Immigrant background peer effects in Italian schools

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Abstract

This article provides an empirical assessment of the effect of immigrant concentration on student learning in Italian primary and lower secondary schools, using the data of a standardized learning assessment administered in 2010 to the entire student population of selected grades at the national level. Identification is accomplished by exploiting the within-school random variability observed in the share of immigrant students across classes. I estimate peer effects allowing for heterogeneous effects between native and immigrant background children, and among natives, between children of different socio-economic background. The main finding is that the proportion of immigrant students has a negative weak effect on child learning outcomes. This effect is somewhat larger for children from disadvantaged backgrounds (immigrants and low socio-economic background), while negligible or even positive for high social origin native children.

1. Introduction

The rapid growth of immigrant flows which has occurred over the last decade in Italy, much like in other European countries, has sparked a growing concern within large sectors of the public opinion over the assimilability of newcomers and the demographic and cultural transformations of the Italian society. A key element of the integration process is the educational system, which is now confronted with the challenge of the inclusion of numerous immigrant children of diverse origins. Overall, at the national level, the share of students with immigrant background in primary and lower secondary school has increased from 3 to 9% in ten years. This growth has contributed to raise the fear that immigrant students are detrimental to the learning opportunities of native children. However, whether this is true or not, is still an open empirical question.

Evidence of large performance gaps between native and immigrant students is provided by OECD (2012), Schnepf (2007) and Dustmann *et al*. (2011). Yet, there is a considerable cross-country heterogeneity in the magnitude of these gaps. In traditional immigration countries like USA, Australia and Canada immigrant children perform much better relative to natives as compared to most European countries, where immigration is a recent phenomenon. Major differences are also observed within Europe, as in English-speaking countries the gap is much smaller. Focusing on the children of immigrants arrived in the second half of the 20th century, Heat and Brinbaum (2007) emphasize that educational inequalities in attainment and performance vary considerably across ethnic communities, but also within ethnic communities over host countries and migration waves.

The lower socio-economic background of immigrant communities is one possible explanation of their educational disadvantage. However, socio-economic background fully explains the educational disadvantage of traditional immigration groups of European ancestry, but not that of 'visible' minorities Heat and Brinbaum (2007). According to the

findings of the literature on recent immigrant waves, performance gaps of recent immigrants are attenuated once conditioning on parental background, but in many countries do not disappear. Other factors seem to be responsible of immigrant disadvantage: language problems, the characteristics of origin and host countries' educational systems and cultural differences (Dronkers *et al*., 2012).

School achievement is likely to be influenced not only by individuals' own characteristics, but, as individuals interact, also by the achievement and behavioral patterns of peers: within-children and children-teacher interactions may affect attitudes toward learning, class climate, teachers' pedagogical style and effort and learning targets. Understanding how peer effects function is crucial to analyzing a variety of educational policies (Hoxby, 2006). The existing literature mainly focuses on socio-economic background, gender and ethnic differences (e.g. Hoxby, 2000; Rangvid, 2003; Hanushek *et al.* 2003; Angrist and Lang, 2004; Schneeweis and Winter-Ebmer, 2005; Vigdor and Nechyba, 2007; Hanushek *et al.* 2009; Ammermueller and Pischke, 2009; Black *et al*., 2010), while only limited effort has been directed to the estimation of peer effects related to immigrant background. Effects related to socio-economic composition are often significant, although their magnitude is not easy to compare across studies. Ammermueller and Pischke (2009) use international PIRLS and provide evidence of sizable socio-economic background peer effects, variable across countries. Evidence of a positive effect of the share of females is provided by Hoxby (2000) on test scores and Black *et al*. (2010) on longer-run outcomes. Racial group effects have been studied in particular for the US. Hoxby (2000) finds significant composition effects, strongest within ethnic groups; similarly, Hanushek *et al.* (2009) provide strong evidence that school black proportion negatively affects achievement of blacks. Substantial effects of racial composition are also reported by Vigdor and Nechyba (2007). Angrist and Lang (2004) investigate the effects of the Metco desegregation program on students in the receiving

district, and find little evidence that whites are negatively affected by the newly arrived black children, while effects on black children in the host districts are modest and short-lived.

Findings from studies on schools ethnic composition may not be relevant for the more recent immigrants. On the one hand, while involuntary ethnic minorities often occupy the lowest levels of the social ladder and may have developed negative attitudes towards the values of the dominant majority group, including educational achievement (Ogbu, 1991), new immigrants may have higher aspirations and expectations over their offspring future (Portes and Rumbaut, 2001; Brinbaum and Cebolla-Boado, 2007) – although, according to the theory of segmented assimilation (Portes and Zhou, 1993), outcomes may diverge depending on the social capital of immigrant communities and the exposure to marginalized domestic minorities. On the other hand, the latest waves of immigrants differ from ethnic minorities in that they have experienced the uprooting from their country and are confronted with a new environment, language, social networks, working conditions and living arrangements.

The sociological literature offers a number of papers on selected European countries and different levels of schooling. Cebolla-Boado (2007) focuses on French lower secondary school, and finds non-significant effects of the share of foreigners on various educational outcomes. Van der Silk *et al.* (2006) and Dumay (2008) study the effect on achievement in the Netherlands. While the first reports only small negative effects on language proficiency, and not always significant, the second finds stronger effects, especially in 4th grade. Agirdag *et al* (2011) study compositional effects of socio-economic background and minority status in Flemish Belgium on the achievement of lower secondary school pupils, finding non-significant effects. Cebolla-Boado and Medina (2011) report no significant effects of the share of immigrants in Spanish primary education. Fekjaer and Birkelund (2007) focus on upper secondary graduates, and examine the effect of migrant school composition on grades and on the probability of university enrollment in Norway; they find small positive effects on

both outcomes for native students and second generation immigrants, negative effects on first generation immigrants on grades. In the educational economics literature, exploiting aggregate data at the country level, Brunello and Rocco (2011) use international PISA data to analyse how immigrant pupils affect the school performance of natives at age 15, finding evidence of small but significant negative effects, increasing with the level of segregation of immigrants. Gould *et al*. (2009) focus on the immigrant concentration in 5th grade on later educational outcomes in Israel; their results suggest that the overall presence of immigrants has large adverse effects on the dropout rate and on the chances of passing the high school exam necessary to attend college. Although findings from all these empirical studies are not always consistent, peer effects related to immigrant background are generally negative, but small and sometimes not statistically significant.

In this paper I provide an empirical assessment of the effect of immigrant concentration on student learning in Italian primary and lower secondary schools. To date, there are no such studies on Italy. I contribute to the existing literature by investigating peer effects on a very recent immigration country, where the majority of immigrant children are born abroad and there is no institutionalized body of policies aimed at their integration. I estimate peer effects allowing for heterogeneous effects of immigrant concentration between native and immigrant background children, and among natives, between children of different social origin.

I assume that peer effects act at the class level. The main empirical problem is self-selection into schools, which makes the proportion of immigrant students highly endogenous. Schools with a high share of immigrant students often host low socio-economic background native children; for this reason I include social origin, native students' repetitions and gender class composition variables as controls. Most importantly, if children from advantaged backgrounds, having higher aspirations and better access to information, choose better schools and/or school attendance rules select students with respect to ability related factors,

the impact of class composition can be easily confounded with school-specific unobservable effects, leading to biased estimates of peer effects. However, if children are randomly placed into classes, it is possible to exploit the within-school random variability in peer variables observed between classes (Ammermueller and Pischke; 2009). Under random assignment, school fixed-effect models produce consistent estimates of class composition effects.

I use the data of the standardized learning assessment administered in 2010 by the Italian National Evaluation Institute (INVALSI) to the entire student population of 5th (end of primary school) and 6th graders (lower secondary school). Although the assumption of random allocation of students into classes with respect to immigrant background is rejected at the system-level, when performing school-level tests, random assignment is not rejected for the majority of institutions. Schools not passing this test are discarded.

I follow the common practice of estimating the impact of class composition effects without trying to separate the effects due to peer achievement from other effects related to peer characteristics. As demonstrated by Manski (1993), disentangling them is a very difficult task. Moreover, since both effects are due to social interaction, it is their joint action that is of interest for public policy (Moffitt, 2001). In the Appendix however, building on the idea developed by Hoxby (2000) to exploit multiple peer variables, I attempt to investigate the different channels by which peer effects operate.

The paper is structured as follows. In Section 2 I illustrate the model and identification problems, review and discuss empirical strategies employed in the literature. Section 3 is dedicated to a brief description of the Italian schooling system and of the immigrant population. Section 4 describes the data. Sections 5 and 6 provide background descriptive evidence on the concentration of immigrant children in schools and achievement gaps. Section 7 is dedicated to the empirical issue of random class allocation. Section 8 turns to the analyses of data and presentation of the results. Conclusions and discussion follow.

2. Theoretical Background

2.1 Peer Achievement and Peer Characteristics

Since learning in schools takes place in a group setting, the composition of the group may affect individual outcomes. First, *achievement* effects might operate. High shares of poor performing children could be detrimental to the learning of peers, because teachers may dedicate a lot of effort to low endowed students, adjust performance targets and keep the level of the instruction low. Individuals' achievement could also be directly influenced by others' achievement: while good students may contribute establishing a positive competition climate, weak students may lose motivation and negatively affect peer attitudes towards learning. On the other hand, in a cooperative environment where well performing students help low performing ones, the former might deepen their own understanding due to learning by teaching and profit by the presence of the latter. As reported in the literature, children with an immigrant background are on average lower performing than native students: peer achievement effects operate if they influence the learning of natives (and possibly that of other immigrants) *because* they perform more poorly.

Second, learning could be affected by predetermined *characteristics* of peers. These effects refer to attitudes and behavioral patterns influencing learning that are not captured by performance scores (Hanushek *et al.* 2003). Consider for example gender class composition effects. Females are commonly thought to have a better attitudes towards schooling and less disruptive behavior; if this is true, *ceteris paribus* a large share of females should foster achievement. On the other hand, if children from disadvantaged backgrounds receive little family support as compared to better off children and do not find adequate support within the school, they may develop negative feelings about learning and damage the overall class climate. Agirdag *et al*. (2011) suggest that the futility culture – the belief that 'students like me' have no control over their educational success and that the school system is working

against them – could have a role in explaining composition effects, and that children in schools with a high share of working class and immigrant children are more likely to internalize negative feelings that may result in a higher sense of futility. Positive effects may operate, instead, if recently arrived immigrant families have high expectations for their children's future. Despite that first generation immigrant children are generally less proficient than native children, their presence may help in creating a positive environment and therefore foster learning. Differentiation in socio-economic or ethnic composition may also affect learning: in heterogeneous groups children are confronted with different social environments, norms and expectations, and both more affluent children and children of disadvantaged backgrounds may benefit from cultural diversity (Van der Slik *et al.*, 2006). If peer effects are stronger within ethnic groups than between them, as reported by a number of papers, the clustering of children by ethnicity or country of origin could also play a role.

2.2 Structural and Reduced Form Model

I assume that peer effects act at the class level. Individuals are nested into classes and classes are nested into schools, so the typical theoretical model for individual achievement is:

$$y_{ics} = \alpha + \beta \bar{y}_{(-i)cs} + \gamma \bar{z}_{(-i)cs} + \tau z_{ics} + \mu_s + \mu_{cs} + \varepsilon_{ics} \qquad (1)$$

where z are individual characteristics. Subscript i represents the individual, c the class and s the school, $\bar{y}_{(-i)cs}$ denotes class average achievement and $\bar{z}_{(-i)cs}$ class average characteristics, all taken excluding individual i. The error term includes a component ε_{ics} capturing individual shocks and components representing unobservables at the class and school levels. Unobserved school-specific effects μ_s are related to organizational features, effectiveness of the principal, school resources. Class-specific effects μ_{cs} capture class teachers' quality.

In the language of the seminal work of Manski (1993), the influence of peer achievement β is the *endogenous effect*; the influence of peer characteristics γ are *exogenous effects*; the effect of being exposed to the same environment, captured by μ_s and μ_{cs}, are

correlated effects. The effect of peer achievement is endogenous because peer achievement influences the achievement of individual *i*, but is itself influenced by *i*'s achievement. The existence of feedback effects implies that a change in individual achievement generates a social multiplier, thereby group average achievement changes by a larger amount than that corresponding to the original change. Due to this simultaneity that cannot be solved in standard ways (the "reflection problem"), unless strong restrictions are posited, model (1) is unidentified (Manski, 1993). Thus, disentangling endogenous and exogenous effects is very difficult: however, their joint effect still retains an intrinsic interest because they are both induced by social interaction. Correlated effects, on the other hand, are spurious. In this perspective, empirical work is often based on "reduced form models", where peer characteristics – but not peer achievement – are included as explanatory variables:

$$y_{ics} = \alpha + \tau^* z_{ics} + \gamma^* \bar{z}_{(-i)cs} + \mu_s + \mu_{cs} + \varepsilon_{ics} \qquad (2)$$

The parameter of interest is γ^*, which measures class composition effects and captures both endogenous and exogenous effects.[1] Richer versions of the model would include observed school characteristics.

2.3 Multilevel Modeling

Multilevel analyses are recommended for models that aim at exploring how micro-level variables are affected by micro-level and macro-level variables (Goldstein, 1997; Snijders and Bosker, 1999). Allowing to handle explanatory variables at the student, class and school levels, they are now widely employed in educational research. The effect of immigrant concentration in schools has been the object of a large number of recent papers from the sociological literature using multilevel models (Driessen, 2002; Fekjaer and Birkelund, 2007;

[1] Reduced form coefficients are function of *all* structural coefficients: γ^*captures exogenous and endogenous peer effects, but its magnitude also depends on individual effects. τ^* also differs from τ, and if endogenous effects are large, the difference between them can be substantial. γ^* and τ^* are also function of class size, so the reduced form (2) is only an approximation of true reduced form if classes have different numerosity. These results are available from the author upon request.

Dumay and Dupriwz, 2008; Brannstrom, 2008; Cebolla-Boado and Medina, 2011; Argidarg *et al*., 2011). However, multilevel models *by themselves* do not address the main empirical problem in the estimation of the effect of school characteristics, including peer effects: how children are allocated to schools.

The composite error term in model (2) has a school-specific component, a class-specific component and an individual component. This complex structure implies that errors of children in the same class or school are not completely independent. Standard statistical tests leaning on the assumption of independence lead to the underestimation of standard errors; as a consequence many significant results are spurious. Multilevel models tackle this problem by allowing multiple error components embedded in a hierarchical structure. However, these models assume that each component is *uncorrelated* to explanatory variables. But when the allocation of children to schools and classes is not random they yield – just like OLS – to biased estimates. Let us discuss the issue of school allocation (which is more severe), postponing that of class assignment for a later section.

Allocation of children to schools is hardly ever random. In some countries children are required to enroll into the school of the area of residence; in others there is freedom of choice. In the former case, neighborhoods generally differ with respect to residents' socio-economic background, immigrant status and so on. If parents are allowed to choose their offspring's school, other effects may add on. Children of the most advantaged backgrounds, having higher aspirations, might favor institutions that ensure better peers (natives, high social origin), and having access to more information, might select higher quality institutions. Hence, school choices are driven by families' observable features (social origin, native or immigrant background) and by unobservable factors (aspirations, attitudes towards immigrants, child innate ability). In addition, especially in those countries with a well developed private sector, school boards may sort students by applying enrolment fees and

setting ability related attendance rules.

Multilevel estimation of (2) yields to consistent estimates of peer effects if only the features that are observed by the analyst drive the selection process (i.e. only observed characteristics of children and observed characteristics of schools matter). The following conditions must hold:

(a) *There is no relation between the unobserved components of school quality and observable features of the student-body* (μ_s is independent of z and $\bar{z}$)

This condition applies if, regardless of their background, families have no information on school quality or if preferences for school quality do not vary with family background. Note that even if researchers had access to data on organizational aspects of schools, they would generally have no information on teacher quality; instead, this information is usually available to (well informed) parents. Information on school quality is likely to matter even with no freedom of school choice, because families choose the neighborhood to live. Another restriction is that high quality teachers and resources should have no incentive to move towards schools attended by more advantaged (or disadvantaged) children.

(b) *Parents of high innate ability children have the same preferences for peer characteristics of parents of low innate ability children* (ε independent of $\bar{z}$)

If high social origin parents might prefer peers with similar family background no matter how their children perform, disadvantaged origin parents of high innate ability children may be more selective that those of low innate ability: if this is the case, the assumption is not valid.

2.4 Accounting for School Endogeneity

If children are not randomly allocated to schools, school (and class) characteristics – including the characteristics of peers – cannot be considered exogenous. In the peer effects literature, Rangvid (2007) and Fekjaer and Birkelund (2007) assume that only observables enter the selection process and includes several individual and school variables. Cebolla-

Boado (2007) attempts to solve the problem using aggregate levels of deprivation in the area of reference as instrumental variables. To remove school selection issues, Brunello and Rocco (2011) exploit PISA data aggregated at the country level: since immigrants sort across countries and the more developed countries usually host a higher share, they control for between-country immigration flows by conditioning on country fixed effects and on the stock of immigrants in a given country at a given time. Schneeweis and Winter-Ebmer (2005), on Austrian upper secondary school, argue that self-selection is mainly driven by the segregation of students in different school-types and employ a school-type fixed effects model.

Other scholars attempt to render school composition an exogenous effect with different identification strategies. Hoxby (2000) controls for selection by exploiting idiosyncratic within-school variation in peer characteristics between adjacent cohorts in given grades. Vigdor and Nechyba (2007), Ammermueller and Pischke (2009) and Lugo (2011) rely instead on differences in the compositions of individual classes within a school. Gould *et al*. (2009) and Black *et al.* (2010) investigate long-term effects of school peers. Gould *et al*. (2009) focus on the immigrant concentration in grade 5 on later educational outcomes in Israel, and account for the endogenous sorting of immigrants across schools by exploiting random variation in the number of immigrants in grade 5, conditional on the total number of immigrants in grades 4-6. Black *et al.* (2010) study post-school and labor-market outcomes, exploiting random variation in cohort composition within schools. Their analyses are not affected by simultaneity issues because the dependent variables are later outcomes and not contemporaneous performance, allowing a clear-cut identification of peer achievement effects. Hanushek *et al*. (2003) use panel data to estimate peer effects on test score gains over time using student and school-by-grade fixed effects in a value-added specification. Identification is achieved by exploiting the fact that students move from one school to another. They aim to control for endogenous school selection, but also to account for omitted

past school and family inputs, which, if neglected, are likely to lead to upward biased estimates of peer effects. The analyses also address the reflection problem, by using past performance as the measure of peer achievement.

The starting point in this paper is the identification strategy suggested by Ammermueller and Pischke (2009). If children are randomly assigned to *classes*, it is possible to exploit the within-school random variability observed across classes in the peer characteristics variables.[2] Within-school differences are given by:

$$y_{ics} - \bar{y}_s = \tau^*(z_{ics} - \bar{z}_s) + \gamma^*\left(\bar{z}_{(-i)cs} - \bar{z}_s\right) + \left(\mu_{cs} - \bar{\mu}_{cs(s)}\right) + \left(\varepsilon_{ics} - \bar{\varepsilon}_{ics(s)}\right) \quad (3)$$

This model has the advantage that (observed and unobserved) school variables are removed, overcoming the issue of school-selection. Random assignment ensures that class-specific effects are independent of the characteristics of children and their families. Moreover, this assumption ensures that also the individual error component is independent of peer characteristics, in that even if school choices were related to innate ability, class assignment is not. Yet, as described in section 7, I reject the assumption that random assignment is applied at the system-level, i.e. by *all* schools. However, when carrying out school-level tests, the random assignment hypothesis is accepted for the majority of the institutions; for this reason the analyses are carried out on this subset of schools.

3. Immigrants and the Italian Schooling System

Formal education starts at age 6. Children follow eight years of comprehensive schooling, divided in two cycles: five years of primary education and three of lower secondary education. Excluding grade failures, children remain with the same classmates and often with the same teachers for each entire cycle. In primary school one to three teachers are usually in charge of the class. Lower secondary school ends with a nationally-based examination at age

[2] Only schools with at least 2 classes can be used to estimate model (3). Since ours is a population survey, most institutions have more classes in each grade. From this perspective Invalsi data is better suited than PIRLS (used by Ammermueller and Pischke; 2009), where in the majority of schools only one class is sampled.

14, after which students choose between a variety of upper secondary educational programs, broadly classified into academic, technical and vocational tracks. There are no ability-related admission restrictions. Education is compulsory up to age 16.

The Italian schooling system is mainly public: in primary and lower secondary school, private institutions host only about 7% and 4% of the student body respectively (MIUR, 2011). There is freedom of school choice; children have the right to attend the neighborhood's public school, but they may also apply to a different public or private institution. Admission in public schools is normally conditional on the availability of places, and ability restrictions are uncommon, even in private institutions. In practice, the majority of students attend their neighborhood public school; due to urban segregation, schools located in disadvantaged areas mainly recruit students from the lowest family backgrounds, thereby the ethnic and socio-economic composition varies considerably across schools. Classes are formed by school-boards. The desirability of within-class heterogeneity is often emphasized in public discourses at different levels, and many schools set internal regulations to define heterogeneity with respect to students' characteristics (ability, gender, immigrant status, disability) as the leading criteria for class formation. However, there are no explicit national recommendations in this matter.

Italy has witnessed a sharp rise of the number of immigrants over the last decade. About 2.7% in 2002, at the end of 2010 the share of foreign citizens reached 7.5% of the resident population. 87% of the foreign born live in the North and in the Centre, although the number living in the South is now increasing. The largest foreign communities are those from Romania, Albania and Morocco. If the older immigrant flows were mainly driven by economic reasons, the number of new permits of stay for family reunion has recently exceeded that of work-related permits, while the number of refugees is still very low. Like other Mediterranean countries, Italy tends to attract immigrants with lower qualifications

(EUROSTAT, 2011); however, given the low average educational attainment of Italians, their formal educational level is similar to that of natives (Dustmann *et al*., 2011).

The share of immigrant background children – children with both parents born abroad – has more than tripled in this period: 8.7% in primary school, 8.5% in lower secondary education and 5.3% in upper secondary education in 2010. The lower share in upper secondary school is an indicator of relative disadvantage: drop-out and non-continuation rates among immigrants are much larger than among natives, and a much higher share of children entering upper secondary education opt for academically less demanding vocational schools.

The Italian educational system is inclusive: immigrant students are always placed in regular classes. However, first generation immigrants are frequently held back to the previous grade, and repetitions are much more common that among natives. The country lacks of an institutionalized body of policies aimed at the integration of migrant background children. Interventions – tackling the reduction of achievement gaps between native and immigrant children, language support addressed to first generation immigrants, training for second language teaching, measures promoting parental and community involvement in schools – are fragmented, and often conducted on a voluntary basis by schools and teachers searching for private or government funds. This might be a reason why Italy is one of the OECD countries with largest native-immigrant performance gaps in PISA 2009, in particular for second generation students, even after adjusting for socio-economic background (OECD, 2012).

4. Data

The survey *Indagine sugli Apprendimenti* is a standardized learning assessment conducted by the National Evaluation Institute (INVALSI) on children attending 2nd, 5th (primary school) and 6th grade (lower secondary school). For the first time in 2010 the assessment was administered to the entire populations of children, consisting of approximately 500.000 individuals per grade. Tests cover the domains of Italian (reading

comprehension, knowledge of the language, grammar) and math, and have been designed following the experience of international assessments. Similarly to TIMSS and PISA, INVALSI submits to 5th and 6th grade students a questionnaire recording information on living customs, main activities and time use, attitudes towards school and learning, persons living with the child, home possessions. School administrations provide information on parental background characteristics (immigrant background, working condition, educational level). School teachers are normally in charge of test administration. However, in order to keep cheating behavior under control, a random sample of classes (of about 30,000 students) have taken the tests under the supervision of personnel external to the school. These results represent a benchmark to evaluate and correct potential bias in performance scores. I measure scores by the proportion of correct answers. As measures of social background, I use the number of books and a composite index ESCS (*Economic, Social and Cultural Status*) provided by INVALSI (see section 8). The relevant information is recorded in the student questionnaire, not administered to children attending 2nd grade; for this reason, in this paper I focus on 5th and 6th grade.

5. Immigrant Children in Italian Schools

Immigrant origin students in 5th and 6th grade represent around 9-10% of the total student population at the national level. They are mainly concentrated in the North (13-14%) and in the Centre (11-12%), while in the South and Islands they are still a minority (2-3%).[3] More than half of them are first generation immigrants. Immigrant children are unevenly distributed across schools (Table 1). The distribution reflects the territorial distribution of immigrant background families, housing choices, explicit school preferences on part of the families, but may also involve school board practices.[4]

[3] These numbers are derived from Invalsi data, excluding missing status children (approximately 2% of the population). Very similar figures are reported by the National Statistical Institute.
[4] Luciano *et al.* (2009) report that some institutions set significant barriers to entry to immigrant background students by denying proper information to parents and any form of support to children.

Table 1. School Percentage of Immigrant Background Students, by Macro-area

	5TH GRADE					6TH GRADE				
% immigrants	NW	NE	Centre	South	Islands	NW	NE	Centre	South	Islands
0	10.7	9.2	13.3	37.3	37.3	7.3	4.7	5.1	23.3	27.9
<10	42.7	34.7	44.9	56.1	56.2	38.8	31.8	41.7	70.2	66.5
10-25	40.7	50.5	38.1	6.1	5.7	44.8	53.6	48.5	6.1	5.2
25-40	4.8	5.3	3.2	0.3	0.8	7.5	9.3	4.3	0.4	0.3
>40	1.1	0.3	0.4	0.1	0.1	1.6	0.7	0.4	0.1	0.1
school mean	10.8	11.5	9.4	3.0	3.1	12.3	13.6	11.4	3.5	3.3
s.d. of school	8.7	7.6	7.4	4.8	4.4	9.6	8.4	7.4	4.3	3.9
overall	13.1	13.7	11.1	3.0	3.3	14.4	15.4	12.5	3.2	3.7
n° schools	1697	1136	1400	1774	1535	1416	982	1031	1221	1175

Elaboration of INVALSI data.

Figure 1 shows mean performance scores of native and migrant background students, separately for the children in benchmark samples (for which the test was administered by personnel external to the school) and the not-in-sample. Mean scores of the not-in-sample are consistently higher than those in-sample: if we think of sample statistics as 'true' values, observed differences between sample and not-in-sample reflect cheating – either teachers helping students or students helping each other. Differences are clearly larger in 5th grade than in 6th grade, in the South and Islands than in the North and Centre.[5]

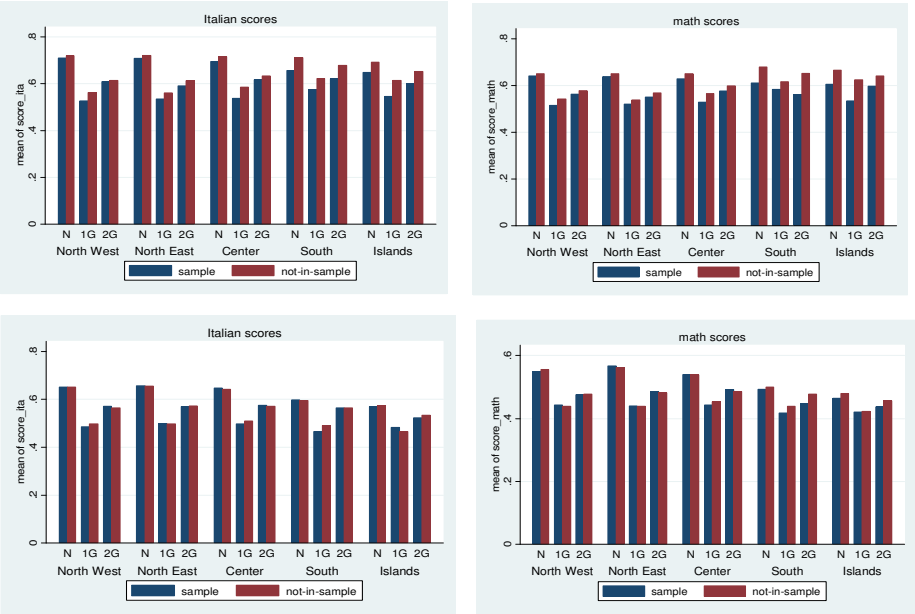
Average sample scores of natives and immigrants differ substantially, in particular for first generation immigrants on language tests, but gaps are also large in math. Second generation immigrants perform better than first generation. Among natives, students of the South and Islands score substantially lower than children of the North and Centre, confirming the severe North-South divide observed in international assessments.

Due to the small number of immigrants living in the South and Islands, I restrict the empirical analyses of the effect of immigrant background class composition to the North and the Centre. This choice is also related to the lower quality of test scores data observed in the south: while cheating is a minor problem in the North (yet some adjustments will still be made in the empirical analyses), it seems to be a critical issue in the South. Note that it is not possible to rely only on the data of the benchmark sample, of better quality, because samples

[5] Evidence of more cheating in the South is reported also in Quintano *et al*. (2009).

do not include more than one class per school, so within-school estimates cannot be obtained.

Figure 1. Mean test scores by immigrant background, sample and macro-area.



NOTE. 5th grade upper panel. 6th grade lower panel. Italian left panel. Math right panel. Blue bar sample. Red bar not-in-sample.

6. Achievement and Immigrant Concentration: *Prima Facie* Evidence

On average, children attending schools with many immigrants perform more poorly. Correlation coefficients between the school percentage of immigrant children and school mean scores of natives, first generation and second generation immigrants, are negative and quite large in size (Table 2).

Table 2. Correlations between Immigrant School Share and Mean School Test Scores

		5TH GRADE		6TH GRADE	
AREA	MEAN SCORES OF	ITALIAN	MATH	ITALIAN	MATH
North-West	N	-0.14	-0.08	-0.32	-0.26
	2G	-0.11	-0.06	-0.20	-0.15
	1G	-0.12	-0.06	-0.21	-0.13
North-East	N	-0.14	-0.08	-0.15	-0.13
	2G	-0.08	-0.05(ns)	-0.20	-0.15
	1G	-0.15	-0.11	-0.20	-0.20
Centre	N	-0.15	-0.16	-0.04(ns)	-0.00(ns)
	2G	-0.09	-0.08	-0.13	-0.05(ns)
	1G	-0.11	-0.07	-0.20	-0.13

NOTE. All correlations but those marked with (ns) are significant at level<0.01.

This preliminary evidence is consistent with the hypothesis that high concentrations of

immigrants are detrimental to the learning of both natives and immigrant children. However, this is not the only possible story. Institutions hosting many immigrant children on average attract lower socio-economic background students, and also socio-economic background affects performance. School-level correlations between the share of immigrants and average background – as measured by the Index of Economic Social and Cultural Status (ESCS, see section 8) – of both native and immigrant students are large and negative (Table 3).[6] These negative associations could be due to the segregation of disadvantaged segments of the society in particular neighborhoods or/and to explicit school choices on part of the families.

Table 3. Correlations between Immigrant School Share and Average School ESCS

	5TH GRADE		6TH GRADE	
Area	*Natives' ESCS*	*Immigrants' ESCS*	*Natives' ESCS*	*Immigrants' ESCS*
North_West	-0.29	-0.16	-0.31	-0.21
North_East	-0.27	-0.19	-0.26	-0.23
Centre	-0.24	-0.20	-0.23	-0.21

NOTES. All correlations are significant at level<0.001.

7. Class Allocation

Although families are sometimes allowed to express preferences for a particular class, leeway for parental choice is limited. In this sense, we should not expect family choices to represent a major issue at this stage. However, despite public discourses often emphasize that within-class heterogeneity should be ensured when classes are formed, there are no explicit rules, therefore some school-boards may allocate children according to different criteria. Random assignment relative to immigrant background was tested both at the school-level and at the system-level. Random allocation implies independence between immigrant status and the class the student is assigned to.[7] At the school-level, the null hypothesis is therefore:

[6] Since correlations are computed separately for native and immigrant students, the figures cannot be merely the result of compositional effects entailed by the lower average socio-economic background of immigrants.

[7] If students are randomly allocated to classes, conditional on the school number of immigrants in the grade N_m and the number of students to be allocated to the class N_c, the number of immigrant students follows a hyper-geometric distribution with mean $\frac{N_m N_c}{N}$, equivalent to the expected value under the assumption of independence.

$$H_0: p_{mig,c|s} = p_{mig|s} \cdot p_{c|s}$$

where $p_{mig,c|s}$ is the joint probability that a randomly chosen child from a given school *s* has a migrant background and is assigned to class *c*, $p_{mig|s}$ is the overall proportion of migrants in the school, and $p_{c|s}$ is the proportion of children in class *c*. Due to the limited number of immigrant children in some schools, to avoid problems related to small expected frequencies instead of the classical Pearson X^2 test I use Fisher's exact test.[8] Considering a prudential significance level of 0.10, the null hypothesis is rejected in 20% of the schools for 5th grade and in 22% of the schools for 6th grade. These institutions do not differ with respect to mean social background, but host on average more immigrants.[9]

The null hypothesis of the system-level test is that random assignment regulates class allocation of immigrant children in *all* schools; due to sampling variability some institutions may exhibit substantial deviations from random allocation. Disregarding the problem of small expected frequencies, the test-statistics is the sum of each school X^2 over all schools; under the null hypothesis it follows approximately a χ^2 distribution with $\sum_s (k_s - 1)$ degrees of freedom, where k_s is the number of classes in school *s*. Random assignment is rejected at significance level 0.001, suggesting that at least some schools actually distribute children to classes according to different criteria.[10]

Identification of peer effects rests on the assumption of random assignment; as in Lugo (2011), I discard non-random allocating institutions and estimate model (3) on the subset of schools passing the test. The crucial hypothesis underlying this strategy is that the class formation *process* – given class actual composition – does not affect performance. For instance, the allocation criterion should not depend on the prediction of how peer effects

[8] *p*-values of Fisher's exact test are computed by summing the probabilities under the null hypothesis of all contingency tables having a smaller or equal probability of the observed table.
[9] The average percentage of immigrants in 5th grade is 16.1% in non-random allocating schools and 12.1% in the random-allocating ones; 16.7% vs 13.7% in 6th grade.
[10] The value of the test-statistic is 28.072 and the corresponding chi-square has 19.783 degrees of freedom.

would operate given the specific group of school children.[11] More specifically, if peer effects are invariant across individuals and schools (i.e. γ^* is a fixed parameter, which, incidentally, is an implicit assumption of the model), model estimation on a subset of schools chosen according to factors that do not affect performance produces consistent estimates.

Let us go back to single-school tests. A significance level of 0.10 means that we have a 10% probability to reject the null hypothesis when it is true, but the probability of accepting the null hypothesis under near alternatives could be large. In other words, the consequence of adopting commonly used low thresholds is to keep in schools that are not really adopting a random allocation criterion, but deviate mildly from it. As a robustness check I run regressions on the set of schools passing the test at different significance levels, up to 0.50, but substantive results do not change much and no clear pattern is appreciable.

Besides immigrant status – the focus of this paper – we may also consider allocation along the socio-economic background dimension. Random allocation implies that at the school level expected average socio-economic background is the same in all classes. Approximately 30% of the schools do not pass the ANOVA F-test with respect to the ESCS index at the significance level 0.10.[12] In this light, I also restrict the analyses to the subset of schools passing both the immigrant status and the ESCS random allocation tests.[13]

What if non-random allocating schools were not completely eliminated? In principle, neglecting the departure from random assignment could affect peer estimates in any direction: (a) there would be *no bias* if despite the sorting, teachers were randomly assigned to classes; (b) we would *overestimate* peer effects if higher quality teachers were allocated to "better" classes (as we would ascribe the effect of better teachers to peers); (c) we would

[11] The assumption would not hold in the following situation. There are two groups of immigrant children: the "good" and the "bad". If a school is attended mainly by the "good", children are allocated randomly to classes, if they are attended mainly by the "bad", sorting is non-random. If "good" immigrant children do not influence peer performance while the "bad" ones do, discarding non-random allocating schools would lead to the underestimation of (average) peer effects.

[12] As ESCS is approximately normally distributed, it is better suited for ANOVA test than the number of books.

[13] Nearly 60% of the schools pass both random allocation tests at the significance level 0.10.

underestimate peer effects if higher quality teachers were allocated to the "worse" classes.

Little is known about the way students and teachers are actually allocated to classes. Despite the lack of empirical studies, case (c) can be considered highly unlikely in Italy. The rationale for non-random sorting and higher quality teachers allocated to the "worse" classes could be to apply ability streaming (which could drive uneven immigrant status and socio-economic background distributions), and assign better resources to those more in need; however, streaming is not a popular pedagogical practice in the Italian compulsory school system. On the other hand: i) some not-explicit sorting by ability may occur; ii) the more informed parents of advantaged backgrounds could manage to place their children with better teachers; iii) better teachers often prefer better students. In this light, if some residual non-randomness was left, I expect it to lead to the overestimation of peer effects.

8. Peer Effects Estimation

8.1 Dependent Variables

As dependent variables I use the proportion of correct answers of Italian language and math tests.[14] Mean scores lay in the range 0.54-0.70 and standard deviations between 0.15 and 0.18, depending on the test and the grade. Mean scores are somewhat higher for Italian tests and in 5th grade, while math test scores display a slightly larger variability.

8.2 Explanatory Variables

Individual and peer variables included in the regressions are summarized in Table 4. Following the literature, I consider gender, socio-economic background and immigrant origin as individual determinants of school performance. Gender is included in order to account for the well established international evidence reporting significant differentials between girls and boys, more favorable for boys in mathematics and more favorable for girls in reading comprehension. I use two measures of social background. The first, the number of books at

[14] INVALSI also supplies performance scores computed with Rasch analysis (correlation with raw scores 0.99). Moreover, for 5th grade it releases scores adjusted for cheating (Quintano *et al*, 2009). I use raw scores because their significance is clearer and the analyses with cheating-adjusted scores yield to odd results of peer effects.

home, captures cultural capital, and is regarded in the literature to be the best single predictor of student performance (Hanushek and Woessmann, 2011). The second is a composite index of Economic, Social and Cultural Status (ESCS) computed following the lines of PISA by INVALSI, based on parental education, parental occupation and a number of home possessions as indirect indicators of family wealth. I differentiate between first generation immigrants (children born abroad from two foreign-born parents) and second generation immigrants (children born in Italy from two foreign-born parents); as we have seen in Figure 1 and in line with the international literature, their average scores are substantially different.

I add a variable indicating children repeating a grade (identified as those who are older than the regular age), as these children are usually particularly low performing. This variable is defined only for natives; immigrant children are not included because many of them are older than their classmates – first generation migrants are often held back in earlier grades (Gavosto, 2010) and the share of immigrant background students failing to pass to the school-year is larger than for natives – and since the focus of the empirical analysis is to estimate the effect of immigrant concentration, their inclusion would capture part of the effect of interest.

To control for cheating, I include a binary variable for children in the benchmark sample, who took the tests under the supervision of personnel external to the school. I also include interactions with first and second generation immigrant status, to account for the evidence that immigrant children could be given more (or less) help than natives.

As regards peer effects, I consider variables accounting for gender, social background, repeating grade and immigrant background class composition. Peer gender effects have been addressed by Lavy and Schlosser (2007), who find that an increase in the proportion of girls leads to a significant improvement in students' cognitive outcomes. Similar results are reported by Hoxby (2000). The importance of peer effects related to the socio-economic background has been documented by many studies in the peer effects literature.

Table 4. Dependent and Explanatory Variables at the Individual and Class Levels.

DEPENDENT VARIABLES					
VARIABLE	DESCRIPTION	MEAN 5TH	S.D. 5TH	MEAN 6TH	S.D. 6TH
Score Italian	Percentage correct answers Italian test	0.70	0.17	0.63	0.15
Score math	Percentage correct answers math test	0.64	0.18	0.54	0.18
EXPLANATORY VARIABLES					
Individual characteristics					
VARIABLE	DESCRIPTION	MEAN 5TH	S.D. 5TH	MEAN 6TH	S.D. 6TH
Female	Gender	0.49		0.48	
Books	N° of books at home [1]	2.06	1.18	2.10	1.20
ESCS	Economic Social and Cultural Status Index	0.11	0.96	0.14	0.97
Repeat	Native repeating grade	0.006		0.032	
1G	First generation migrant	0.073		0.093	
2G	Second generation migrant	0.056		0.049	
Sample	Child in sampled class	0.075		0.080	
1G*sample	First gen. migrant child in sampled class	0.005		0.007	
2G*sample	Second gen. migrant child in sampled class	0.004		0.004	
Class peer characteristics					
VARIABLE	DESCRIPTION	MEAN 5TH	S.D. 5TH	MEAN 6TH	S.D. 6TH
p. Female	Proportion of females	0.49	0.11	0.48	0.11
mean Books	Mean n° of books at home[1]	2.06	0.45	2.10	0.43
mean ESCS	Mean ESCS	0.11	0.46	0.14	0.47
p. Repeat	Proportion of natives-repeating grade	0.006	0.020	0.032	0.045
p. 1G	Proportion of first gen. migrants	0.073	0.081	0.093	0.092
p. 2G	Proportion of first gen. migrants	0.056	0.070	0.049	0.062
p. 1G*nat	Native child * prop. first generation migrants	0.059	0.075	0.074	0.085
p. 2G*nat	Native child * prop. second gen. migrants	0.045	0.064	0.039	0.055
p. 1G*nat*book	Native child * prop. first gen. mig.*books	0.123	0.190	0.159	0.224
p. 2G*nat*book	Native child * prop. second gen. mig.*books	0.097	0.162	0.086	0.144
p. 1G*nat*ESCS	Native child * prop. first gen. mig.*ESCS	0.006	0.089	0.011	0.106
p. 2G*nat*ESCS	Native child * prop. second gen. mig.*ESCS	0.006	0.076	0.008	0.065

NOTES. Standard deviation not reported for binary variables
[1] 0=0-10 books; 1=11-25 books; 2=26-100 books; 3=101-200 books;4=>200 books

To account for immigrant composition peer effects I consider the proportion of first and second generation immigrants. Since the former may have language problems and get consistently lower scores than the latter, I allow these two groups to have different effects. I also allow for heterogeneous effects of immigrant concentration on children of different backgrounds, by including variables interacting each of the immigrant background peer variables with native status (to distinguish between the effect of immigrant concentration on immigrants and natives), and with both native status and individual socio-economic background (to allow for different effects on natives, according to their resources).

8.3 Results

Model (3) is estimated with maximum likelihood, where the class-specific and individual error terms are assumed to be independent and to follow a normal distribution. Results relative to schools passing random class allocation tests with respect to immigrant origin and ESCS at the level 0.10 are reported in Table 5. Individual characteristics strongly affect achievement. In line with international results, females perform significantly better in Italian and worse in math. Children of the highest social strata obtain much better scores than those belonging to the lowest ones, and the coefficients of both indicators, the number of books and ESCS, are large and highly significant.

Table 5. Results for Test Scores on Individual and Peer Variables.

	5th Italian	*5th Math*	*6th Italian*	*6th Math*
Individual variables				
Female	0.012***	-0.039***	0.012***	-0.026***
Books	0.021***	0.020***	0.019***	0.020***
ESCS	0.031***	0.030***	0.028***	0.030***
1gen mig (ref native)	-0.120***	-0.074***	-0.103***	-0.070***
2gen mig (ref native)	-0.067***	-0.044***	-0.056***	-0.057***
Repeat grade *native	-0.134***	-0.141***	-0.091***	-0.120***
Sampled class	-0.005	-0.004	0.002	0.002
Sampled class*1gen mig	-0.020**	-0.009	-0.005	-0.001
Sampled class*2gen mig	-0.005	-0.002	-0.005	-0.008
Peer variables at class level				
% Females	-0.002	0.004	-0.001	0.005
Mean ESCS	0.006	0.005	0.001	0.005
% native repeating grade	0.025	-0.003	-0.016	-0.022
% 1gen mig	-0.087***	-0.054**	-0.034**	-0.003
%1gen mig*native	0.054**	-0.003	0.025	-0.015
% 1gen mig*native*books	-0.003	0.006	0.005	0.006
% 2gen mig	-0.097***	-0.009	-0.059***	-0.022
% 2gen mig*native	0.032	-0.060**	0.027	-0.047
% 2gen mig*native*books	0.018**	0.030***	0.015**	0.033***
VAR(BETW CLASSES)/VAR(TOT)	0.051***	0.087***	0.010***	0.021***
N° CHILDREN	122244	126187	141390	141487
N° CLASSES	7232	7305	7428	7425
N° SCHOOLS	1756	1756	1780	1780

NOTES. Estimates are based on the subset of schools passing the immigrant and ESCS allocation tests at the level α=0.10. Classes with at least 10 children without missing values on all explanatory variables, schools with at least 20 children and 2 classes, and less than 20% of children with unknown native/immigrant origin.

* p-value<0.05, **p-value<0.01, ***p-value<0.001

The achievement of native students repeating the grade is much lower than that of regular students. Immigrant children perform more poorly that natives; first generation immigrants are particularly disadvantaged, as the percentage of questions answered correctly is 7-12 points below that of natives. Not surprisingly, gaps are larger for Italian tests.

Moving to peer variables, the share of females is never statistically significant. Class average socio-economic background is also not significant: however, this result is not robust to specification changes and to the set of schools excluded from the analysis (see section 8.4). Similar findings hold for the share of native children repeating the grade.[15]

The effects of immigrant concentration – linear combinations of the coefficients of main effects and interaction effects – are shown in Table 6. The share of immigrant origin children does affects achievement. Yet, effects are heterogeneous and generally small. Immigrant children's achievement is negatively affected in Italian, while it is not for math (with the exception of first generation immigrants in 5th grade). Low socio-economic background native children's scores are negatively affected in particular by the share of second generation students. On the other hand, more advantaged native children seem to even benefit from the presence of second generation immigrant peers.

What about the magnitude of these effects? The largest figure in Table 6 is -0.085. Since the share varies in principle between 0 (no migrants) and 1 (all migrants), this means that a 10 percentage point increase in the proportion of first generation immigrants lowers the percentage of correct answers by less than 1 point, approximately 1/20th of the population standard deviation. Although not negligible, this is indeed a *weak* effect.

[15] Both socio-economic background measures are highly significant at the individual level. However, at the peer effects level they behave somewhat differently. Neither class composition in terms of ESCS nor of the number of books is significant when I restrict the analysis to the schools passing both random allocation tests (see also section 8.4 on robustness checks). But the number of books is more relevant than ESCS in highlighting heterogeneous effects of immigrant concentration. To keep the presentation simple, I adopt a pragmatic approach. I report peer effect results with respect to the more significant specification: as regards social background, I use ESCS (which turns out to be significant for other subsets of schools); as regards the interaction with immigrant origin I use the number of books.

Table 6. Effects of Immigrant Background Class Composition

	5TH GRADE ITALIAN	5TH GRADE MATH	6TH GRADE ITALIAN	6TH GRADE MATH
Effect of 1G on:				
Immigrants	-0.085***	-0.045***	-0.035**	-0.005
natives Books=0	-0.037**	-0.045***	+0.002	-0.005
natives Books =2	-0.037**	-0.045***	+0.002	-0.005
natives Books =4	-0.037**	-0.045***	+0.002	-0.005
Effect of 2G on:				
Immigrants	-0.075***	-0.009	-0.046***	-0.021
natives Books =0	-0.075***	-0.071***	-0.046***	-0.072***
natives Books =2	-0.029*	-0.009	-0.005	-0.002
natives Books =4	+0.017	+0.053**	+0.036**	+0.067***

NOTES. According to point estimates of the models with only significant immigrant background peer effects. 0=0-10 books; 1=11-25 books; 2=26-100 books; 3=101-200 books;4=>200 books

* p-value<0.05, **p-value<0.01, ***p-value<0.001

8.4 Robustness Checks

The results summarized in the previous section refer to the subset of schools passing both random allocation tests – with respect to immigrant status and ESCS, at the significance level 0.10. In order to evaluate the extent to which results are dependent on the subset of schools employed for the analyses, I make a number of the robustness checks.[16] First, focusing on the immigrant random allocation test only, I analyze various sets of schools passing the test at different significance levels (up to 0.50). Second, I raise the threshold for both immigrant status and ESCS test. Although I find some changes regarding immigrant background peer effects, the focus of this paper, no clear pattern is appreciable and the substantive conclusions remain the same.

Yet, average class ESCS coefficients are subject to substantive changes: they are positive and significant if we choose the schools to analyze on the basis of the immigrant background random allocation test, but lose significance (as shown in Table 5) when we restrict to schools passing the ESCS random allocation test as well. Consider however that socio-economic background measures are likely to be affected by measurement error, and in this case corresponding peer effects are underestimated (Ammermueller and Pischke, 2009).

[16] For space reasons the results discussed in this section are not shown here but are available upon request.

9. Conclusions and Discussion

The considerable growth of the share of immigrant students which has occurred over the last decade has contributed to raise the concern within large sectors of the public opinion that immigrant children would have a negative influence on the school performance of natives. However, this concern does not seem to be empirically well-founded. The analyses carried out in this paper point to the existence of *negative* effects of the concentration of immigrant students on peer performance; yet, these effects are *small* and *heterogeneous*. As regards Italian language tests, the concentration of first generation immigrant students appears to influence immigrants more than natives. Among natives, while low socio-economic background children may somewhat suffer from a large share of immigrant background classmates, children of higher background do not; on the contrary, in some cases they even seem to benefit from the presence of immigrants.

The identification strategy adopted in this paper rests on the assumption of random class assignment: model estimation is undertaken on the subset of schools passing the randomness test. Consequences of possible residual non-randomness are discussed in section 7 and point to the overestimation of family background peer effects. I can think of two additional potential sources of bias: omitted variables and measurement error. Regarding the first, Hanushek *et al.* (2003) demonstrate that peer effects are overestimated when historical family and school inputs are neglected. As for the second, Ammermueller and Pischke (2009) show that measurement error in the family background variables leads to the underestimation of the corresponding peer effects; yet, they focus on the number of books at home, which have a large likelihood of incorrect reporting. Although the complexity of the model does not allow to make precise predictions, if the immigrant origin is not subject to measurement error, the underestimation of peer effects related to the number of books should yield to the overestimation of peer effects related to immigrant background. In this light, the estimates

obtained in this paper are likely to represent upper bounds of immigrant origin peer effects.

Two major conclusions can be drawn: (i) the concentration of immigrant children in schools should not be an issue of major concern as there is little evidence of substantial detrimental effects on students' learning; (ii) still, since disadvantaged children (immigrants or low social background) are somewhat affected, children should be allocated into schools and classes according to the principle of maximum family background heterogeneity.

Yet, the relative disadvantage of immigrant children at the individual level is large and needs to be urgently addressed with adequate integration policies – severely lacking in Italy – aimed at ensuring equality of opportunity to all children and at fostering social cohesion.

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