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Trade-Off between Effectiveness and Equity? An Analysis of Social Sorting between Classrooms and between Schools

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This article analyzes whether school social segregation, derived from policies and practices of both between-school student allocation and within-school streaming, is related to the effectiveness of the Italian education system. Hierarchical regression models are used to set out territorially aggregated factors of social sorting influencing learning opportunities beyond the traditional north-south economic divide. The findings show that practices that foster or consent to uneven distribution of students between classrooms are likely to adversely affect the overall level of educational effectiveness, especially in those areas with the lowest levels of socioeconomic development. As regards the uneven between-school allocation, the findings show that what matters when it comes to assessing the negative effect of between-school segregation on educational outcomes is not the region of residence but whether pupils live in a metropolitan area. The results are discussed in light of the students' heterogeneity management models found in the international arena.

Social Inequalities in Italy's Secondary Education

Since its creation in 1962, the Italian lower secondary education level has had to deal with two major challenges: raising school attendance during the period of compulsory schooling and ensuring an appropriate level of proficiency for all children, regardless of socioeconomic background. Both goals are of great relevance because lower secondary education represents a key academic stage that prepares students for one of four tracks in upper secondary education: general upper secondary, technical, vocational, or vocational education and training. The first goal of universal access at the lower secondary school level has been achieved, but much remains to be done in terms of expanding equal opportunities for academic success and quality of human capital.

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A typical approach for assessing educational equity has been to examine the extent to which the social background of students is associated with educational opportunities. Special attention has been paid to background factors that may have an important role in the decisions made in the last year of lower secondary education, before students transition to one of the four upper secondary education tracks. In Italy, research findings have generally identified a strong relationship between the choice of academic track and a student's family background, specifically the parents' education (Contini et al. 2008; Checchi 2010; Fondazione Giovanni Agnelli 2010).

Recent research has shown that equity is largely upheld at the primary level but that a learning divide due to family background opens up at the lower secondary school level (De Simone 2013). Social inequalities that are mainly created in lower secondary education are likely to be reproduced and widened at the upper secondary level. Although students cannot be formally tracked into different streams in lower secondary education, they may already be orientated to one of the upper secondary tracks, whether by informal practice of within-school placement or by school choice.

Inequalities in schooling in Italy are strongly intertwined with the existing territorial divide that reflects deep socioeconomic differences between macroareas, regions, and provinces, following a north-south gradient.[1] Past studies have confirmed that historical inequalities in the levels of economic growth and development across regions have led to disparities in the effectiveness-efficiency dimension of the education system. Research on territorial disparities has identified several factors that explain this inequality in educational opportunities in Italy. Studies have generally shown that the territorial dimension interacts in different ways with individual, school, and institutional factors (Fondazione Giovanni Agnelli 2010). For instance, Montanaro (2008), who analyzed results from the main international surveys—such as the Programme for International Student Assessment (PISA), Trends in International Mathematics and Science Study, and Progress in International Reading Literacy Study—pointed out that the performance gap between north and south is mostly attributable to differences in the performance of students from disadvantaged families. Checchi (2004) found that the territorial differences in the distribution of students in upper secondary education tracks persist even after controlling for student background at both the individual and school levels. Finally, on the basis of comparative analyses between macroareas and regions, another study has also concluded that the distribution of students by academic track within compulsory edu-

[1] Italy has 20 regions, which are administrative units grouped in five geographical macroareas (North-West, North-East, Centre, South, and South and Islands). The macroareas do not correspond to administrative units but are higher territorial units for statistical purposes. Administrative regions comprise provinces, which are intermediate administrative divisions between municipalities and regions.

cation is a source of inequality and polarization in certain regions (Fondazione Giovanni Agnelli 2010).

However, there has been little research on territorial disparities beyond the north-south divide. One study (Bratti et al. 2007) used data from PISA 2003 and from Italian public administration sources to analyze geographical differences at the province level. The authors estimated associations between province variables and student performance and found that the state of the school infrastructure, the local labor market (e.g., employment rate and informal economy), and financial resources for school facilities (equipment and buildings) are local factors associated with student performance.

Overall, this article investigates the social determinants of education inequalities and the territorial disparities beyond the north-south divide, two aspects that are closely linked in Italy, to understand further the unequal allocation of students from different socioeconomic backgrounds among schools and classrooms and how this allocation itself is associated with student performance.

The Equity Concern: Allocation Policies, School Practices, and Social Segregation in Schools

Educational systems adopt various policies and practices to cope with the heterogeneity of students in secondary education. These include early tracking of students (institutional differentiation; Dupriez et al. 2008), intraclassroom ability grouping and between-classroom streaming (ability tracking; Shavit and Müller 1998; LeTendre et al. 2003; Hindriks et al. 2010), grade retention, and individualized support. On the basis of these policies and practices, Mons (2004, 2007) has proposed a functional classification of heterogeneity management models within which countries are grouped: the separation model, à la carte integration model, the uniform integration model, and the individualized integration model. While the first model corresponds to countries with early selection into vocational and academic paths (Germany, Austria, Hungary), the other models are seen in countries that have a comprehensive structure and use different approaches to cope with mixed-ability students.

In this section, the heterogeneity management models help us understand the mechanisms behind social segregation in both schools and classrooms since forms of differentiation of students might be associated with socially homogenous school environments and differential school processes. We substantiate how school segregation signals inequity in access to educational opportunities, as it is associated with differences in educational provision, teacher expectations, school climate, and peers. Finally, we explore the main research findings on the relationship between nonrandom sorting of students, social segregation in schools, and educational outcomes.

Between-School Allocation-Related Factors

The pattern of nonrandom allocation of students across schools may be considered a form of curricular differentiation (LeTendre et al. 2003). Here we should distinguish between differentiation by school type that corresponds to the separation model and differentiation due to access regulation schemes. As regards the first differentiation mechanism, also called institutional differentiation, research has already shown that allocation to different school types accounts for the bulk of segregation even in contexts where children are evenly distributed among the curricular tracks in a school (Jenkins et al. 2008). Selection into schools generates higher levels of social segregation basically by concentrating low-ability students in certain types of school or in academic tracks of less educational value.[2]

Between-school social segregation is also fostered by policy or practices that affect school access. For example, school location is linked to the residential segregation of students (Rivkin 1994; Taylor and Gorard 2001; Rivkin and Welch 2006). Other factors are related to schemes of school choice and access in market-oriented nonregulated systems. Higher levels of social segregation or heterogeneity between schools (and therefore within-school social homogeneity) may be generated, for instance, through "cream-skimming" practices that may result from greater school autonomy, the presence of private schools in compulsory education, and open school choice.[3]

In Italy, both school choice and residential segregation, mainly observed in large urban areas, appear to predict school segregation by socioeconomic status. Although lower secondary education does not have formal curricular tracks, school choice might be influenced by preferences regarding the upper secondary education track. That is, informed families may choose lower secondary schools according to their academic standards or social reputation and which school is more likely to guarantee access to the desired upper secondary track. Since access to information is itself dependent on families' social backgrounds, allowing school choice can lead to school social segregation.

Italian schools are also likely socially dissimilar because of their different admission criteria that interact with both the school location and parental choice of school. Access to lower secondary schools is regulated by school boards (Consigli di istituto) that have the autonomy to define priority criteria for admission; these criteria are published online and applied in the case of oversubscription. While respecting school autonomy, education authorities nevertheless specify that admission criteria should meet "reasonableness" principles. Generally, these priority admission criteria include a student's

[2] Ammermüller 2005; Schütz et al. 2005; Hanushek and Wößmann 2006; Hindriks et al. 2010.

[3] Willms and Echols 1992; Waslander and Thrupp 1995; West et al. 2006; Allen 2007; Dronkers and Robert 2008; Alegre and Ferrer 2010.

disability status, proximity to the school, and completion of primary education in a school belonging to the same "comprehensive institute,"[4] as well as the presence of siblings in the same school and proximity of parents' workplace to the school. Authorities also recommend avoiding any form of admissions test.[5]

Between-Classroom Placement-Related Factors

According to Mons (2004, 2007), in the à la carte integration model (found in countries such as the United Kingdom, the United States, and Canada), streaming is a form of curriculum differentiation in terms of the number and difficulty of courses and is decided on the basis of student abilities and interests. Italy would seem to follow a uniform integration model that is characterized by a common core curriculum up to entrance into upper secondary school and by specific measures to deal with student heterogeneity.

Countries with the uniform integration model may eventually use some form of ability grouping or streaming, in addition to grade retention, in order to reduce educational differences among students within the same learning setting. In the placement of students, teachers and administrators may consider several student characteristics, such as ability, behavior, and attitude toward the school. Moreover, families, as stakeholders, may put pressure on the school about the placement of their children. For example, some families may prefer not to have (and try to avoid having) their children in the same classroom as those students who may be an obstacle to the academic progress.

In Italy, since the law requires that students be exposed to the same curriculum and the same quality and quantity of instruction, the uneven allocation of students between classrooms by their social background is likely due to school practices such as informal streaming according to different curricular objectives (Duru-Bellat and Mingat 1997; Dupriez et al. 2008). Although school actors seem to agree that classroom composition should be diverse or heterogeneous, teachers, school administrators, and other stakeholders have expressed concern about the nonrandom placement of students within schools.

If true, deliberate placement of students applies at the entrance to lower secondary education, when the classes are set up according to local school board criteria. Usually, lower secondary schools collect information on students at the end of the final academic year of primary education. The infor-

[4] See Article 19 of Law 111 (July 15, 2011), from Decree Law 98/11 setting urgent measures for financial stabilization, according to which all lower secondary schools are being progressively integrated with the adjacent primary schools into comprehensive schools (Istituti Comprensivi). Such schools arose as a way to rationalize expenditure on school organization and were justified as a way to guarantee the transition of students across grades, providing an integrated "vertical" curriculum and allowing better coordination among teachers.

[5] Circolare n.28, Prot.206, Iscrizioni alle scuole dell'infanzia e alle scuole di ogni ordine e grado per l'anno scolastico 2014/2015 [Preschool and school subscriptions for all grades for the academic year 2014/2015] (Rome, 10-01/2014).

mation provided may include not only the academic records of students but also their behavior and attitude. At this point, teachers and school administrators may place students in somewhat homogeneous classrooms according to didactic-based decisions (i.e., to form ability-based, homogeneous learning settings); however, pressure from more informed parents may also influence the placement.

Social Sorting across and within Schools: Uneven Allocation and Effectiveness

Since the publication of the Coleman Report (Coleman et al. 1966), numerous studies on classroom and school composition have observed that student performance declines when schools group together students with low socioeconomic status (Willms 1986; Caldas and Bankston 1997; Alegre and Ferrer 2010) and nonnative backgrounds (Dronkers and Levels 2007; Hanushek et al. 2009). Composition effects are closely related to peer effects (Thrupp et al. 2002; Hindriks et al. 2010) that are "based on the notion that class learning is a collective activity, where students, teachers and curriculum interact and students resource one another" (Resh and Dar 2012, 931). Moreover, composition effects interact closely with institutional effects that pertain to instruction, school organization, and management (Thrupp 1999; Opdenakker and Van Damme 2001).

Several studies have shown the relevance of interactions between classroom composition and institutional factors (Baker et al. 2002; Opdenakker et al. 2002; Dumay and Dupriez 2007). Other studies have emphasized how school and classroom composition (in socioeconomic, ability, or ethnic terms) may widen or narrow the development of certain pedagogic and organizational processes (Thrupp 1999), exposing students to differential educational stimuli. For instance, the effective use of homework may vary depending on the proportion of children struggling with basic literacy, with no support at home; likewise, schools with a homogeneous low-socioeconomic-status composition might have more difficulty in planning and financing extracurricular activities and engaging parents (Lupton 2005).

In homogeneous learning settings, school and classroom conditions may differ and affect learning. These conditions include the nature of instruction (Gamoran et al. 1995; Harris 2010); the quantity, quality, and pace of instruction (Pallas et al. 1994); the design of student assessment (Gamoran and Mare 1989); teachers' learning objectives, which may be focused on discipline rather than on content (Lockwood 1996); and the expectations, behaviors, and engagement of teachers, school administrators, parents, and students themselves (Hattie 2002). In an in-depth study of teaching and learning in streamed classrooms, Oakes (1985) found that low-socioeconomic-status settings are not environments conducive to learning.

Research on student sorting and educational outcomes has mainly focused on ability grouping and streaming practices and the effects for stu-

dents placed within low- and high-ability settings. Earlier studies indicated that ability grouping increases inequality without fostering efficiency (Hoffer 1992) or that it increases efficiency only slightly (Argys et al. 1996). Others have suggested that inequality is increased to the extent that grouping high-ability students together leads to moderate positive effects, while concentrating low-ability students in a classroom has a strong or moderate negative impact.[6] Nevertheless, recent research has cautioned that studies have often failed to account correctly for the endogeneity of school location (Betts 2010). In contrast to earlier studies, the research has found little or no differential effect on achievement (Betts and Shkolnik 2000a; Figlio and Page 2002), concluding that streaming could even benefit low-ability students when accounting for the possibility that tracking programs affect school choice.

Research Objectives: Exploring the "Social Sorting Effect"

Empirical research has found negative effects for placing students in a low-ability stream that may be greater than the positive effects for placing them in a high-ability learning environment, an asymmetry that could result in a negative net "average" effect on achievement (Agasisti and Falzetti 2013). This study assesses the average impact on academic performance, not of streaming students according their ability but of sorting students by their socioeconomic background, both within and between schools. With respect to the allocation of students to schools, we test whether a socially unequal allocation of students among schools, measured at the province level, explains territorial differences in educational outcomes. Insofar as the higher rates of school segregation are more likely to be found in provinces with a metropolitan area, we tested whether the urban context mediates the effect of school segregation on test outcomes.

We also explore the extent to which educational effectiveness is related to the nonrandom placement of students in classrooms. Social sorting in schools creates more socially homogeneous learning environments that may make them either more or less effective. Through cross-province analyses that allow us to go beyond the traditional north-south economic divide, we explore the extent to which the social dissimilarity between classrooms is associated with educational effectiveness. Since Italy has traditionally shown a significant territorial divide, we also test whether the relationship between equity in student placement and effectiveness depends on the geographical location along the north-south axis and the level of socioeconomic development in the area.

[6] Hoffer 1992; Argys et al. 1996; Opdenakker et al. 2002; De Fraine et al. 2003.

Data and Method

The INVALSI Student Performance Data Set

Since 2007, the Italian National Institute for Evaluation of the Education System (Istituto Nazionale per la Valutazione del Sistema Educativo di Istruzione e di Formazione; INVALSI) has carried out a survey on student performance in grades 2, 5, and 6 every academic year. In the Italian education system, these grades correspond, respectively, to the second and fifth grade of primary education and the first year of lower secondary education. While school participation in the survey was voluntary in the 2008–9 academic year, participation was obligatory for all schools in 2009–10. Approximately 9,600 schools and 1,715,000 students were involved in the 2009–10 survey. In this study, the models have been estimated for 475,743 first-year students of lower secondary education (usually 11 years old) from 5,790 middle schools spread over 103 provinces.

Identification Approach

Analyzing the effects of a nonrandom distribution of students between schools or between classrooms is faced with identification problems. When exploring the association between the placement of students and their levels of performance, concerns arise about the endogeneity of decisions for allocating students in certain schools or in certain classrooms (Betts and Shkolnik 2000b; Rees et al. 2000; Betts 2010). In the case of within-school social segregation, endogeneity is a problem to the extent that low-ability students, who are likely to be less affluent students also, are grouped into more homogeneous classrooms according to their initial ability. Students could also be selected according to unobservable variables, such as behavior and motivation, which in turn are likely to be correlated with initial achievement. In the case of between-school social segregation, concern about how to address endogeneity statistically arises when high-ability students choose or are selected by better or socially advantaged schools as a way to maintain their academic standing.

There are different approaches to addressing endogeneity and omitted-variable bias. Some studies have exploited across- and within-school variation, comparing ungrouped students with students homogeneously grouped within, or tracked between, schools.[7] Some have considered the decision of schools to group students as exogenous with respect to student achievement, while other researchers have adopted strategies to control for the endogeneity of whether schools stream students and the setting into which students are placed (Betts 2010). For instance, Betts and Shkolnik (2000a) compared the grouped with ungrouped students, controlling for class ability level in nongrouping

[7] Gamoran 1992; Hoffer 1992; Argys et al. 1996; Betts and Shkolnik 2000a; Figlio and Page 2002.

schools. This strategy allowed them to observe differences when the ability estimated by teachers was similar (when unobserved motivation and ability was likely to be constant). Studies such as that of Argys et al. (1996) corrected for selectivity bias to control for unobserved student or school characteristics affecting both achievement and track placement. Finally, other studies adopted instrumental variables approaches using a grade's sorting index as an instrument for the sorting index of another grade in the same school (Collins and Gan 2013) or the between-classroom sorting index in the same school in the previous year (Agasisti and Falzetti 2013).

Although analyzing streaming on a school-by-school basis would be the best way to estimate the causal effects of the nonrandom placement of students, critical requirements for such an analysis are absent from the data. Working at the school level requires longitudinal data on students to control for unobserved confounding variables, as well as data on the academic background of students and peers, teacher quality, and school resources in order to address the problem of omitted-variable bias. Two of the most important variables to account for are the quality of teachers and school resources, as they are likely to be unequally distributed across schools and classrooms.

In our case, longitudinal data to link schools over time and key information at the school and classroom levels are not publicly available in the data set with student test scores provided by INVALSI. As a result, we use province-level measures of social sorting instead of school-level measures. This strategy avoids the difficult questions related to who attends socially advantaged schools or who is grouped within schools (Betts 2010), thus attenuating concerns about endogeneity of school choice or teacher decisions on grouping students.

Much research uses geographically aggregated information to attenuate problems of endogeneity of student allocation. Such studies typically compare countries or regions with education systems that assign students into different types of schools (i.e., public or private) or curricula (i.e., vocational vs. academic paths). Some of these studies use time difference-in-differences approaches to estimate the effects of tracking on effectiveness or equity (Meghir and Palme 2005); others use difference-in-differences approaches between grades and between countries with and without student tracking (Hanushek and Wößmann 2006); and still others use cross-sectional data to analyze between- and within-country differences (Schütz et al. 2005; Bauer and Riphahn 2006; Wößmann 2007).

Despite the use of these estimation approaches, concerns about endogeneity at the territorial level and about omitted-variable bias remain. First, endogeneity may be a problem to the extent that families are free to decide which province to live in or that potentially endogenous policy decisions could be made at the province level to regulate school enrolment or how

students are allocated within schools. However, bias due to student mobility may be considered almost nonexistent, since mobility is a rare phenomenon before lower secondary education. Moreover, we can exclude provincial administrative bodies having a role in the distribution of students across schools or within schools since they do not have competence in terms of enrolment policies or composition of classrooms. Second, the risk of omitted-variable bias may confound the real effects of sorting. As explained in detail in the next section, this is dealt with by introducing key controls for demographics, local culture, territorial development, school resources, and school quality at the province level as covariates in the equations.

Specification of the Education Function

The education function estimated here uses province-level data to analyze the extent to which social sorting is related to student achievement, specifically, whether the prevalence and intensity of sorting practices at the contextual level are associated with educational effectiveness. This level of analysis allows us to explore the territorial divide in Italy beyond the traditional north-south divide. The aim is to explore factors that might be associated with educational effectiveness but that are not necessarily related to economic differences between the north and south regions.

We analyze student performance using multilevel or hierarchical regression models (Raudenbush and Bryk 2002). In these models, students are nested within larger level 2 units (schools), which in turn are nested within larger level 3 units (provinces). The student level is maintained when estimating the effects, as it is directly related to learning environment and processes (Wößmann 2003). The education function allows us to observe the impact of aggregated territorial factors on individual student performance, accounting for individual background, school-level characteristics, and territorial factors.

The unconditional model partitions total variation in outcomes into three variance components (within schools, between schools, and between provinces) and allows us to examine the variation in outcomes at all three levels. It is expressed as follows:

$$\text{reading}_{ijk} = \pi_{0jk} + e_{ijk}, \tag{1}$$

$$\pi_{0jk} = \beta_{00k} + r_{0jk}, \tag{2}$$

$$\beta_{00k} = \gamma_{000} + u_{00k}, \tag{3}$$

where, at level 1 (eq. [1]), reading_{ijk} is the academic performance of student i in school j in province k; π_{0jk} is the mean performance in school j in province k; and e_{ijk} is the deviation of the performance of student i from the school mean (random "student effect"). At the school level (eq. [2]), β_{00k} is

the mean performance in province k and r_{0jk} is the deviation of the mean performance of school k from the province mean (random "school effect"). Finally, at the province level (eq. [3]), γ_{000} is the grand mean, while u_{00k} is the deviation of the mean performance of province k from the grand mean (random "province effect").

We then estimate an education function to explore the relationship between test performance and a set of control variables at the three levels. The functions can be represented by a general structural model at each level, as expressed in the following equations:

$$\text{reading}_{ijk} = \pi_{0jk} + \pi_1 F_{ijk} + \pi_2 G_{ijk} + \pi_3 I_{ijk} + \pi_4 \text{ESCS}_{ijk} + e_{ijk}. \tag{4}$$

$$\pi_{0jk} = \beta_{00k} + \beta_{01}\bar{F}_{jk} + \beta_{02}\bar{G}_{jk} + \beta_{03}\bar{I}_{jk} + \beta_{04}\overline{\text{ESCS}}_{jk} + \beta_{05} C_{jk} + \beta_{06} M_{jk} + r_{0jk}. \tag{5}$$

$$\begin{aligned}\beta_{00k} = {} & \gamma_{000} + \gamma_{001}\text{BC}_k + \gamma_{002}\text{BS}_k + \gamma_{003} T_k + \gamma_{004} E_k + \gamma_{005} Q_k \\ & + \gamma_{006} S_k + \gamma_{007} C_k + \gamma_{008}(\text{BC}_k \times \overline{\text{ESCS}}_k) + \gamma_{009}(\text{BC}_k \times T_k) + u_{00k}.\end{aligned} \tag{6}$$

$$\beta_{05k} = \gamma_{050} + \gamma_{051}\text{BS}_k + u_{05k}. \tag{7}$$

In equation (4), reading_{ijk} is student i's academic achievement in reading and is modeled as a function of predictors at three levels (student, school, and province) plus random errors in each of them, π_{0jk} is the intercept for school j in province k, and π_{Pjk} are the level 1 coefficients (association between student background and outcome in school j in province k). The control variables at this level are F_{ijk} (whether student is female), G_{ijk} (whether the student has ever been retained in a grade), I_{ijk} (vector on immigration background of the student, i.e., whether the student is a first-generation or second-generation immigrant), and ESCS_{ijk} (a continuous measure of the economic, social, and cultural status of students.)

The ESCS index is a composite measure that is derived from three indexes: highest occupational status of parents (according to the International Socioeconomic Index of occupational status), highest educational level of parents, and number of books at home. Bukodi and Goldthorpe (2013) demonstrated that working with only one component of socioeconomic background could underestimate the social origin effects: "when the combined effects of parental class, status, and education are considered, it is evident that wider inequalities will be revealed than when social origins are treated in a more limited way, as, say, simply in terms of parental class" (11).

In equation (5) we used a level 2 model for variation between schools within provinces. The intercept term for province k is β_{00k}. The coefficients β_{0qk} represent the association between school characteristics q and π_{0jk}. The control variables in this equation are the averages of school-level measures:

$\bar{F}_{jk}$ is the fraction of female students in school j in province k; $\bar{G}_{jk}$ is the fraction of grade-retained students; $\bar{I}_{jk}$ is the fraction of first-generation and second-generation immigrant students; $\overline{\text{ESCS}}_{jk}$ is the average student socioeconomic index; C_{jk} is whether the school has a comprehensive structure, with students from preprimary education to lower secondary school; and M_{jk} is whether the school is located in a metropolitan area. Variable M_{jk} is relevant because it may interact with predictors of student allocation at the province level in that the social or ethnic homogeneity of certain urban contexts may be related to the social segregation of schools (Rivkin 1994; Taylor and Gorard 2001; Gorard et al. 2003).

To model for variation between provinces we use a level 3 model (eq. [6]), where γ_{000} is the intercept on the province level, and γ_{0ms} is the coefficient representing the association between province characteristics m and β_{00k}, u_{00k} is a level 3 random effect, and standard errors were clustered at the province level. In this model, province effect β_{00k} is predicted by aggregated factors at the territorial level.

The explanatory factors of interest are measures of between-classroom (within-school) social sorting (BC_k) and measures of between-school social sorting (BS_k). To impute such measures at the province level, we calculate a variance-components model of the individual ESCS index for all Italian provinces. For a comparative descriptive framework among provinces, we calculate the between-classroom and between-school variance of socioeconomic status as a percentage of the between-classroom and between-school variance, averaging across all Italian provinces (see the appendix).

Addressing Omitted-Variable Bias

Adopting a geographical identification approach requires controlling for, as much as possible, the influence of unobserved variables that may confuse the real effects of social sorting. First of all, since we are interested in observing provincial effects, it is necessary to control empirically for the north-south territorial divide mentioned earlier. To account for economic, social, and cultural territorial differences across the larger territorial aggregates, we introduce a separate north-south dummy variable, a set of macroarea dummy variables, and region fixed effects (T_k).

Omitted-variable bias could result from any unobserved province trait that is correlated with social sorting and has an influence on student achievement. To address this possible bias, we include a set of social, cultural, economic, and institutional characteristics of provinces in the estimation models (table 1). The control variables at the province level are grouped into four vectors (eq. [6]). The first vector, E_k, covers economic and sociodemographic variables in the province, such as its gross domestic product, unemployment rate, and population density and an index of the quality of life.

TABLE 1
DESCRIPTIVE STATISTICS

Variable	Mean	SD	Min	Max
Level 1—students:				
Reading scores	61.71	15.21	.00	100.00
Female students	.48	.50	.00	1.00
Grade-retained students	.07	.25	.00	1.00
First-generation immigrant students	.06	.23	.00	1.00
Second-generation immigrant students	.03	.18	.00	1.00
Economic, social, and cultural status of students	.00	1.00	−2.59	2.47
Students in a classroom suspected of cheating	.06	.24	.00	1.00
Level 2—schools:				
Economic, social, and cultural composition of school	−.01	.48	−2.04	1.95
Fraction of female students	48.15	8.21	.00	100.00
Fraction of grade-retained students	7.21	6.07	.00	100.00
Fraction of first-generation and second-generation immigrant students	9.47	9.13	.00	95.57
School in a metropolitan area	.14	.35	.00	1.00
Comprehensive school (from preprimary education to lower secondary school)	.68	.47	.00	1.00
Level 3—provinces:				
Macroarea of residence:				
North-West	.23	.42	.00	1.00
North-East	.21	.41	.00	1.00
Centre	.20	.40	.00	1.00
South	.16	.36	.00	1.00
South and Islands	.19	.40	.00	1.00
North-south dummy variable (north = 1)	.45	.50	.00	1.00
Index of between-school social sorting	.00	1.00	−1.52	3.53
Index of between-classroom social sorting	.00	1.00	−1.75	2.61
GDP per capita of province	.00	1.00	−1.72	2.19
Unemployment rate (15–64 years)	7.87	3.75	2.10	19.00
Population density of province (×10,000)	2.54	3.37	.39	26.30
Index of the quality of life	4.99	2.19	.00	10.00
Index of educational provision and demand	.90	.45	.23	3.90
Share of private schools	.06	.06	.00	.24
Share of teacher turnover in lower secondary school	10.27	2.57	5.00	16.30
Index of temporary teachers in lower secondary school	.00	1.00	−4.89	1.14
Local authority spending on education	274.88	56.32	188.00	397.00
Economic, social, and cultural composition of province	.01	.18	−.40	.41
Fraction of grade-retained students	7.16	1.83	2.48	11.76
Fraction of first- and second-generation immigrant students	10.63	5.69	1.59	22.51
Share of early school leavers	19.19	5.86	7.60	35.80
Teacher absenteeism in lower secondary school (days)	6.81	1.85	4.00	12.00
Indicator of teacher cheating	.59	.77	.00	3.13
Risk of tax evasion	100.00	20.32	48.00	148.00
Proportion of people doing unpaid work for a voluntary organization	.09	.04	.00	.23
Proportion of newspaper readers	.57	.12	.31	.83

NOTE.—In levels 1 and 2, data are drawn from the data set provided by the Italian National Institute for Evaluation of the Education System (INVALSI). In level 3, the indicators of early school leavers, teacher absenteeism, public spending on education, teacher turnover, and temporary teachers are provided by the Tuttoscuola report 2011 (Tuttoscuola: 2° Rapporto sulla Qualità nella Scuola). The index of educational provision and demand, the index of population density, and the index of the quality of life are provided by the Istituto G. Tagliacarne (Rome). We calculated the indicator of teacher cheating on the basis of suspicious answer strings that partially follow the method suggested by Jacob and Levitt (2003). This cheating indicator has been calculated at the classroom level and then imputed at the province level. The risk of tax evasion is provided by Centro Studi Sintesi and published in "Il Sole 24 Ore" (August 27, 2012). The indicators of people working for a voluntary organization and of newspaper readers are drawn from the multipurpose survey on households "Aspects of Daily Life," 2009, provided by the Italian National Institute of Statistics. The rest of the variables in level 3 are drawn from the INVALSI data set. $N_{students} = 475{,}743$; $N_{schools} = 5{,}790$; $N_{provinces} = 103$.

Some studies have indicated how social inequality among schools is influenced by differences in the quality of schools and by school choice.[8] For controls related to quantity and quality of school provision, we include a second vector, Q_k, which includes variables such as the share of private schools, the share of teacher turnover in lower secondary education, an index of temporary or contract teachers in lower secondary school, the local authority spending on education, and a proxy variable for the quality and quantity of educational provision to account for the dynamics of parental choice. The proxy variable for educational provision is constructed as an index that combines a weighted average of two indicators related to the quantity and the quality of provision and an indicator of potential (using data on population, surface, etc.) and effective (using data on actual users) demand for educational services. This proxy variable is included to control for the potential effect of school resources and school choice on performance, which in turn may influence the effect of sorting practices across schools.

As regards the within-school allocation, we use aggregated variables or indicators that may explain sorting practices based on students' social background. We include a third vector, S_k, that consists of variables related to student body composition: the fraction of grade-retained students; the fraction of first-generation and second-generation immigrant students; the economic, social, and cultural status index of students in the province; and the share of early school leavers. The variables related to immigrant and grade-retained students reflect the possible need to manage student heterogeneity, such as by using streaming practices. We assume that provinces with a higher proportion of immigrant or grade-retained students would be more prone to group students, which in turn could bias the observed real effect of social sorting on performance.

In vector C_k we include proxy variables for civic capital. Some research has indicated that lack of trust toward education authorities and nonadherence to the rule of law is significantly related to illicit behaviors of school actors, such as teacher cheating in standardized tests (Paccagnella and Sestito 2014). Other research has found that such cheating practices, understood as a proxy for deviant behaviors, are more likely in schools that undertake practices such as social streaming in classrooms or in contexts that lack civic capital (Ferrer-Esteban 2014). Hence, we make the assumption that separating students on the basis of their social origins, or succumbing to parental pressure for such practices, is likely to reflect lower levels of civic capital.

The variables of civic capital are related to both the school system and the local community. First, we use indicators of teacher cheating and teacher absenteeism in lower secondary school. We also include factors of civic capital and awareness related to the local context, such as the likelihood of tax evasion, the proportion of people doing unpaid work for a voluntary orga-

[8] Willms and Echols 1992; Allen 2007; Dronkers and Robert 2008; Alegre and Ferrer 2010.

nization, and the proportion who read newspapers to be informed about politics. This last factor has been used elsewhere as a proxy for political awareness, a dimension of civic capital (de Blasio et al. 2014; Paccagnella and Sestito 2014).

Finally, we include the interaction terms $BC_k \times \overline{ESCS}_k$ and $BC_k \times T_k$ to analyze the extent to which the strength of association between educational effectiveness and social tracking within schools depends on the local economic, cultural, and social context. We also include a cross-level interaction term to test whether the effect on educational outcomes of being in a metropolitan area could be attributed to the level of school segregation in the province (eq. [7]).

Results

We use a step-by-step approach to construct and estimate our models, starting with a fully unconditional model and then adding individual and school-level variables and selective aggregated factors at the territorial level. This approach allows us to observe and interpret changes in the direction and strength of associations.

Social Sorting between Schools

Patterns of school segregation.—We first present the factors that currently determine the levels of school segregation in Italy. We find that provinces with large urban aggregates are more likely to have higher levels of social segregation in schools. Before and after accounting for territorial differences between regions in terms of economic development (table 2, models 1 and 2,

TABLE 2
FACTORS ASSOCIATED WITH BETWEEN-SCHOOL SOCIAL SEGREGATION IN ITALY

Provincial Factor	(1)	(2)	(3)	(4)	(5)
Metropolitan area	1.635***	1.719***	1.372***	.852**	.676*
	(.28)	(.36)	(.36)	(.34)	(.34)
Population size			.305**	.276**	.122
			(.14)	(.12)	(.13)
Index of educational provision and demand				.412***	.405***
				(.11)	(.10)
Share of private schools					. 343***
					(.13)
Region fixed effects	No	Yes	Yes	Yes	Yes
Control variables	Yes	Yes	Yes	Yes	Yes
R^2	.515	.595	.626	.695	.731

NOTE.—Ordinary least squares models at the provincial level. Dependent variable: standardized between-school variance in student socioeconomic status. Robust standard errors in parentheses. A wide range of control variables were used: province average of the cultural and socioeconomic index, province unemployment rate, percentage of adult population in education and training (25–64 years), index of the quality of life, share of dropouts, index of temporary teachers, share of teacher turnover, and share of teacher absenteeism (in days). Complete data are available on request. $N = 103$.

* $P < .10$.

** $P < .05$.

*** $P < .01$.

respectively), when we include the metropolitan area variable, there is a statistically significant increase in the between-school socioeconomic variance. This coefficient remains statistically significant even when controlling for other potentially relevant predictors of the unequal distribution of students across schools (table 2, models 3–5), which partially captures the effect of being in a metropolitan area. The indicator of population size is associated with school segregation (model 3) and is likely to be related to the phenomenon of residential segregation.

In contrast, we observe that the index of educational provision and demand at the province level is associated with social segregation in schools. The significance of the metropolitan area is further attenuated with a reduction of 38 percent (model 4). This confirms that the relationship between this index and levels of school segregation is likely to be mediated by the number, quality, and diversity of school providers, which is closely related to the extent of education service demand. Since families in Italy are given a wide margin of school choice, it is plausible that the diversity of available school providers fosters informed and strategic school choices by certain profiles of parents.

Another factor that captures the explanatory power of the metropolitan area by 21 percent is the presence of private schools (model 5). The inclusion of this factor absorbs the significance of the population variable, suggesting that the observed population effect in models 3 and 4 is mediated by the increased likelihood of attending private schools in highly populated areas. This may reflect the preferences of urban families but can also be a differentiation strategy of certain families to avoid disadvantaged schools located in their own residential area or when there are no places in the preferred public school.

Nevertheless, the net average effect of being in a metropolitan area on the level of school segregation remains significant. This coefficient is not fully captured by the population indicators, the index of educational provision and demand, or the presence of private schools. Instead, the effect of urban residence on school segregation is likely to be explained by other unobserved characteristics, such as developed transport networks, criteria for school admission applied in case of oversubscription, or covert processes of student selection (more likely in medium and large cities). In the next section, the variable related to the metropolitan location of schools may be useful to observe heterogeneity effects of school segregation on performance, while the other predictors associated with school social segregation seem to be appropriate control factors to attenuate the risk of omitted-variable bias.

School segregation and educational outcomes.—The relationship between student performance and nonrandom allocation across schools is shown in

table 3. When not controlling for geographical fixed effects or key predictors at the province level (table 3, model 1), this relationship is negative. When a range of social, economic, and cultural characteristics of provinces and the location of the school are taken into account, and thus the risk of omitted-variable bias is attenuated, the size of the coefficient decreases but remains significant.

To check whether the effect of school segregation on performance varies between large territorial aggregates, we include a north-south dummy variable (table 3, model 4). This inclusion does not affect the significance of the coefficient, implying that school segregation does not have a territorial component. To check for robustness, we include other geographical controls: dummy variables for macroareas and the regions. The results of these models are illuminating. When controlling for region and macroarea fixed effects, the coefficient of school segregation on performance loses statistical significance (table 3, models 5 and 8). Indeed, the explanatory power of the index is essentially captured by the differences between regions and between macroareas, which means that more than a provincial effect, this is a cross-regional or between-macroarea school segregation effect.

Another factor that may mediate the effect of school segregation on student performance is the urban location of schools (table 2). Eleven of the 15 provinces in Italy with a metropolitan area are among the top 20 provinces with a high rate of school segregation: Naples, Catania, Palermo, Trieste, Rome, Genoa, Milan, Bari, Turin, Messina, and Bologna. There is about a 1 percentage point decrease in the conditional mean of the academic scores with respect to the school location in a metropolitan area, after accounting for control variables and geographical fixed effects (models 3–5, table 3). However, this result becomes statistically insignificant when the interaction terms with the level of school segregation in the province are included (model 6, table 3). Instead, test scores decline by almost 1 percentage point for students attending an urban school where between-school social variance is increased by one unit.

Social Sorting between Classrooms within Schools

Geographical pattern of social sorting and performance.—Unlike the between-school component of social segregation, there exists a clear pattern of between-classroom segregation along Italy's north-south divide. While the southern provinces generally have greater social differences between classrooms, the northern and central provinces tend to minimize such differences. Figure 1 shows that in the south, but also in some provinces in the north, schools tend to form socially homogeneous classrooms, resulting in large social differences between them.

Since southern provinces have higher rates of social inequality between classrooms and schools are generally low performing, the association between

TABLE 3
HIERARCHICAL REGRESSION MODELS: SOCIAL SORTING ON PERFORMANCE; PROVINCIAL EFFECTS MODELS

	(0)	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Intercept	62.23***	62.27***	62.24***	62.32***	62.17***	62.82***	63.07***	63.42***	65.12***	65.01***
	(.26)	(.20)	(.13)	(.14)	(.16)	(.33)	(.35)	(.34)	(.84)	(.83)
Level 3 model—provinces:										
Index of between-school social sorting		−.36**	−.32*	−.30*	−.28*	−.17	−.05	−.13	−.19	−.07
		(.15)	(.17)	(.17)	(.16)	(.15)	(.15)	(.14)	(.13)	(.13)
School in a metropolitan area × between-school social sorting in province (cross-level interaction)							−.83**			−.77**
							(.34)			(.33)
Index of between-classroom social sorting		−1.67***	−.43***	−.44***	−.39***	−.31**	−.33**	.27	−.36**	−.35**
		(.23)	(.13)	(.13)	(.14)	(.14)	(.13)	(.33)	(.14)	(.14)
Between-classroom social sorting × ESCS province (third level interaction)							1.37**			1.27*
							(.59)			(.73)
Economic and sociodemographic variables:										
GDP per capita of province			−.10	−.10	−.15	−.35	−.59*	−.44	−.38	−.49
			(.41)	(.41)	(.40)	(.35)	(.34)	(.33)	(.33)	(.33)
Unemployment rate (15–64 years)			−.13*	−.12*	−.12*	−.09	−.08	−.07	−.05	−.04
			(.07)	(.07)	(.07)	(.07)	(.07)	(.07)	(.07)	(.07)
Population density of province (× 10,000)			.06	.06	.05	.02	.07	.04	.02	.07
			(.06)	(.05)	(.06)	(.04)	(.04)	(.04)	(.04)	(.05)
Index of the quality of life			−.06	−.08	−.07	−.09	−.04	−.02	.03	.05
			(.19)	(.19)	(.18)	(.18)	(.17)	(.17)	(.12)	(.12)
Quantity and quality of educational offer:										
Index of educational provision and demand			.07	.27	.38	.29	.12	.23	.47*	.27
			(.35)	(.34)	(.33)	(.29)	(.29)	(.29)	(.27)	(.28)

Fraction of private school providers	−1.24	−.60	−1.26	−1.74	−2.04	−.63	−.40	−1.24
	(2.51)	(2.48)	(2.23)	(2.16)	(2.08)	(2.05)	(2.07)	(1.95)
Share of teacher turnover in lower secondary school	−.09*	−.09*	−.07	−.05	−.02	−.01	−.06	−.03
	(.05)	(.05)	(.05)	(.05)	(.05)	(.06)	(.06)	(.05)
Index of temporary teachers in lower secondary school	−.56**	−.55**	−.54***	−.53***	−.53***	−.53***	−.59***	−.56***
	(.22)	(.22)	(.20)	(.19)	(.18)	(.16)	(.20)	(.19)
Local authority spending on education	.03	.03	.03	.03	.03	.03	.03**	.03**
	(.01)	(.01)	(.01)	(.01)	(.01)	(.01)	(.01)	(.01)
Student composition in province:								
Economic, social, and cultural composition of province	2.30**	2.34**	2.30**	2.84***	2.30**	3.12***	2.31**	2.23*
	(.95)	(.95)	(.92)	(.87)	(.93)	(.89)	(1.13)	(1.12)
Fraction of grade-retained students	−.16*	−.15*	−.16*	−.17**	−.15*	−.20**	−.16**	−.13*
	(.08)	(.08)	(.08)	(.08)	(.08)	(.08)	(.08)	(.07)
Fraction of first-generation and second-generation immigrant students	.13**	.12**	.12**	.09*	.08*	.06	.07	.06
	(.05)	(.05)	(.05)	(.04)	(.04)	(.04)	(.04)	(.05)
Share of early school leavers	−.07***	−.07***	−.07***	−.07***	−.04**	−.05**	−.07**	−.06**
	(.02)	(.02)	(.02)	(.02)	(.02)	(.02)	(.02)	(.02)
Civic capital-related factors (school system):								
Teacher absenteeism in lower secondary school (days)	−.27**	−.26**	−.20*	−.15	−.17*	−.13	−.09	−.12
	(.11)	(.11)	(.10)	(.10)	(.10)	(.10)	(.10)	(.10)
Indicator of teacher cheating	−.8***	−.79***	−.82***	−.71**	−.61**	−.73**	−.57	−.54
	(.26)	(.26)	(.24)	(.27)	(.26)	(.27)	(.38)	(.38)
Civic capital- and awareness-related factors (community):								
Risk of tax evasion	.02*	.02*	.02**	.02**	.02**	.02**	.01	.00
	(.01)	(.01)	(.01)	(.01)	(.01)	(.01)	(.01)	(.01)
Proportion of people doing unpaid work for a voluntary organization	2.93	2.80	4.09	5.23	5.66	5.68	10.03***	9.88***
	(4.08)	(4.08)	(4.05)	(3.9)	(3.7)	(3.71)	(2.73)	(2.63)

TABLE 3 (*Continued*)

	(0)	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Proportion of newspaper readers			3.17**	3.48**	2.94*	2.87**	2.09	2.56*	2.44*	1.77
			(1.51)	(1.51)	(1.57)	(1.36)	(1.38)	(1.35)	(1.37)	(1.37)
North-south territorial divide:										
North-south dummy variable (north = 1)					.65**					
					(.27)					
Macroarea dummy variables (ref: North-East):										
North-West						.60***	.44*	−.10		
						(.25)	(.25)	(.35)		
Centre						.02	−.19	−.65		
						(.31)	(.32)	(.42)		
South						−1.56***	−2.05***	−2.22***		
						(.59)	(.62)	(.67)		
South and Islands						−2.12***	−2.69***	−3.34***		
						(.67)	(.71)	(.81)		
Region fixed effects	No	No	No	No	No	No	No	No	Yes	Yes
Macroarea fixed effects × between-classroom social sorting:										
North-West								−.64		
								(.45)		
Centre								−1.08**		
								(.45)		
South								−1.09**		
								(.52)		
South and Islands								−.51*		
								(.26)		
Level 2 model—schools:										
School in a metropolitan area				−.97**	−.98**	−.96**	.49	−.96**	−.95**	.36
				(.46)	(.46)	(.46)	(.77)	(.46)	(.46)	(.74)
Economic, social, and cultural composition of school	1.70***	1.66***	1.57***	1.70***	1.71***	1.71***	1.65***	1.70***	1.71***	1.66***
	(.28)	(.28)	(.29)	(.32)	(.32)	(.32)	(.31)	(.32)	(.32)	(.30)
Fraction of female students	.01	.01	.01	.01	.01	.01	.01	.01	.01	.01
	(.01)	(.01)	(.01)	(.01)	(.01)	(.01)	(.01)	(.01)	(.01)	(.01)

Fraction of grade-retained students	−.09***	−.09***	−.09***	−.09***	−.09***	−.09***	−.09***	−.09***	−.09***	−.09***
	(.02)	(.02)	(.02)	(.02)	(.02)	(.02)	(.02)	(.02)	(.02)	(.02)
Fraction of first-generation and second-generation immigrant students	.00	.00	−.01	.00	.00	.00	−.01	−.00	.00	−.01
	(.02)	(.02)	(.02)	(.01)	(.01)	(.01)	(.01)	(.01)	(.01)	(.01)
Comprehensive school (from preprimary education to lower secondary school)	.27**	.23**	.26**	.21*	.21*	.23*	.25**	.22*	.25**	.26**
	(.12)	(.12)	(.12)	(.12)	(.12)	(.12)	(.12)	(.12)	(.12)	(.12)
Level 1 model—students:										
Female students	1.16***	1.16***	1.16***	1.16***	1.16***	1.16***	1.16***	1.16***	1.16***	1.16***
	(.06)	(.06)	(.06)	(.06)	(.06)	(.06)	(.06)	(.06)	(.06)	(.06)
Grade-retained students	−8.53***	−8.53***	−8.53***	−8.52***	−8.52***	−8.52***	−8.52***	−8.52***	−8.52***	−8.52***
	(.11)	(.11)	(.11)	(.11)	(.11)	(.11)	(.11)	(.11)	(.11)	(.11)
First-generation immigrant students	−7.88***	−7.88***	−7.88***	−7.88***	−7.88***	−7.88***	−7.88***	−7.88***	−7.88***	−7.88***
	(.41)	(.41)	(.41)	(.41)	(.41)	(.41)	(.41)	(.41)	(.41)	(.41)
Second-generation immigrant students	−4.93***	−4.93***	−4.93***	−4.93***	−4.93***	−4.93***	−4.93***	−4.93***	−4.93***	−4.93***
	(.27)	(.27)	(.27)	(.27)	(.27)	(.27)	(.27)	(.27)	(.27)	(.27)
Economic, social, and cultural status of students	3.52***	3.52***	3.52***	3.52***	3.52***	3.52***	3.52***	3.52***	3.52***	3.52***
	(.05)	(.05)	(.05)	(.05)	(.05)	(.05)	(.05)	(.05)	(.05)	(.05)
Indicator of teacher cheating	6.29***	6.29***	6.30***	6.29***	6.29***	6.29***	6.29***	6.29***	6.29***	6.29***
	(.25)	(.25)	(.25)	(.25)	(.25)	(.25)	(.25)	(.25)	(.25)	(.25)
Random effects:										
Within-school variance explained	13.36	13.36	13.36	13.36	13.36	13.36	13.36	13.36	13.36	13.36
Between-school variance explained	39.51	39.50	39.58	39.84	39.86	39.88	40.58	39.89	39.93	40.63
Between-province variance explained	25.16	62.93	92.71	92.94	93.32	94.74	95.07	95.35	97.04	97.25

NOTE.—Hierarchical linear models at three levels: students (N = 475,743), schools (N = 5,790), and provinces (N = 103). Dependent variable: reading scores in the INVALSI test (first year of lower secondary education). Final estimation of fixed effects, with robust standard errors in parentheses.

* $P < .10$.

** $P < .05$.

*** $P < .01$.

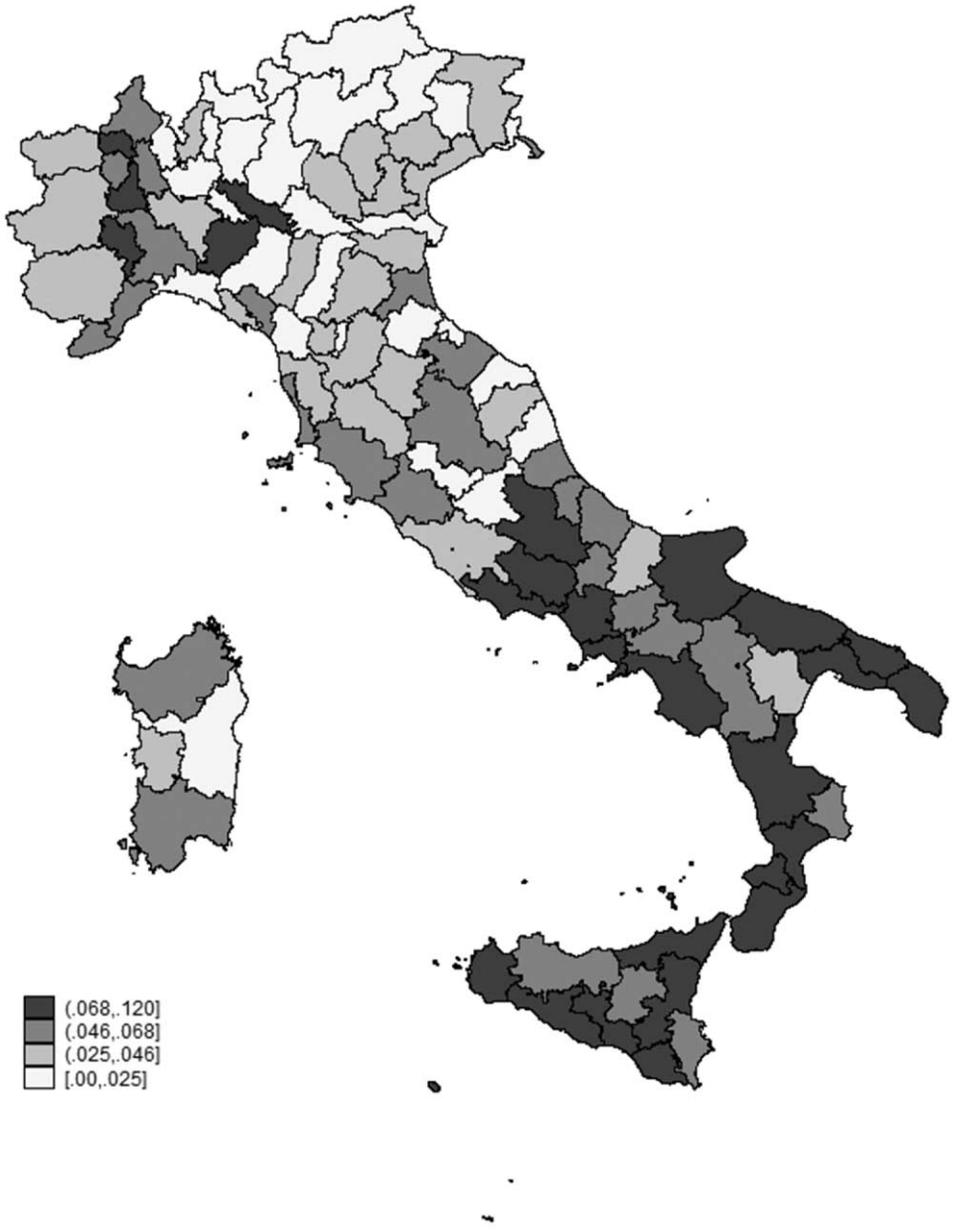

FIG. 1.—Between-classroom variance in students' socioeconomic status as a percentage of the total between-class variance across the Italian provinces (quantiles of the distribution).

this factor and performance is expected to be negative. Regressing the reading scores on the between-classroom variance of socioeconomic status, the slope estimate shows that, at all latitudes, there is a negative association between informal social sorting and performance, even in the presence of manifest differences in education effectiveness across the country (fig. 2).

We also explore whether the negative association of between-classroom variance and test scores is related to the north-south divide. Regressing the reading scores on the between-classroom variance of socioeconomic status, accounting for several control factors, and including alternative geographical fixed-effects specifications (a north-south dummy variable, a set of macroarea dummy variables, and region fixed effects), the coefficient of within-school social sorting in table 3 remains significant and negatively associated with performance (with a significance level of 5 percent).

These results corroborate the significance of a territorial component in the association between social sorting and student performance. The interaction terms between macroarea dummy variables and the proxy of within-school social sorting indicate that living in southern provinces or in the island provinces is associated with scoring 2–3 points lower, net of the influence of numerous controls (fig. 3; table 3, model 7). This gap becomes wider, between 0.5 and 1 point, for southern and island provinces with higher levels of between-classroom social sorting. Thus, the north-south divide in Italy extends

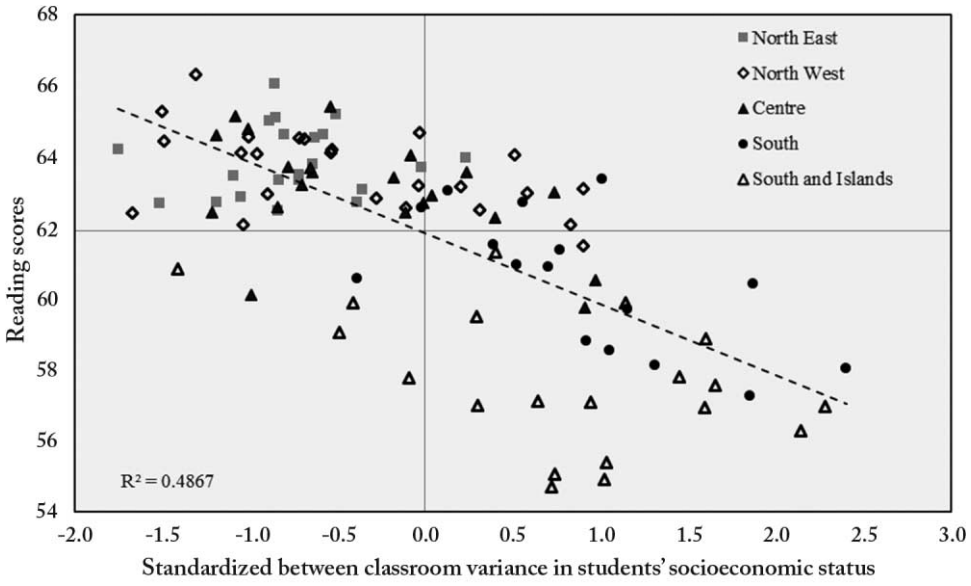

FIG. 2.—Between-classroom social sorting on reading scores, at the province level

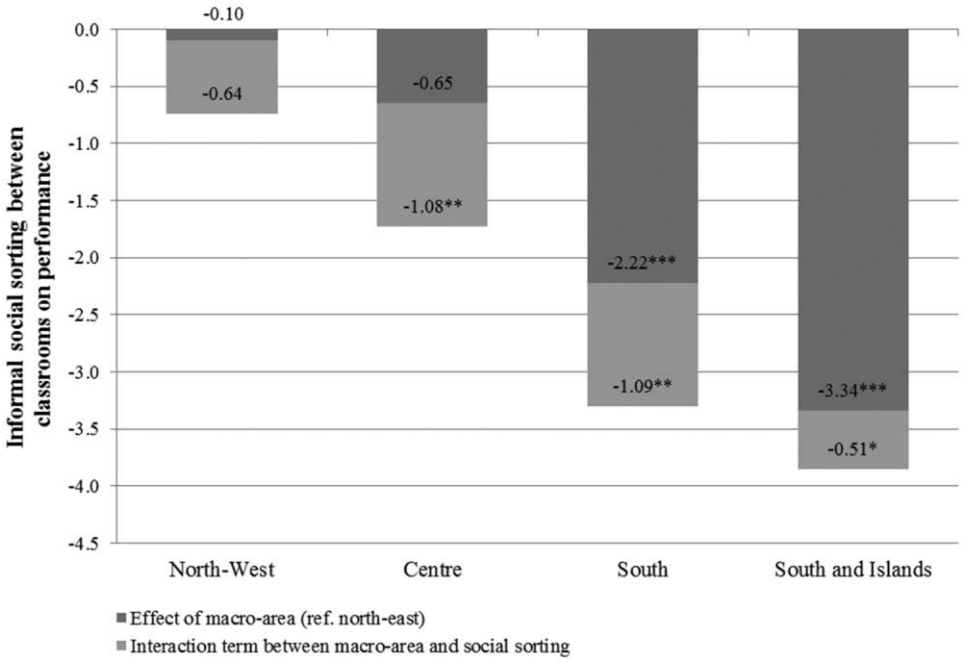

FIG. 3.—Between-classroom social sorting on reading scores, according to the Italian geographical macroareas. NOTE.—Interaction terms, based on model 7 of table 3, between the Italian geographical macroareas and the between-classroom variance in students' socioeconomic status explain the educational outcomes of students (reading scores). *** $P < .01$; ** $P < .05$; * $P < .10$.

also to the association between equity and effectiveness, meaning that there is no trade-off between the two dimensions, at least from a territorial perspective.

Between-classroom social sorting and educational outcomes.—Results indicate that the nonrandom allocation of students across classrooms according to their social background is strongly associated with lower test scores, our measure of educational effectiveness (table 3, model 1). This coefficient remains significant at 1 percent even after controlling for a number of relevant factors (models 2 and 3). Moreover, adding controls for geographical factors (north-south divide, macroarea dummy variables, and region fixed effects) does not alter this result (models 4, 5, and 8): the negative association of between-classroom social sorting and student performance is explained by the differences between provinces within the largest territorial aggregates.

The results affirm that allocating students homogeneously according to their socioeconomic status adversely affects their performance. We do not know whether this negative association is the average of differential effects in low-ability and high-ability classrooms. Nevertheless, the results could be explained: the negative average effect of social sorting could be due to the fact

that concentrating students with a high socioeconomic status leads to moderate positive effects, while allocating students with low socioeconomic status is likely to negatively affect their educational outcomes. Hence, in the case of the Italian lower secondary schools, there seems to be no trade-off between effectiveness and equity; rather, both dimensions are complementary with each other.

A deeper analysis of informal tracking is required to explore the factors that could interact to either exacerbate or minimize the effects of student sorting. To test whether the effects of social tracking differ depending on the territorial social composition, we have added interaction terms at level 3 of the conditional model between the aggregated measure of student social background and the index of between-classroom variance of status (table 3, models 6 and 9). As illustrated in figure 4, those provinces with low socioeconomic levels (tenth percentile of the province mean of the ESCS index) may expect, on average, a decrease in scores in the standardized reading tests when there are practices of social sorting. Even those provinces with medium-high socioeconomic levels (fiftieth and seventy-fifth percentiles of the province ESCS index) may be associated with a decrease in performance when students are grouped according to their socioeconomic status. The negative effect on

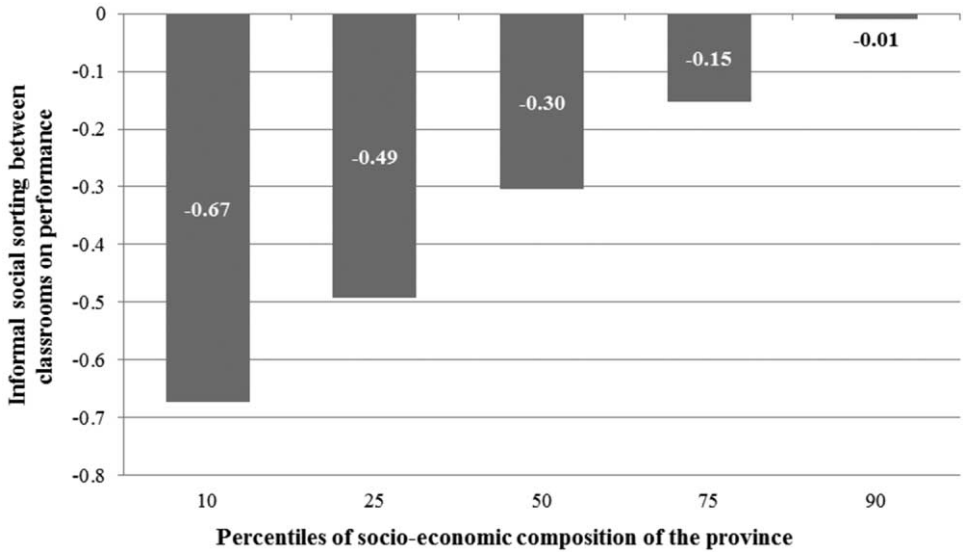

FIG. 4.—Between-classroom social sorting on reading scores, according to the socioeconomic composition of the province. NOTE.—Interaction terms, based on model 6 of table 3, between the percentiles of the index of economic, social, and cultural composition of provinces and the between-classroom variance in students' socioeconomic status explain the educational outcomes of students (reading scores).

student performance of social sorting between classrooms affects to a greater extent students with a disadvantaged background.

Conclusion and Discussion of Policy Implications

The objective of this research has been to examine the association between student performance and the nonrandom, socially uneven allocation of students between classrooms and schools. We have found an overall decrease in educational effectiveness derived from practices of student sorting between classrooms and, under certain conditions, between schools. These results have policy implications—and not only for Italy—since they underline the reciprocal interaction between the goals of raising an education system's effectiveness and maintaining the principle of equal educational opportunities for children and youth.

Social Sorting between Schools

Our results show that what fundamentally matters when it comes to assessing the negative effect of between-school segregation on educational outcomes is whether pupils live in a metropolitan area where school differentiation is more likely to be exacerbated. One of the main determinants behind school differentiation is the social composition of the neighborhoods (residential segregation) in which schools are located. The social or ethnic homogeneity of the population in certain areas, together with the presence of catchment areas in which priority access is given to students living near the school, contributes to social differentiation between schools (Rivkin 1994; Taylor and Gorard 2001; Rivkin and Welch 2006).

School location in large urban areas is also likely to interact with the degree of parental choice. For instance, school segregation may be mediated by the availability of school options to students and their parents. The larger the number and the greater the diversity of school providers, the wider the opportunity for selecting a school according to their preferences and means; compared with high-income students, low-income students will have fewer options available to them. There may also be a socially uneven allocation when the choice of private schools is the strategic choice of parents when access to the preferred public school is not possible (Calsamiglia and Güell 2014) or when parents wish to avoid socially disadvantaged, homogeneous learning settings or the more heterogeneous environments of public schools.

There is a common phenomenon behind the school social differentiation in systems that combine quasi-market mechanisms (open choice) with public regulation of school access (catchment areas): the information asymmetry among families. This differential access to information, which tends to mirror socioeconomic and cultural differences, makes well-off families better able to identify and choose the schools of higher quality. These families are

more likely to activate strategies of school choice, either relocating to socially homogeneous areas or attending preferred schools that are farther from home. In order to obtain a more socially equitable distribution of students among schools, education policy should foster better information access for disadvantaged families. This is especially necessary in highly segregated locations and in large urban aggregates.

Between-Classroom Placement

In Italy, educational authorities do not regulate student sorting between classrooms, and schools have autonomy to set within-school allocation criteria. According to Mons (2004, 2007), countries with a uniform integration model like Italy may eventually stream students in order deal with the complexity of teaching mixed-ability classrooms. This is consistent with the findings of this study that some degree of social sorting between classrooms is present in Italy. Although this practice contravenes the stance of Italian education authorities as it goes against the equity principle in schools and classrooms, informal streaming seems to be widespread nonetheless, especially in the south and the island provinces. This finding is relevant to the extent that the nonrandom allocation of students across classrooms is significantly associated with a lower student performance overall.

This study challenges the widespread belief that, in Italy, lower secondary classrooms are formed with the aim of respecting heterogeneity. Given these conditions, we consider inadvisable any school practice that may lead to socially more homogeneous learning environments. This practice is especially inadvisable in both the southern and insular areas, and the most economically disadvantaged provinces, where the downward spiral of "inequity ineffectiveness" is even more pronounced.

An alternative to more public control could be to require schools to make explicit, every academic year, the criteria that have been applied to compose classrooms, rather than just informing about the ideal criteria of student allocation. Since nonrandom allocation is currently a result of informal practices, which are neither formally recognized by the educational authorities nor openly declared by schools, this would force schools to be accountable to families of school allocation policies that may affect the learning settings of their children.

Methodological Appendix

Student Allocation-Related Explanatory Factors

The explanatory factors of interest are measures of between-classroom (within-school) social sorting (BC_k) and measures of between-school social sorting (BS_k). To impute such measures at the province level, a variance-components model of the individual ESCS index for all Italian provinces is calculated. A fully unconditional three-level model (eqq. [A1]–[A3]) partitions the total variation in the index into

three components: variance between students within classrooms, variance between classrooms within schools, and variance between schools within the province.

$$\mathrm{ESCS}_{icj} = \pi_{0cj} + \varepsilon_{icj}, \tag{A1}$$

$$\pi_{0cj} = \beta_{00j} + r_{0cj}, \tag{A2}$$

$$\beta_{00j} = \gamma_{000} + u_{00j}, \tag{A3}$$

where, at the student level, ESCS_{icj} is the sociocultural and economic status of student i in classroom c in school j; π_{0cj} is the mean ESCS of classroom c in school j; and ε_{icj} is the deviation of the ESCS of student i from the classroom mean (random "student effect"). At the classroom level, β_{00j} is the mean ESCS of school j, and r_{0cj} is the deviation of the mean ESCS of classroom c from the school mean (random "classroom effect"). Finally, at the school level, γ_{000} is the grand mean within a province, while u_{00j} is the deviation of the ESCS mean of school j from the grand mean (random "school effect").

As a measure of social sorting, we used variance components of both level 2 (between classrooms within schools, τ_π) and level 3 (between schools, τ_β). At level 2, a high variance of ESCS between classrooms means that there is more heterogeneity among classrooms within the same school; that is, classrooms are socially more homogeneous because students with similar social backgrounds tend to be allocated together to the same learning environment. At level 3, the higher the ESCS variance between schools, the more heterogeneity between schools and the more internal homogeneity within schools. Indicators of both between-classroom and between-school allocation have been calculated for every Italian province and included as explanatory factors in the main empirical model. This proxy of social sorting was used to measure not the extent to which schools and classrooms have a high or low social composition but the extent to which both schools and classrooms within schools are socially dissimilar.

The unconditional three-level model also estimates the proportion of ESCS variation within classrooms, between classrooms within schools, and between schools. For a comparative descriptive framework among provinces, the between-classroom and between-school variance of socioeconomic status is calculated as a percentage of the between-classroom and between-school variance averaging across all Italian provinces. This shows the differentiation of provinces in terms of social segregation within and between schools and is calculated as follows:

$$\mathrm{BC}_k = \frac{\tau_\pi}{\sigma^2 + \tau_\pi + \tau_\beta}, \tag{A4}$$

$$\mathrm{BS}_k = \frac{\tau_\beta}{\sigma^2 + \tau_\pi + \tau_\beta}, \tag{A5}$$

where σ^2, τ_π, and τ_β are the variance components of levels 1, 2, and 3, respectively. Equation (A4) expresses the proportion of variance between classrooms within schools in province k, while equation (A5) indicates the proportion of variance between schools in province k.

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