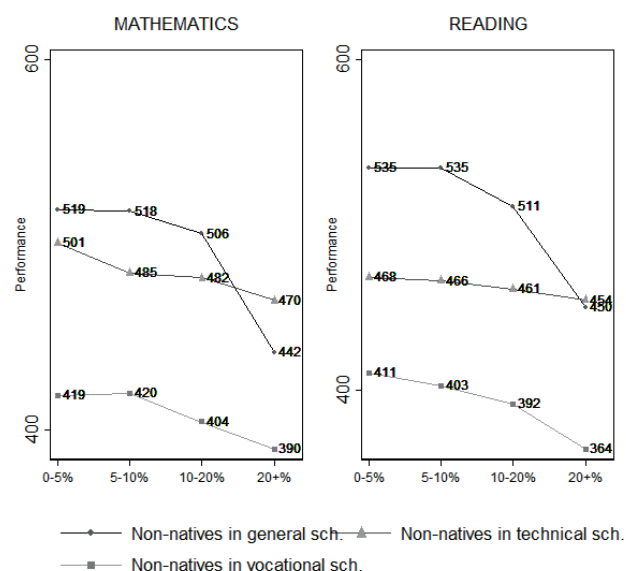
Figures 2 and 3 show the average performance in mathematics and reading of native and non-native students in schools with different shares of immigrant students. In general schools with a share of immigrants ranging between 10% and 20%, the average performance in mathematics and reading of natives is, respectively, 2 percent and 4 percent smaller than in schools without immigrants. In vocational and technical schools the same disadvantage in mathematics is 2.6 and 7% and in reading 2.1 and 6% respectively. If schools with more than 20% immigrants are considered, the gap in mathematics and reading increases to 5.7 and 5.1% in technical schools and to 10.6 and 10.1% in vocational schools. With regard to non-natives the pattern is slightly different: the average performance in mathematics in schools with a proportion of immigrants between 10 and 20% compared to schools with a share between 0 and 5% decreases by 2.3, 3.7, and 3.6% in general, technical and vocational schools, respectively. With regard to reading the performance decreases by 4.5, 1.5, and 4.6% in general, technical, and vocational schools respectively. With regard to schools with a proportion greater than 20%, the gap in mathematics increases by 6.1% in technical schools and by 6.9% in vocational schools: while the gap in reading increases to 3 and 11% in technical and vocational schools respectively.

Figure 2. Mean natives' performance in mathematics and reading in schools with different proportion of students with an immigrant background. Results shown for the three types of school.



Source: PISA 2009 and 2012. The 1st PV was adopted.

Figure 3. Mean non-natives' performance in mathematics and reading in schools with different proportion of students with an immigrant background. Results shown for the three types of school.



Source: PISA 2009 and 2012. The 1st PV was adopted.

Several conclusions can be drawn from this preliminary and descriptive attempt to investigate the association between the school's ethnic concentration and students' performance. First, with regard to natives, there is a cross-tracking variability in the disadvantage of having non-native peers in school. The disadvantage is almost double in vocational, compared to general and technical schools. The cross-tracking variability is weaker among non-natives, especially between technical and vocational schools. Second, between one third and a half of the gap, depending on the type of school and on whether natives or non-natives are concerned, is driven by schools with more than 20% immigrants. In sum, the association seems not to be linear, but, conversely, it seems to intensify beyond a share of 20%. Furthermore, the disadvantage seems to be greater in vocational schools than in general and technical ones.

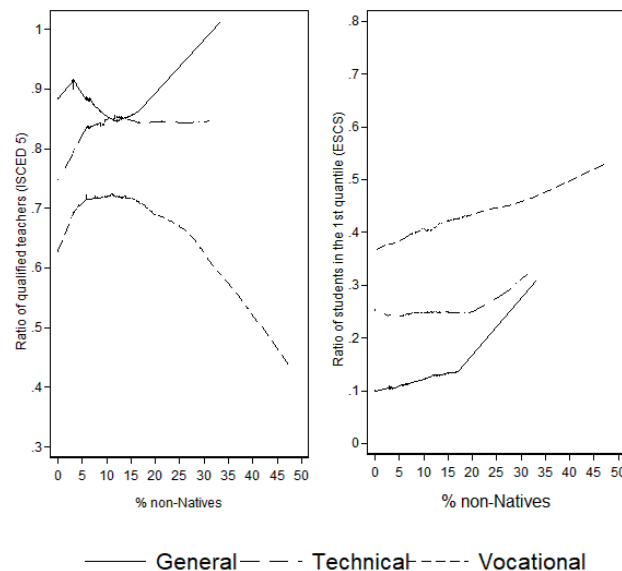
As it was problematized above, the effect of concentration could be mediated by other sorting processes. Schools may offer different qualities of learning environments, either because they differ in the amount of educational resources available, or because more qualified teachers tend to prefer schools with high-achieving students. It can also be because non-native students tend



to concentrate in schools where the ratio of students from a disadvantage background is high (Opdenakker & van Damme 2001, Cebolla-Boado & Medina 2011). The left-hand box in Figure 4 shows the correlation between the ratio of qualified teachers (with an ISCED 5 qualification) and the school's proportion of immigrant students. While in general and technical schools the correlation seems to be irrelevant (note that the increase in general schools from 18% to 35% immigrants is driven by one school); in vocational schools, beyond a share of 25% the ratio of qualified teachers decreases sharply. Non-natives in vocational schools seem to be twice as penalized: first, they tend to concentrate in vocational schools, where there is strong evidence of the low-level and low-quality average performance of students; second, teachers' quality decreases where they are better concentrated.

As shown in the right-hand box of Figure 4, in vocational schools there seem to be a socio-economic and socio-cultural composition effect. The correlation between the school's proportion of immigrants and the school's ratio of students in the lowest quantile of the socio-economic and socio-cultural distribution is positive. The gap between a vocational school without immigrants and a vocational school with a share around 50% is close to 15 percentage points. Also, in technical schools with a proportion of immigrants greater than 20%, the proportion of students in the lowest quantile of the socio-economic and socio-cultural distribution increases.

Figure 4. School proportion of qualified teachers (ISCED 5) and school concentration of students with a low ESCS at increasing proportion of immigrants. Non-parametric estimates.



Source: PISA 2009 and 2012.

### ***Ethnic Concentration Effect on Natives and non-Natives***

In the previous section, the average performance in mathematics of natives and non-natives in schools with different proportions of immigrants was shown. It is still unclear, however, whether the association between the school's ethnic composition and the students' performance is significant, and whether this association holds also after accounting for other uneven sorting processes. Italy is a relatively new immigration country; therefore, there are still few schools with a proportion of immigrant students greater than 20%, and they tend to be concentrated in the vocational branch. For the sake of simplicity, only results for the complete models will be displayed.

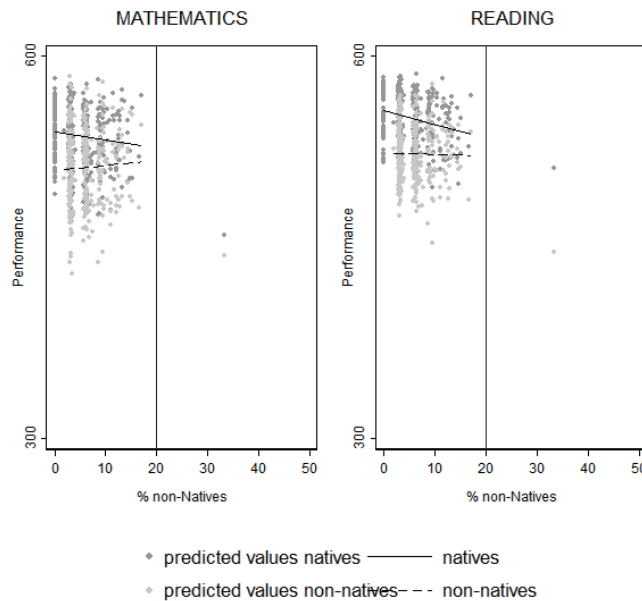
Figures 5, 6, and 7 report results for both mathematics and reading performance in general, technical and vocational schools, respectively (coefficients shown in Table A2 in the appendix). The non-linearity of the association between the school's ethnic density and natives and non-natives performance seems to be supported, with the exception of non-natives in vocational schools. The effect is not significant and the slope is rather flat for both natives and non-natives in schools with a proportion of immigrants below 20%. This is an important finding as the majority of upper secondary schools in Italy have fewer than 20% immigrants. If the school's ethnic composition is modelled as a linear effect, we would find a significant association between the proportion of immigrants in school and the average students' performance. This result, however, would be misleading, as the significance is driven by few schools at the extremes of the ethnic concentration distribution. This argument is even truer for general and technical schools, where only few schools have a proportion of non-natives greater than 20%. In general and technical schools, the slope below and above the threshold increases substantially. These results, however, are meaningless with regard to general schools, as only one school exceeds 20% immigrants, as shown in Figure 6. Little can be said with regard to technical schools as well, as only 13 schools have a share greater than 20% (Figure 7).

We reasoned that the effect of concentration should vary across types of schools. Two competing hypotheses were formulated: one predicts a stronger negative effect in vocational compared to general schools, due to the selection process allocating students into the three types of schools. The other, conversely, predicts a stronger negative effect in general schools, due to the higher average performance of students in this branch of education. Net of individual and school-level characteristics, we do not observe large differences between tracks. Among natives, there seems to be no substantial differences between tracks, especially with a share of immigrants below the threshold. Contrary to expectations, in vocational schools the change in the

slope is less steep compared to technical schools. This result could partially be explained by the larger sample of vocational schools, with a share of immigrants greater than 20%.

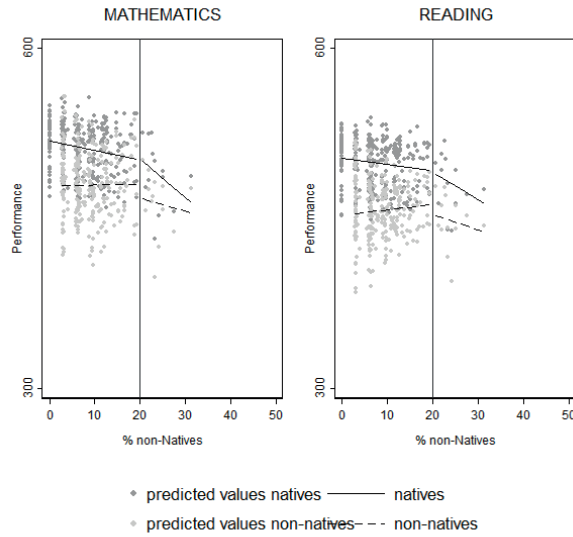
The last hypothesis expects non-natives in general and technical schools to be influenced by the proportion of immigrant peers in a similar way than Italians; while, in vocational schools the association is expected to differ, compared to natives. Both hypotheses seem to be supported. Similarly to Italians, non-native students are not affected by peers in general and technical oriented schools, until a ratio of 20%, as shown in figures 5 and 6. Beyond this ratio, the effect is significant. However, we should pay the same caution as for natives with schools with a share greater than 20%. In vocational schools, conversely, the effect differs to natives. The effect of concentration on immigrant students in vocational schools is linearly negative. The correlation turned out to be significant both below and above the threshold.

Figure 5. Natives and non-natives mathematics and reading score at increasing proportion of students with an immigrant background. Slope estimated before and after the 20 % cut-of (only general schools).



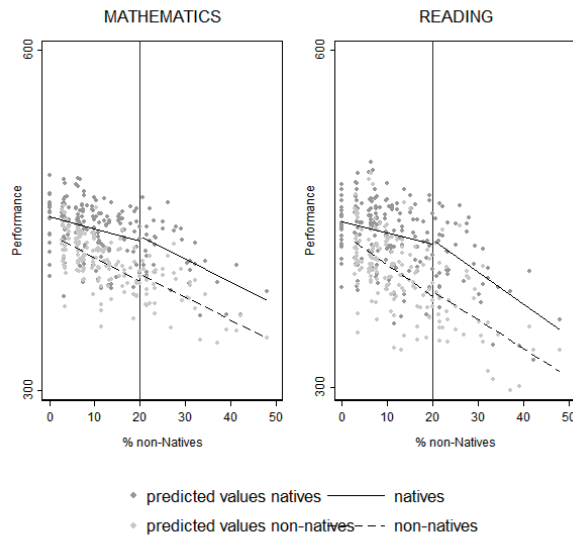
Source: PISA 2009 and 2012. The 1st PV was adopted.

Figure 6. Natives and non-natives mathematics and reading score at increasing proportion of students with an immigrant background. Slope estimated before and after the 20 % cut-of (only technical schools).



Source: PISA 2009 and 2012. The 1st PV was adopted.

Figure 7. Natives and non-natives mathematics and reading score at increasing proportion of students with an immigrant background. Slope estimated before and after the 20 % cut-of (only vocational schools).



Source: PISA 2009 and 2012. The 1st PV was adopted.

## Conclusion

The rapid growth of immigrant flow to Italy and consequently to its educational system, has enhanced the public concern over the assimilability of newcomers and the possible negative effects on the natives. However, this concern, as the research showed, seems not to be entirely founded.

This study suggests that the ethnic concentration effect on natives' achievement in the North and the Center of Italy is non-linear, and negative effects might occur only once a rather high and empirically still rare concentration of immigrants is reached. The misspecification as linear effects will lead to wrong conclusions and consequently to wrong policy implications. Once school and compositional controls are included in the model, the effect of immigrants' concentration on natives is only significant in schools with a ratio of immigrants greater than 20%. This regards about five percent of students in upper-secondary education, as emerged from Table 1, thus a very minor part of the student-body. In short, the findings suggest, in line with Crane's arguments (1991), the importance to determine thresholds in peer effect analyses and it provides empirical evidence for the relevance of the political decision to limit the concentration of immigrants in classes to 30%.

Further, the effect of concentration depends on the school type. Immigration seems to affect natives and non-natives similarly in general and technical schools. Both are not influenced by peers with proportions smaller than 20%. In vocational schools, on the other hand, the proportion of immigrants is linearly associated with non-natives' performance; while, it affects natives only beyond the threshold of 20%. The public concern should then focus on vocational schools, where social problems and exclusion tend to concentrate. Whereas, in general and technical schools the selected group of immigrants should not be a concern for Italian students yet.

One of the major methodological challenges analysing peer effects lies in the non-random distribution of students across social spaces. The major part of this selection process in Italian's upper secondary education, however, is reasonably captured by school types. Therefore, conducting the analysis separately for the three school types allowed, to some extent, to control for this selectivity issue – although the reported associations should not be interpreted as strictly casual, as endogeneity cannot be fully ruled out, due to unobserved characteristics.

This study, due to data limitation, does not distinguish between different ethnic groups. The latter differ in terms of social exclusion, disciplinary problem, educational expectations, and language and cultural barriers. A development could be to disentangle the effect of concentration into smaller groups and to see whether the effect varies across ethnicities.

### Notes

1. The index was derived from four items measuring school principals' perceptions of potential factors hindering instruction at their school. These factors are a lack of: *i*) qualified science teachers; *ii*) a lack of qualified mathematics teachers; *iii*) qualified Italian teachers; and *iv*) qualified teachers of other subjects (for details see: PISA 2009 technical report).
2. The index was derived from seven items, measuring school principals' perceptions of potential factors hindering instruction at their school. These factors are: *i*) shortage or inadequacy of science laboratory equipment; *ii*) shortage or inadequacy of instructional materials; *iii*) shortage or inadequacy of computers for instruction; *iv*) lack or inadequacy of Internet connectivity; *v*) shortage or inadequacy of computer software for instruction; *vi*) shortage or inadequacy of library materials; and *vii*) shortage or inadequacy of audio-visual resources (for details see: PISA 2009 technical report).

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## Appendix

Table A1. Descriptive statistics.

Variables	North and Center (N:28.700)	
	Mean	SD
Mathematics (5 plausible values)		
- Math PV1	514.6	85.8
- Math PV2	514.6	86.3
- Math PV3	514.6	85.8
- Math PV4	514.8	85.6
- Math PV5	514.7	86.0
Reading		
- Reading PV1	514.9	88.2
- Reading PV2	515.1	88.7
- Reading PV3	514.5	88.3
- Reading PV4	514.7	88.4
- Reading PV5	514.7	88.5
-		
<i>Individual level variables</i>		
Gender		
- Male	51.0	
- Female	49.0	
Wave		
- 2009	50.5	
- 2012	49.5	
ESCS index (min/max: 0-100)	61.2	11.9
Macro area of residence		
- North	69.2	
- Center	30.8	
School type		
- General	46.5	
- Technical	33.1	
- Vocational	20.4	
<i>School level variables</i>		
School's proportion non-natives (min/max: 0-48)	7.2	6.8
School's proportion 2 <sup>nd</sup> gen immigrants (min/max:0-28)	2.0	2.8
School's proportion low ESCS (min/max: 0-100)	46.6	15.9
School's community		
- More than 100 thousands (city)	26.5	
- Less than 100 thousands (town)	73.5	
School's competition		
- Only one school	30.8	
- More than one school	70.2	
% qualified teachers (min/max: 0-100)	82.0	25.0
Teachers shortage (min/max: 0-100)	29.3	17.9
School's educational resources (min/max: 0-100)	66.9	16.2

Table A2. Multilevel models of the school's ethnic composition effect on students' performance in mathematics by school types, immigration status, and competences.

% non-natives	General		Technical		Vocational	
	Natives	Non-nat.	Natives	Non-nat.	Natives	Non-nat.
<i>Mathematics</i>						
Constant	478.2***	455.6 ***	459.8***	427.1***	383.4***	353.3***
% non-natives ≤ 20	-1.4	.17	-.45	.36	-.30	-1.8*
% non-natives > 20	-6.7***	-6.3**	-5.7**	-4.9*	-1.4*	-2.0*
<i>Reading</i>						
Constant	529.5***	511.1***	469.1***	322.5***	384.9***	335.4***
% non-natives ≤ 20	-1.4	-.10	-.23	.47	-0.0	-2.1*
% non-natives > 20	-4.1	-4.1	-4.1^	-2.2	-1.6^	-2.7**
<i>N students</i>						
- ≤20	12,658	608	8,435	653	4,428	387
- >20	22	11	211	98	788	281
<i>N schools</i>						
- ≤20	408	316	288	238	160	137
- >20	1	1	13	13	39	39

Source: PISA 2009 and 2012. ^ $p < .10$ ; \* $p < .05$ ; \*\* $p < .01$ ; \*\*\* $p < .001$ .

Models net of: school's proportion 2nd generation immigrants, gender, wave, macro area, student' ESCS, school's location, presence of competing schools, teachers' quality (ISCED 5), school's educational resources, teachers shortage, school's share of students with a low ESCS (full model). Models exclude Southern regions.