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**Beyond the traditional territorial divide in the Italian
Education System. Effects of system management factors
on performance in lower secondary school**

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Preliminary version

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Beyond the traditional territorial divide in the Italian Education System. Effects of system management factors on performance in lower secondary school¹

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ABSTRACT

The main aim of this paper is to analyze the effect of territorial inequalities on educational opportunities in the Italian lower secondary school. For this purpose, the paper means to respond to two general questions: first, to what extent territorial factors related to education system's management are affecting student performance. Second, starting with the assumption that some territorial factors may lead to better academic standards, to what extent there is not a *trade-off* between effectiveness and equity in the Italian education system. Through hierarchical regression models, which allow both observing the heterogeneity between provinces, and accounting for structural and economic differences between macro-areas, this paper sets out some aggregated factors influencing academic performance: beyond the traditional North-South differences, cross-province factors such as social heterogeneity between classes within schools, social segregation of schools, and the rate of teachers in precarious employment, are observed to adversely affect the reading scores of students.

INTRODUCTION: INEQUALITIES IN THE ITALIAN EDUCATION SYSTEM

Since its creation in 1962, the Italian comprehensive lower secondary school has had to deal with two major challenges: to raise school attendance all over the country for all students until the completion of compulsory schooling, and to ensure an appropriate level of proficiency for all children, regardless of their socioeconomic background. Both goals are of greater relevance considering that Italian lower secondary school represents a key academic stage where students are oriented toward one of four academic tracks of the upper secondary education: *general upper secondary school*, *technical school*, *vocational school*, and *vocational education and training system*. The first objective of raising the general level of instruction of the Italian population has been achieved in the

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lower secondary school: ensuring universal compulsory education allowed to respond effectively to the principle of equal opportunity of access (attainment). However, the second goal is at stake: research suggests that much remains to be done in terms of equal opportunities of academic success and quality of human capital (achievement). In addition, territorial divide in Italy has been identified as one of the main causes behind the exacerbation of education inequalities across the country. This introduction has two main objectives: first, to briefly point out some research evidence confirming how Italian lower secondary school has failed to guarantee equal opportunities for pupils to succeed; second, to recall some relevant findings substantiating how territorial inequalities have led to education disparities in the Italian school system.

Social inequalities in the lower secondary

Since access to lower secondary education has been guaranteed to all students, an appropriate approach to assess education equity at this stage is to observe to what extent performance is related to family background, and how this social origin is, in turn, associated with choice of upper secondary tracks. On one hand, the most recent research on equity and quality of human capital in Italy has shown that lower secondary school as its main responsibility is to exacerbate social inequalities in schooling. In this sense, De Simone (2011) employs a pseudo-panel approach with two waves of the TIMSS survey (2003, 2007) to disentangle the role of lower secondary from primary school's effects in explaining performance. This author finds that social equality is largely upheld in primary school, while social inequalities seem mostly to originate in lower secondary education.

At this point, it is worth getting back to a few research findings that ascertain some factors playing an important role in the decisions made in the last year of lower secondary education, before moving to one of the four tracks of the upper secondary. According to Checchi (2010), three main factors addressing the choice exist: gender (being female), academic competences of students, and the educational level of parents. The author points the last factor out as being the one that most explains the choice. In fact, there are numerous studies proving that a strong relationship between choice of upper secondary's academic track and the students' family background exist, specifically with the parents' educational level (Checchi & Flabbi, 2007; Contini et al., 2008; Fondazione G. Agnelli, 2010). As argued by Checchi & Flabbi (2007), track allocation in the Italian secondary education is not meritocratic as is the German system, partially due to the flexibility of the Italian education system, which allows parents to make a choice more dependent on their background, and less dependent on the proficiency level of students (and very likely, regardless of the counselling of lower secondary teachers, as well).

Territorial divide and education inequalities

The Italian school system has a great territorial complexity, as demonstrated in several studies on geographical differences in terms of academic achievement. This complexity has mainly been analyzed from the perspective of the differences between macro-areas, which usually responds to the geographical axis between north and south. In fact, many studies have confirmed that historical inequalities in relation to levels of economic growth and development among territorial aggregates have led to disparities in the effectiveness-efficiency dimension of the education system. These studies, which have analyzed territorial polarization trends in education, have made clear the importance of analyzing the *region effect* in the north-south axis as one of the major determinants of an uneven distribution of educational opportunities nationwide.

Much research on territorial disparities in Italy has been realized using data from international surveys, with representative samples by region or macro-areas, such as OECD-PISA, IEA-PIRLS or IEA-TIMSS. For instance, using data from PISA 2000 survey, Checchi (2004) found differences between Italian regions in explaining students' choice and distribution among tracks in upper secondary education. The author points out that the observed regional effect persists, even after accounting for students' background variables at both individual and school level. In addition, Montanaro (2008) collected results from the main international surveys to illustrate the differentiated territorial nature of the Italian education system. After confirming the North-South divide in terms of educational effectiveness, the author highlights the factors that may explain these disparities: a significant portion of the differences between North and South is attributable to students from disadvantaged families.

A recent analysis of territorial disparities in Italy emerges from the 2010 report on the Italian education system published by G. Agnelli Foundation (2010). Based on comparative analyses between macro-areas and regions, the authors conclude that the Italian territorial dimension interacts in different ways with individual, school and institutional factors. Thus, for example, they note that institutional policies such as the distribution of students on tracks before the end of compulsory education can be a source of great inequalities in certain regions, while in others it does not lead to a polarization situation. Other research papers have dealt with territorial inequalities using data from other sources. For instance, Ballarino et al. (2010) study patterns of drop-out over cohorts by macro-regions using data from the Italian Longitudinal Household Survey. Although their results confirm a decrease in tendency of drop-out rates all over the country, there is still a small fraction of the youngest cohorts (about 4%) in the South that leave the education system before completing compulsory schooling.

Finally, for the purpose of our research, it is interesting to highlight how little research has focused on territorial disparities beyond the north-south divide. This is the case of the research conducted by Bratti, Checchi, and Filippin (2007), which uses data from PISA 2003 and imputed information from sources of the Italian public administration, to analyse territorial differences at province level. Since Italian sample by province in PISA survey is not statistically representative, authors do not mean to assess

performance differences by province, but only to estimate associations between local variables and students' performance. Among the most relevant results, authors point out that school infrastructures, the state of the labour market (employment, irregular economy...), and financial resources for facilities are those local factors being associated with performance of students.

BACKGROUND: FACTORS OF SCHOOL SYSTEM MANAGEMENT

For the purpose of studying territorial education disparities beyond territorial economic and development differences, the research strategy has focused its attention in the management dimension of the secondary school system. Three factors of education management at both system and school level, which have been hypothesized to adversely affect academic performance, have been approached: precarious employment of teachers, students' allocation across schools, and student distribution across classrooms. The following briefly presents some background findings that contextualise our research.

Management of education system's resources: precarious employment of teachers

It is quite obvious that quality of teaching and learning environments are related to the length and stability of teachers' employment. First, teacher quality and supporting career experiences depend to great extent on the concerns of teachers about employment uncertainty and expectations regarding employment continuity. Second, teachers who have to wait too long to get a permanent contract are at risk of becoming demotivated. In addition, teachers with precarious employment conditions often have to move from one school to another, which has also been confirmed as an important factor affecting quality of teaching.

A recent international survey conducted by the OECD on effective teaching (TALIS) gives relevant empirical support to the relationship between quality teaching and stability in the contractual status of teachers in lower secondary education. Factors that indirectly affect learning, such as teachers' self-efficacy in their success with students and classroom disciplinary climate, are significantly and positively related to the length and stability of employment of teachers. For instance, in some countries teachers who are more likely to report higher levels of reported self-efficacy are employed on a permanent contract, on a full-time basis, and have had more experience working as a teacher (OECD, 2009). On the other hand, there are many countries in which teachers giving classes with a more positive disciplinary climate are those with labour stability, with more experience, and employed on a full-time basis (OECD, 2009). It is worth noting that these results are drawn from estimation models, in which years of schooling (as a *proxy* of experience) and school socio-economic variables are accounted for.

Moreover, the precarious employment of teachers is often associated with a high turnover rate across schools. The first most evident impact of turnover rates on learning environments can be associated with both the teaching and the study programs

discontinuity. There is a significant relationship between teacher turnover and teacher quality (Rivkin et al., 2005). Whereas, schools having a high number of short-term replacement teachers are likely to show more problems of discipline and student respect for teachers (OECD, 2005). In Italy, for instance, one can observe a vortex mobility of precarious teachers with an annual assignment, which adds up to an equally vortex mobility of teachers with tenure and new recruits. Overall, it fosters turbulence in the system, with negative effects on both pedagogical and didactic continuity, and the possibility of consolidation of professional communities that strengthen the teacher workforce (Fondazione G. Agnelli, 2009).

In addition, this teacher turnover may have a different impact depending on the level of regulation in each country to assign teachers to schools. At international level, one can observe two general models of staff assignment: position-based and career-based systems³. The trend observed, to a greater extent in the former is that there is less regulation in the allocation of teachers and, consequently, disparities between schools in terms of qualification and experience of staff might be exacerbated. The problem identified in this case is that highly qualified teachers are more likely to transfer to another school when teaching lower-achieving students, while less effective teachers stay in lower-performing schools, and, therefore very likely to enlarge differences on learning opportunities of students (Boyd et al., 2008; Boyd et al., 2005). This is consistent with research on the relationship between school social composition and turnover rates: as stated by Hanushek et al. (2004), students with lower social background and ethnic minority students have to face higher teacher turnover, and are more likely to be taught by newly qualified teachers.

Allocation of students across schools and classrooms: school composition effect

Both education system policies and school practices might have a significant role in either fostering or limiting social capital in the schools' common areas, in which interactions among students with different abilities and socio-economic and cultural background are generated. Certain school models and practices may tend to promote between-classroom social dissimilarity within schools; while other systemic educational policies, along with other structural elements, can generate high levels of segregation between schools. On one hand, schools may foster social segregation between classes by means of *formal and informal tracking* practices such as *streaming* and ability grouping, that is, differentiating students on the basis of their abilities and according to different curricular objectives (Dupriez et al., 2008; Duru-Bellat & Mingat, 1997). On

³ According to the OECD (2005), in the "career-based systems, teachers are generally expected to stay in the public service throughout their working life. Initial entry normally occurs at a young age, it is based on academic credentials and/or a civil service entry examination, and the entry criteria are usually demanding. Once recruited, teachers are normally allocated to posts according to internal rules. Promotion is based on a system of grades attached to the individual rather than to a specific position", while in "Position-based public services the focus tends to be on selecting the best-suited candidate for each position, whether by external recruitment or internal promotion. Such systems generally allow more open access at a wide range of ages, and entry from other careers is relatively common, as is movement from teaching to other jobs and later returns to teaching".

the other hand, education systems might generate higher levels of social heterogeneity (and therefore school social homogeneity) due to its own structure of institutional differentiation (e.g. early tracking), but also through ‘cream-skimming’ practices of schools (Alegre & Ferrer-Esteban, 2010; Allen, 2007), schemes of open school choice (Allen, 2007; Willms & Echols, 1992) and the presence of independent private schools (Alegre & Ferrer-Esteban, 2010).

Although schools and classrooms represent two different levels of analysis, in both cases we can talk about a salient process that might have a significant bearing on overall performance of schools and classrooms, as well as on inequalities among students: the *compositional effect*, or the *social composition of schools*. As stated by Harker and Tymms (2004), ‘such an effect is often reported when school-level aggregate of an individual-level variable makes an independent contribution to the explanation of outcome variable’. Since the publication of the Coleman Report (1966), numerous studies have confirmed the existence of significant effects of school composition on academic performance. The studies on composition generally have analyzed the influence of socioeconomic composition of classes and schools (Alegre & Ferrer-Esteban, 2010; Caldas & Bankston, 1997; Dumay & Dupriez, 2007; Willms, 1986), and the effects of ethnic composition (Dronkers & Levels, 2007; Hanushek et al., 2009). The results of these studies have led to a main conclusion: students’ performance declines when school tends to concentrate students with low socioeconomic status, low academic skills and non-native students (being true the opposite).

On the other hand, even research on ability composition highlights significant results, from both a pedagogical point of view and education policy approaches. Although findings indicates that the level of effectiveness increases for students distributed in groups with higher skills, it also underlines how the effect for students of low academic profile might be even more intense: typically, grouping highly skilled students leads to moderate positive effects, while the concentration of low ability students has a strong negative impact (De Fraine et al., 2003; Hoffer, 1992). Although, by way of contrast, there are studies that find little evidence that grouping has differential effects across students with diverse ability levels (Betts & Shkolnik, 2000), it is worth underlying that studies generally suggest that class effect is larger for low achievers than for high achievers, that is, low ability students are more school and class dependent, probably due to poorer personal resources (De Fraine et al., 2003).

The interpretation of the effects of social composition on performance can be addressed by two complementary approaches from two different disciplines: sociology of education and pedagogy. Taking into account the potential effect of social resources, from sociological literature it has been suggested that the effect of segregation may reduce the social network, limiting personal expectations and encourage the ‘contagion’ of values and behaviours that discourage learning and knowledge (Brännström, 2008; Jencks & Mayer, 1990). In fact, as stated by Gorard and Cheng (2011), *there is very little good evidence internationally that having pupils with similar characteristics clustered in the same schools produces any improvement in overall levels of attainment*. From a pedagogical perspective, several studies have highlighted the benefits of the

heterogeneity of students within classes. In this sense, the authors pointed out that interactions in heterogeneous environments of learning can enhance cognitive restructuring, problem-solving skills and other forms of high-level thinking (Wilkinson & Fung, 2002) as well as facilitating the development of teaching methods based on the personalization of education and the positive interdependence among peers (Johnson & Johnson, 2009; Slavin, 1990, 2010). In addition, research findings on composition factors have pointed out their indirect influences on academic progress, insofar as they affect the probability that differential instruction and learning occur (Hattie, 2002). In this respect, equity issues rises to the extent that direct effects are related to expectations effects by teachers and other participants such as students themselves, parents and principals (Hattie, 2002).

RESEARCH QUESTIONS

In accordance with the above, one would assume that lower secondary school has the responsibility, to a great extent, to either create or enlarge social inequalities among students in getting benefit from education. One could also presume that lower secondary has become the stage from which social inequalities are projected to the next academic stages. From the beforementioned findings, one could attribute part of the responsibility to the family background of students, while another part could be attributed to the expectations (of parents and teachers) towards the tracked structure of the upper secondary. In addition, the Italian education system accounts for a great territorial complexity, which translates into an enlargement of differences and education inequalities among regions and macro-areas. Nevertheless, to date there is little empirical evidence about both management practices that can contribute to either reproducing or overcoming inequalities in this specific education stage, and territorial differences beyond the north-south divide.

So the main purpose of this paper is to analyse the effect of territorial inequalities on educational opportunities in the Italian lower secondary school. In this framework, the research strategy means to respond to two general questions: first, to what extent territorial factors related to education system's management and configuration are affecting student performance, even after accounting for the well-documented structural and economic differences among the large Italian geographical aggregates? And second: starting from the assumption that some territorial factors may lead to better academic standards, to what extent higher levels of performance can be associated to a more equitable distribution of education benefits, that is, to what extent there is not a *trade-off* between effectiveness and equity in the Italian education system?

In order to respond to these two main questions, this paper focuses on some factors at territorial level, which have been hypothesized to have an impact on academic performance. First, since employment conditions of teachers may have an important effect on quality teaching, this paper tries to explore to what extent the territorial differences with regard to the rate of teachers in precarious employment may explain lower students' scores. Second, as mentioned above, school policies to allocate students

among classrooms can lead to either more socially homogeneous or heterogeneous learning environments. Since non-random allocation can be made on the basis of students' abilities, and students' performance is highly related to their family background, this practice may effectively become a policy of within-school social segregation. At this point, the questions pursued in this work are: how does this segregating practice between classrooms affect the overall level of the system's effectiveness? To what extent more socially heterogeneous learning environments can lead to more effective lower secondary schools? And last, but not least, the uneven distribution of students between schools according to their social background can contribute to explain education inequalities among students. In this sense, this paper means to answer the following question: how and to what extent does an equitable allocation of students among schools at province level have a significant role in explaining differences in terms of educational effectiveness?

DATA AND METHODS

The INVALSI student performance dataset

Since 2007, the Italian National Institute for the 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 students' performance of grades 2, 5 and 6 every academic year. According to the Italian education system structure, these grades correspond, respectively, to grades 2nd and 5th of Primary Education, and 1st grade of Lower Secondary Education. While in the academic year 2008-2009 participation in the survey was voluntary and each school decided whether to join or not, for the school year 2009-2010 the National survey involved all schools and all classes⁴. Specifically, the 2009-10 Survey involved approximately 9.600 schools and 1.715.000 students⁵. For the purposes of this paper, the estimation models constructed covered 475.743 first year students of lower secondary education from 5.790 middle schools, spread over 103 Italian provinces.

The evaluation survey focuses on reading and mathematics competences, and tests were elaborated according to curricular objectives of each grade, as well as taking into account several frameworks from international evaluation surveys (IEA-PIRLS and OECD-PISA for reading, and IEA-TIMSS, OECD-PISA and NCTM for maths)⁶. The present research focuses its attention on reading competence in Italian, which was

⁴ Participation in the survey was stated by the Italian Ministry of Education: "Circolare ministeriale n. 86 del 22 ottobre 2009, prot. n. 10825 - Servizio nazionale di valutazione - Rilevazione degli apprendimenti - Anno scolastico 2009/2010".

⁵ For further information on technical issues, please see the INVALSI full report, which provides a framework on organisation, sampling and survey instruments, and presents preliminary results. Other documentation can be found in the INVALSI website: <http://www.invalsi.it/snv0910>

⁶ For specific information on framework construction of INVALSI tests (in Italian), please see "Quadro di riferimento di Italiano" (http://www.invalsi.it/snv0910/documenti/Qdr_Italiano.pdf), and "Quadro di riferimento di Matematica" (http://www.invalsi.it/snv0809/documenti/QdR_Matematica.pdf)

structured into three main sections: 1) reading comprehension of a narrative text, 2) reading comprehension of expository text, and 3) grammatical knowledge and skills. Furthermore, useful administrative data on personal, family and academic background of students was collected: sex, age, occupational status and educational level of parents, immigration background, and grade retention.

Variables and measures

The dependent variable is the students' academic achievement in reading in the 1st grade of lower secondary education, which was calculated from 58 items of the reading test, and expressed as the proportion of correct answers for each student.

As to control measures, we use variables at individual, school and province level. Regarding student background, we use variables related to demographic profile (gender and immigrant background), family background (economic, social and cultural status, ESCS) and academic progress (grade retention). The ESCS index has been derived from three indices: highest occupational status of parents, highest educational level of parents, and number of books at home. At school level, we consider the proportion of students being female, withdrawing one or more grades, and having immigration background. All this information has been aggregated at school level from individual data. Moreover, we have calculated the school average of students' ESCS, and constructed *dummies* variables to distinguish between whether schools are allocated in metropolitan areas or not. As control factors at province level, we use the GDP per capita as a *proxy* of level of territorial development, and both the proportion of non-native students and students who dropped-out the academic career as territorial composition factors⁷. Finally, we also use *dummies* variables to separately account for fixed effects of macro-area and region of residence⁸.

Concerning explanatory factors related to management of the education system, the empirical model will analyse three aggregated factors at province level. First, we are interested in analyzing to what extent labour conditions of teachers have an impact on performance of students. As a proxy of labour conditions, we use the aggregated proportion at province level of teachers of lower secondary with precarious working conditions⁹. In addition, we will use two indicators of social segregation between-classes and between-schools in order to observe territorial differences and its impact on academic achievement. To impute those variables of social segregation at provincial level, we calculated the variance component of the individual ESCS index for all Italian provinces. A fully unconditional three-level model (1) allows us to observe the variation of the outcome measure allocated across the three levels (students,

⁷ Several provincial factors were imputed from other sources into the Invalsi dataset. GDP per capita was

⁸ For more specific information on control variables included in the analysis, see descriptive statistics in Table 5 (Appendix)

⁹ Source: "2° Rapporto Tuttoscuola sulla qualità della scuola". (<http://www.tuttoscuola.com>)

classrooms and schools). The unconditional model partitions the total variability of the outcome into three components: variance between students within classrooms, variance between classrooms within schools, and variance between schools. It is expressed as

$$\begin{aligned} ESCS_{ijk} &= \pi_{0jk} + \varepsilon_{ijk} \\ \pi_{0jk} &= \beta_{00k} + r_{0jk} \\ \beta_{00k} &= \gamma_{000} + u_{00k} \end{aligned} \quad (1)$$

where, at student level, $ESCS_{ijk}$ is the socio-cultural and economic status of student i in class j in school k ; π_{0jk} is the ESCS mean of class j in school k ; and ε_{ijk} is the deviation of the ESCS of student ijk from the classroom mean (random ‘student effect’). At class level, β_{00k} is the ESCS mean of school k , and r_{0jk} is the deviation of the ESCS mean of class jk from the school mean (random ‘classroom effect’). Finally, at school level, γ_{000} is the grand mean, while u_{00k} is the deviation of the ESCS mean of school k from the grand mean (random ‘school effect’).

As a measure of social segregation within and between schools, we use variance components of both level 2 (between classes within schools, τ_π) and level 3 (between schools, τ_β), respectively. To the extent that variance of ESCS between classrooms is high, it will mean that there is more heterogeneity among different classes within the same school. That is, classes are socially more homogeneous because students with similar social background tend to be allocated into the same learning environment. Moreover, to the extent that ESCS variance between schools is high, that will mean there is more heterogeneity among schools, which, in turn, tend to aggregate students with the same social profile. Both indicators of between-class and between-school segregation are calculated for every Italian province and imputed as explanatory factors into the main empirical model. As can be deduced, the aim of using this *proxy* of social segregation is not observing the measure to which schools and classrooms have a high or low social composition, but merely to know the extent to which both schools and classes within schools are socially dissimilar.

The unconditional three-level model also allows us to estimate the proportion of the ESCS variation within classes, between classes within schools, and between schools. To get a comparative descriptive framework among provinces, the between-classes and between-schools variance of socioeconomic status was calculated as a percentage of the variance average between-classes and between-schools across all Italian provinces. It allows us to observe to what extent provinces are differentiated in terms of social segregation within and between schools, and it is calculated as follows

$$\tau_\pi / (\sigma^2 + \tau_\pi + \tau_\beta) \quad (2)$$

$$\tau_\beta / (\sigma^2 + \tau_\pi + \tau_\beta) \quad (3)$$

where σ^2 , τ_π and τ_β are the variance components of levels 1st, 2nd and 3rd, respectively. Equation (2) is the proportion of variance between classrooms within schools, while equation (3) is the proportion of variance between schools within provinces.

Specification of the education production functions

The education production function proposed uses province-level data to analyze to what extent some territorial factors are related to students' achievement. Many researchers have used aggregated data to study determinants on performance. Nevertheless, as stated by Wößmann (2003) in his study on schooling resources and educational institutions, we consider that student level is the most relevant to estimate effects, as it is directly related to learning environment and processes. In this sense, the estimation of microeconomic production functions allows us to account for individual background, school level characteristics, and territorial development factors, in order to observe the impact of education system management on individual students' performance.

On the other hand, to avoid problems related to the assumption of independence of observations by disaggregating both school and territorial variables to the individual, we have modelled student performance accounting for the hierarchical structure of data (Raudenbush & Bryk, 2002): multilevel regression analysis takes account of the fact that students are nested within larger level-2 units of schools, which in turn are nested within larger level-3 units of provinces. Instead of an equation to calculate the overall data, the multilevel regression analysis estimates a regression equation for each larger unit. Such analysis has been implemented to link individual performance to variables at student, school and province level. Therefore, in order to estimate to what extent territorial factors can have an effect on performance, we have simultaneously accounted for differences between macro-areas (North-South gradient) and differences within macro-areas, that is, heterogeneity at province level.

To present and discuss the results in an intuitive way, models have been constructed using a *step-by-step* approach (Raudenbush & Bryk, 2002), starting from a fully unconditional model, continuing with the addition of individual and school-level variables, to the selective inclusion of aggregated factors at territorial level. This approach has allowed us to observe and interpret eventual changes in the direction and strength of associations. As realized by Bratti et al. (2007), we have estimated the models accounting for macro-areas at third level. Separately, we have also estimated the effects controlling for region fixed effects. Both procedures have allowed us to capture unobserved effects that are common within macro-areas and regions. In this way, we have been able to set out to what extent observed effects of aggregated factors at province level either explain differences between provinces within the same macro-area (or region) or, otherwise, follow a North-South gradient. That is, whether province factors show provincial effects or not.

Firstly, in order to assess the impact of explanatory factors in how provinces are differentiated, it is necessary to know how variation of the outcome measure is allocated in the third level. For this purpose, the first modelling step consists in calculating the proportion of variation in reading scores at province level, which is expected to be explained by aggregated factors, imputed at territorial level. The fully unconditional model, which allows partitioning the total variability into three variance components

(within-schools, between-schools and between-provinces), will give us such information. It is expressed as follows:

$$\begin{aligned} reading_{ijk} &= \pi_{0jk} + e_{ijk} \\ \pi_{0jk} &= \beta_{00k} + r_{0jk} \\ \beta_{00k} &= \gamma_{000} + u_{00k} \end{aligned} \quad (4)$$

where, at student level, $perform_{ijk}$ is the academic performance of student i in school j in province k ; π_{0jk} is the performance mean of school j in province k ; and e_{ijk} is the deviation of the performance of student ijk from the school mean (random ‘student effect’). At school level, β_{00k} is the performance mean of province k , and r_{0jk} is the deviation of the performance mean of school jk from the province mean (random ‘school effect’). Finally, at province level, γ_{000} is the grand mean, while u_{00k} is the deviation of the performance mean of province k from the grand mean (random ‘province effect’).

Secondly, in order to model performance as a function of territorial variables, accounting for individual and school variables, as well as other territorial composition factors, an education production function has been realized. The production function can be represented by a general structural model at each level:

$$reading_{ijk} = \pi_{0jk} + \pi_{1jk}a_{1ijk} + \pi_{2jk}a_{2ijk} + \dots + \pi_{pjk}a_{pijk} + e_{ijk} \quad (5)$$

$$\pi_{pjk} = \beta_{p0k} + \sum_{q=1}^{Q_p} \beta_{pqk}X_{qjk} + r_{pjk} \quad (6)$$

$$\beta_{pqk} = \gamma_{pq0} + \sum_{s=1}^{S_{pq}} \gamma_{pqs}W_{sk} + u_{pqk} \quad (7)$$

In a general level-1 model (5), students’ performance is modelled as a function of predictors at student level and a random student-level error, where Y_{ijk} is the performance of student i in school j and province k // π_{0jk} is the intercept for school j in province k // a_{pijk} are $p=1, \dots, P$ students’ characteristics to predict performance. π_{pjk} are the level 1 coefficients (association between students’ background and outcome in school j in province k) // e_{ijk} is the random effect of level 1 (residual student effect).

To model for variation between schools within provinces we use a general level-2 model (6), where each school effect π_{pjk} is modelled as a function of predictors at school level plus a random error. There are $P+1$ equations, one for each level-1 coefficient, and random effects in these equations are assumed to be correlated. In this level-2 model, β_{p0k} is the intercept term for province k // X_{qjk} is a school characteristic to predict the school-effect π_{pjk} (each π_p may have a unique set of predictors, $q=1, \dots, Q_p$) // β_{pqk} is the coefficient representing the association between school characteristics X_{qjk} and π_{pjk} // r_{pjk} is a level-2 random effect.

Finally, to model for variation between provinces we use a general level-3 model (7), where province effect β_{pqk} is predicted by aggregated indicators at territorial level. For each province there are

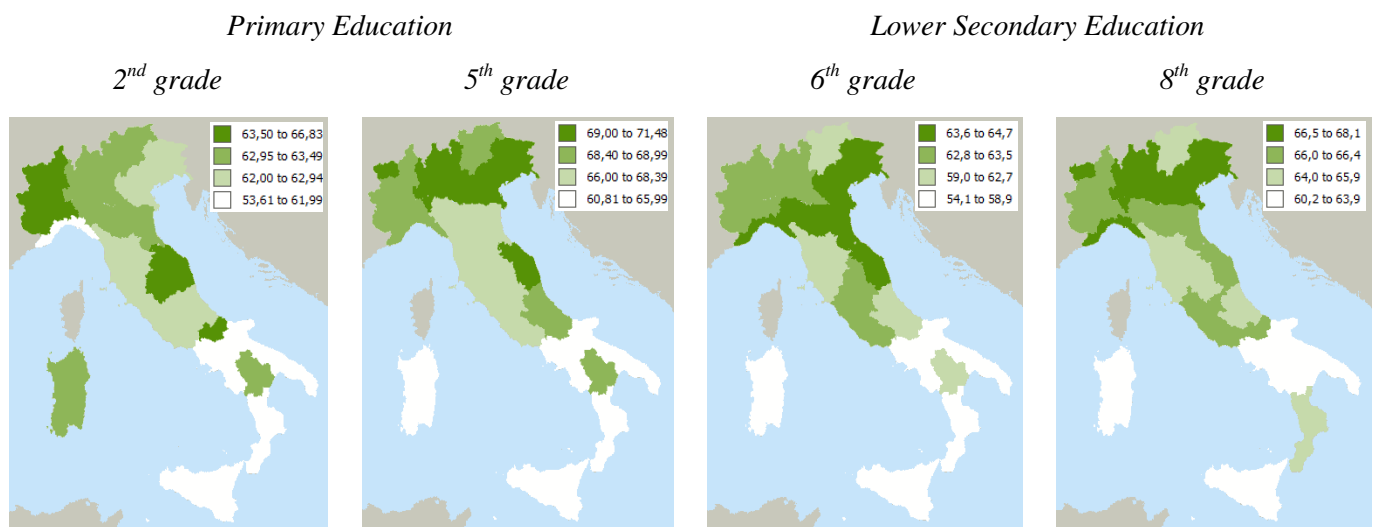
$\sum_{p=0}^P(Q_p + 1)$ equations. In this level-3 model, γ_{pq0} is the intercept in the province level for $\beta_{pqk} // W_{sk}$ is a territorially aggregated characteristics to predict the province effect // γ_{pqk} is the coefficient representing the association between province characteristics W_{sk} and $\beta_{pqk} //$ and u_{pqk} is a level-3 random effect.

RESULTS: TERRITORIAL INEQUALITIES IN THE ITALIAN EDUCATION SYSTEM

The Italian North-South divide: factors of territorial development

As mentioned above, many researchers have already pointed out the North-South divide of the Italian education system in terms of educational effectiveness. Figure 1 illustrates a simple measure of performance by region, expressed as the average reading scores across the compulsory education system. It clearly depicts the traditional territorial divide, in which regions from the South and the Islands systematically show compared lower reading scores, while northern territorial aggregates are characterized by higher levels of performance at all stages in the school system. Simultaneously, differences of reading scores are attenuated between northern and central regions and, in turn, the results of north-eastern regions are slightly higher than those of north-western regions.

Figure 1. Average of correct answers in reading in grades 2, 5, 6 and 8, by region



Further analyses to obtain how territorial location of residence has an impact on performance can be realized estimating the effect of macro-area fixed effects, after accounting for territorial development factors. Table 1 shows how living in the North makes a difference in terms of academic standards, gross and net of territorial development factors at province level. First, we can observe how economic development factors seem to have a significant impact on performance: students located in provinces with high development levels, tend to achieve better academic results.

However, although we can observe that province GDP per capita explains part of outcomes' variance between provinces, its effects disappear after controlling for macro-areas fixed effects (-79%). This means that province GDP does not explain differences between provinces within the same territorial aggregate, but respond to differences among the territorial aggregates. That is, province GDP accounts for the heterogeneity between macro-areas, which in turn are internally homogeneous in terms of development. This indicates that local GDP is not a provincial effect and follows the North-South gradient, which can be confirmed when observing the net effect of macro-areas: the extent to which as we move down through Italian geography, from the North to the South and the Islands, the likelihood to obtain high academic results decreases.

Table 1. Territorial development and performance

<i>Territorial fixed effects</i>		Coef.	Coef.	Coef.
Province GDP			1.88*** [0.23]	0,39 [0.29]
Macro-area of residence (*)	North-West	0.29 [0.29]		0.33 [0.31]
	Centre	-0.99*** [0.33]		-0.79** [0.37]
	South	-3.20*** [0.65]		-2.58*** [0.66]
	South and Islands	-4.89*** [0.74]		-4.21*** [0.73]

Sig. *** p < .01; ** p < .05; * p < .10

Note: Conditional regression models at three levels: students, schools and provinces. Dependent variable: reading scores. Final estimation of fixed effects with robust standard errors in brackets. Control variables: individual, school and province variables (appendix, table 6). (*) Reference geographic area: North-East.

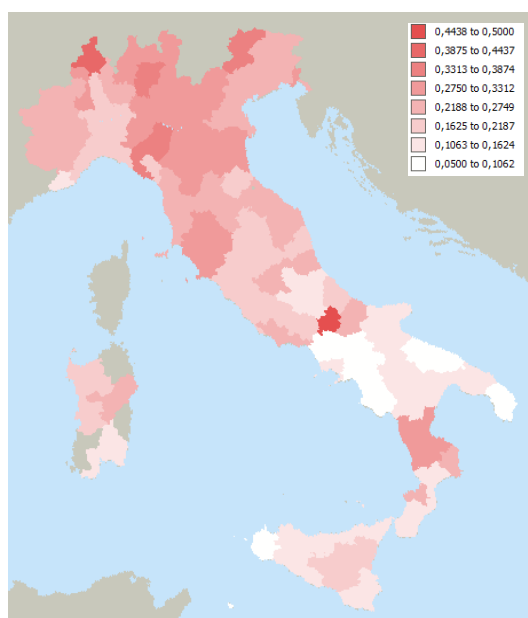
Factors of education system management on performance

In accordance with the above results, it is worth noting that development levels (resource investments, employment, wealth...) contribute to explain differences in the North-South axis, but do not help to understand schools' effectiveness differences between provinces within the same macro-area. This section has the specific scope to disentangle territorial factors showing an explanatory power in explaining education effectiveness, beyond both the social composition of provinces (GDP) and the territorial development level of the country (macro-areas *dummies*). All the factors imputed in the analysis, which are expected to explain territorial heterogeneity, can be faced with education policies at different levels: precarious employment of teachers (policies on school system administration), social dissimilarity between schools (policies on student allocation across schools), and social heterogeneity between classes (school policies on student allocation across classrooms).

Precarious employment of teachers

First, it is relevant to show a descriptive picture of the precarious teachers' rate across all the Italian provinces. As can be seen in figure 2, the map illustrates a well defined North-South pattern, in which labour uncertainty rate is concentrated largely in the northern and central regions, while the South shows a relatively small proportion of teachers with temporary contracts. Here one could plausibly believe the interaction between the highest demands of teachers' jobs observed in the North, and the structural possibilities to assume teaching staff by the educational administration. Whatever the case, it is worth taking into account this phenomenon to understand the associations presented in the estimation models below.

Figure 2. Rate of teachers in precarious employment, by province



The association between the index of teachers in precarious employment in lower secondary across the provinces, and the individual performance of students is illustrated in table 2. Specifically, three coefficients are presented. The first one represents the direct effect of the index, net from individual background variables and school composition factors, but not from other contextual factors (a). The other two indices represent the estimated value of the index once the heterogeneity between macro-areas and between regions is accounted for (c). The first result, which could be presumed as ostensibly counterintuitive, indicates that students attending schools in provinces with high rates of precarious teachers tend to obtain higher marks in reading. However, since no geographical control has yet been accounted for, one can intuitively attribute this association to a 'North effect', to the extent that it is in the northern areas where students obtain higher marks in the INVALSI tests.

Indeed, the positive association between job insecurity of teachers and performance becomes significant and negative after considering all variables of geographic location and economic development of provinces. The fact that this effect is significant, net belonging to either certain macro-areas or regions, indicates that this index of teachers in precarious employment does not meet the north-south axis, but it is a cross-province factor associated with performance across the entire country. Effectiveness differentials of schools among provinces within the same macro-area can be explained by a different impact of teachers with temporary contracts. In other words, the problem of teachers' job insecurity, even if it takes place in a low percentage, may be negatively associated with learning depending on the province in which students live.

Hypotheses for explaining such an association could be several. Factors such as temporality, job insecurity, and higher rates of turnover of precarious teachers may be behind the negative effect observed on learning. As stated in the background section, the length and stability of employment of teachers are positively related to factors that affect either indirectly or directly on learning, such as teachers' self-efficacy and classroom positive disciplinary climate (OECD, 2009). Moreover, a number of studies have widely confirmed the impact of teachers' mobility on both educational discontinuity and staffing composition between schools, with evident consequences on teaching quality (Boyd et al., 2008; Boyd et al., 2005; Rivkin et al., 2005). These explanations could very likely be applied to the Italian context, since teachers' mobility is widely extended, above all among teachers with temporary contracts (Fondazione G. Agnelli, 2009).

Table 2. Territorial differences and precarious teachers

<i>Territorial factors</i>	[a] Coef.	[b] Coef.	[c] Coef.
Precarious teachers	0.96*** [0.34]	-0.35** [0.162]	-0.61*** [0.184]
Macro-areas fixed effects	No	Yes	No
Regions fixed effects	No	No	Yes

Sig. *** p < .01; ** p < .05; * p < .10

Note: Conditional regression models at three levels: students, schools and provinces. Dependent variable: reading scores. Final estimation of fixed effects with robust standard errors in brackets. Control variables: individual, school and province variables (appendix, table 6).

School social segregation

As in the previous section, a starting point to analyze social dissimilarity between schools in Italy is to illustrate in what way it is present across the Italian provinces. As can be seen in figure 3, there is no territorial pattern according to the North-South territorial axis, but a pattern related to the presence of metropolitan areas in the

provinces with the highest levels of school social segregation. Specifically, among the top twenty provinces, with a higher rate of school segregation, eleven of the fifteen provinces with a metropolitan area are found: Naples, Catania, Palermo, Trieste, Rome, Genoa, Milan, Bari, Turin, Messina, and Bologna. In fact, this assumption can be confirmed when the differences of between-school variance of students' socioeconomic status in provinces with and without metropolitan areas are observed. As can be seen in figure 4, provinces accounting for metropolitan areas present a mean of between-school variance statistically different from those provinces with no large urban aggregates.

This phenomenon is not surprising if we reflect on the main causes that can lead schools to have both a homogeneous social composition and, in turn, to be differentiated with respect to other schools. Indeed, some studies have already confirmed how school placement in large urban areas interact with the reasons behind school stratification, such as residential stratification (Taylor & Gorard, 2001), open school choice (Allen, 2007), and the –often covert- selection of students in school admissions (*cream-skimming*) (West et al., 2004). It is worth considering this result for further analyses, since we will need to account for school location to disentangle the net effects of school social segregation on the students' results.

Figure 3. Between-school variance in students' socioeconomic status as a percentage of the average between-school variance across the Italian provinces

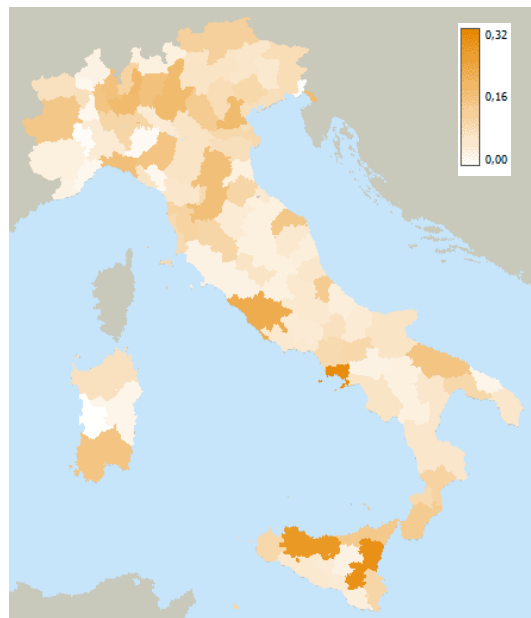
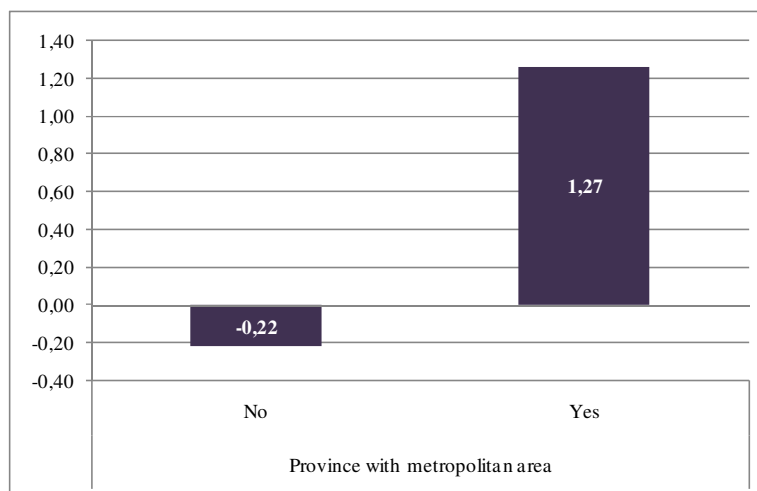


Figure 4. Standardized mean of between-school variance in students' socioeconomic status and metropolitan area



Note: mean difference statistically significant (1%)

At this point, we present the regression coefficients which indicate, to what extent, the level of social dissimilarity between schools of provinces is related to educational effectiveness. In table 3 below, we partially replicate the procedure applied in the former section on precarious employment of teachers, but showing also the estimated coefficient with and without the metropolitan location of schools: first we show the direct effect on performance of the index, without controlling for either geographical or metropolitan location fixed effects (column *a*); secondly, effects of between-school social segregation are shown, net from school location in metropolitan areas (*b*); in addition, we control for macro-areas fixed effects, gross and net from metropolitan location of schools (*c* and *d*); and finally, we account for regions fixed effects, again gross and net from location of schools (*e* and *f*).

Table 3. Territorial differences and school social segregation

<i>Territorial factors</i>	[a] Coef.	[b] Coef.	[c] Coef.	[d] Coef.	[e] Coef.	[f] Coef.
School social segregation	-0.41** [0.18]	-0.34* [0.19]	-0.31** [0.19]	-0.25* [0.13]	-0.16 [0.10]	-0.10 [0.11]
Metropolitan area fixed effect	No	Yes	No	Yes	No	Yes
Macro-areas fixed effects	No	No	Yes	Yes	No	No
Regions fixed effects	No	No	No	No	Yes	Yes

Sig. *** $p < .01$; ** $p < .05$; * $p < .10$

Note: Conditional regression models at three levels: students, schools and provinces. Dependent variable: reading scores. Final estimation of fixed effects with robust standard errors in brackets. Control variables: individual, school and province variables (appendix, table 6).

At a glance we observe that the allocation of students among schools based on their socioeconomic status is strongly and negatively associated with performance, gross from both school location and geographical fixed effects. As observed in column *b* and *c*, the coefficient loses some strength but remains significant after accounting, separately, for both metropolitan areas and macro-areas fixed effects. In addition, the coefficient keeps its significance on performance, even when controlling for both indicators jointly. However, this last model confirms what has been hypothesized above, that is: no matter the macro-area of residence of students, the higher the social dissimilarity between schools in a province within the same macro-area, the worse the pupils' academic results.

In the above cases, it is worth noting how the significance of the coefficient is attenuated when controlling for macro-areas fixed effect, which points out that to some extent, school segregation has a territorial component. At this point, as a robustness check, we have included another geographical control, such as the regions fixed effect. The results of these models are, at the very least, illuminating. The coefficients in columns *e* and *f* show that, when controlling for regions fixed effects, the significance of the coefficient disappears. Indeed, the explanatory power of the index is essentially captured by the heterogeneity between regions, which in turn tends to be basically homogeneous in terms of school stratification: more than a provincial effect, we should talk of a *cross-regional* school segregation effect.

Social dissimilarity among classrooms within schools

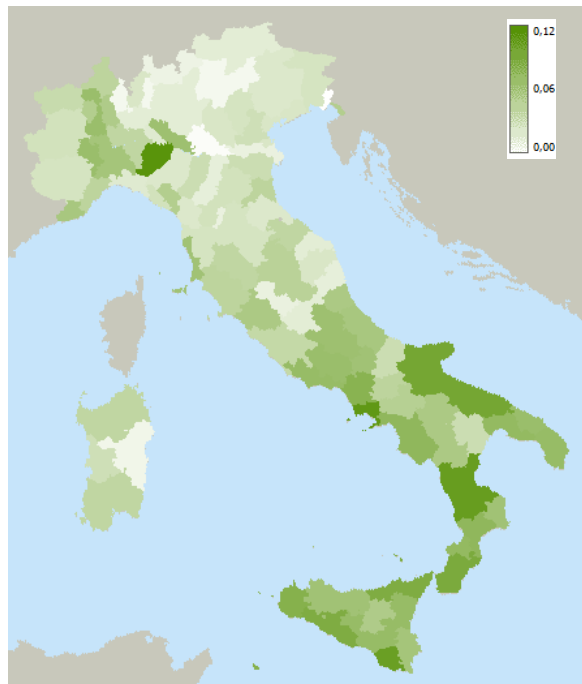
To study *informal tracking* practices in schools, we should start with a prior assumption: since we have no information on specific reasons behind students distribution across classes (such as family pressures, pedagogical decisions, teachers' expectations...), we cannot assume that *informal tracking* is equivalent to 'social selection': as stated in the background section, since students' performance is highly related to their social origin, classes may have been formed by aggregating students with a homogeneous level of academic abilities.

The analysis of the between-classes variance of students' socioeconomic status allows us to study the composition effect at the closest level to students: the teaching and learning environment taking place within classrooms. Moreover, to be focused on social status variance allows us to assess, in a particular way, the practices of selection and non-random distribution of students across classes: insofar as social status refers to an ascribed characteristic of student (*input* variable to the lower secondary) and not to a factor of academic ability (*output* variable), it enables us to avoid problems of statistical bias stemming from eventual practices of *cheating*.

As realized before, we firstly show the Italian geography illustrating the proportion of between-class variance according to social background. As seen in figure 5, there exists a clear pattern of territorial distribution that responds to a north-south gradient: while

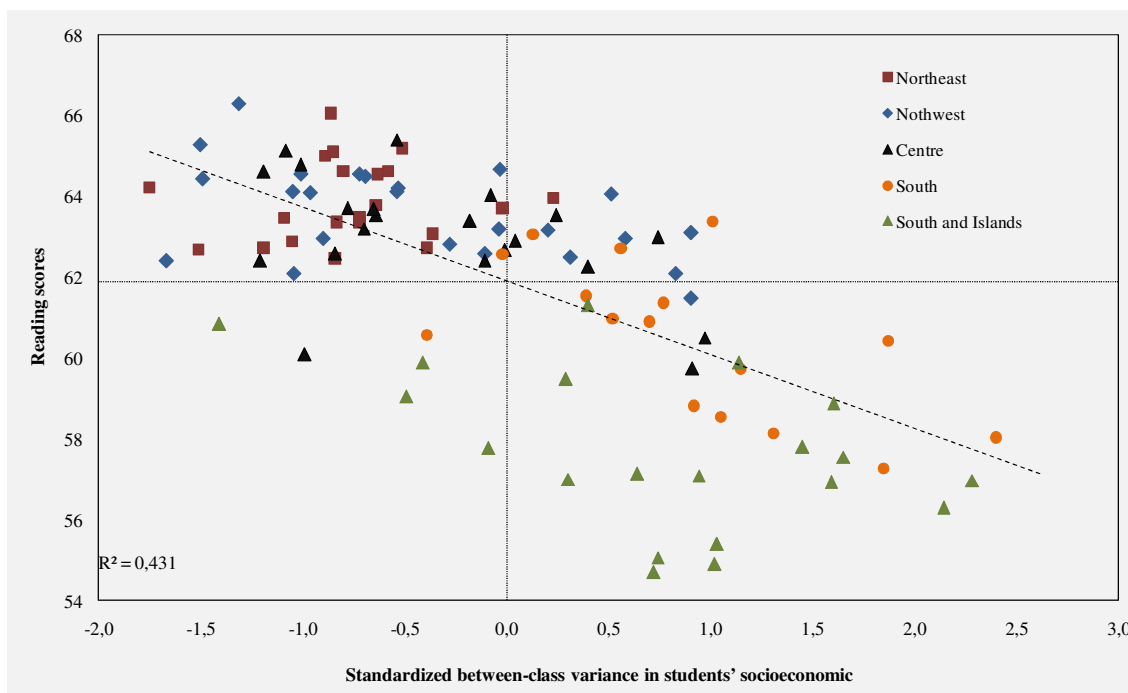
the southern provinces generally present a higher social variability between classrooms, most of the northern and central provinces tend to minimize it. Indeed, this chart shows how the formal equity principle to arrange students' distribution across classes is widely disregarded: in the South, but also in some provinces in the North, schools tend to create classes socially homogeneous and, therefore, socially heterogeneous among them.

Figure 5. Between-class variance in students' socioeconomic status as a percentage of the average between-class variance across the Italian provinces



Since southern provinces present higher rates of social dissimilarity between schools, one should expect that the association between this factor and performance will be significant and negative. The first step to be taken in order to understand such a relationship is to regress the reading scores on the between-class variance of socioeconomic status. As illustrated in figure 6, the line slope tells us that at any latitude there exists a negative association between informal tracking and performance, even in presence of manifest education effectiveness differences across the national territory.

Figure 6. Between-class variance in students' socioeconomic status and reading scores at province level



Nevertheless, a net negative association of between-class variance with scores can be true to the extent that it is an effect not only mediated by the territorial distribution of academic performance, from the North to the South. Taking this into consideration, it is worth estimating the net effects of such index in order to disclose whether this phenomenon responds only to the mentioned territorial pattern, or whether it explains the differences between provinces within the largest territorial aggregates. Estimated values showed in table 4 help to unravel such relationships.

Table 4. Territorial differences and social dissimilarity among classrooms

<i>Territorial factors</i>	[a]	[b]	[c]
	Coef.	Coef.	Coef.
Classroom social segregation	-0,62*** [0,18]	-0,63*** [0,17]	-0,37** [0,15]
Macro-area fixed effects	No	Yes	No
Region fixed effects	No	No	Yes

Sig. *** p < .01; ** p < .05; * p < .10

Note: Conditional regression models at three levels: students, schools and provinces. Dependent variable: reading scores. Final estimation of fixed effects with robust standard errors in brackets. Control variables: individual, school and province variables (appendix, table 6).

First we can substantiate that practices of non-random allocation of students across classrooms on the basis of their social background is strongly associated with an overall decrease in educational effectiveness, gross from any control of students' location of residence (column *a*). However, even accounting for both geographical factors (macro-areas and regions), the coefficient remains significant and negatively associated with performance (*b* and *c*). This effect seems to be partially attenuated when including the region fixed effect, that is, when taking into account heterogeneity among regions. Attending to both results with geographical fixed effects, we can confirm what was advanced previously: independently from the geographical province location, the more schools tend to split pupils in a non-random way across classes at province level, the worse the overall academic performance of students.

By our analysis, we are unable to know the reasons behind practices of tracking students. Neither can we know whether the negative association with students' performance is due to direct effects of social composition factors, or whether they are indirect effects mediated by unequal levels of quality teaching and instruction. However, results allow us to affirm that separating students according to their socioeconomic status (probably derived from ability grouping practices) is observed to adversely affect the reading scores of students. As pointed out in the background section, these results seem to give support to what was stated in the background section: students' performance declines when school tends to concentrate students with either low socioeconomic status or low academic skills (Alegre & Ferrer-Esteban, 2010; Caldas & Bankston, 1997; De Fraine et al., 2003; Dumay & Dupriez, 2007; Opdenakker & Van Damme, 2001; Willms, 1986). In this respect, we should confirm that in the case of the Italian lower secondary school, there is not a *trade-off* between effectiveness and equity, but both dimensions are complementary and should be jointly fostered.

Conclusions

The evidences presented in this paper might constitute a valuable source to inform education policies focused on the management of the school system. As indicated in the research questions, the main objective is double: to find significant associations between effectiveness and territorial factors focused on system's management, and to observe to what extent higher levels of performance can be associated to a more equitable education system. According to this research aim, in the following we briefly describe the main findings obtained, from which we expect that several implications to organize and manage the lower secondary school could be derived.

The first significant finding is related to employment conditions of teachers. Results show robust evidence on the impact of the rate of teachers in precarious labour conditions at province level, which is observed to be negatively associated with students' learning. This effect does not follow the regional north-south pattern, but it explains the territorial differences between provinces. In the Italian case, this effect may be associated with factors such as temporality, job insecurity, professional expectations,

and the academic interruptions that students may be subject to caused by higher levels of teachers' mobility.

In addition, the second relevant finding is related to the allocation of students across schools. The results suggest that, independently from the macro-area where schools are allocated, a distribution of students which tend to concentrate them in a socially homogeneous way in certain schools will lead to the overall academic performance tending to decline. Nevertheless, the explanatory power of the index is essentially captured by the heterogeneity between regions, which in turn tends to be basically homogeneous in terms of school stratification: beyond the North-South divide, more than the province, what fundamentally matters when it comes to assessing school social segregation is the region of residence where pupils live (presumably according to the presence of large metropolitan areas).

Finally, the more robust evidence found in this research regards the social dissimilarity between classes, which can be derived from practices of *informal tracking* within schools. The results allow us to conclude how non-random allocation of students across classrooms on the basis of their social background, aggregated at province level, is strongly associated with an overall decrease in educational effectiveness, net from the geographical location of schools. Although we are unable to determine reasons behind practices of tracking students, we can confirm that tracking students according to their socioeconomic status (most probably derived from ability grouping practices) is observed to adversely affect the reading scores of students. Moreover, we can confirm that, in the Italian lower secondary, the goal to raise the system's educational effectiveness interact reciprocally with the objective to respond effectively to the principle of equal opportunities of academic success.

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Appendices

Table 5. Descriptive statistics

Level-1 Descriptive Statistics (students)

<i>Variables</i>	<i>Obs</i>	<i>Mean</i>	<i>Std.Dev.</i>	<i>Min.</i>	<i>Max.</i>	<i>Freq.</i>	<i>%</i>
Reading scores	475743	61.71	15.21	0.00	100.00		
Female	475743	0.48	0.50	0.00	1.00	230648	48.5
Grade retention	475743	0.07	0.25	0.00	1.00	32126	6.8
Non native with non native parents	475743	0.06	0.23	0.00	1.00	27084	5.7
Native with non native parents	475743	0.03	0.18	0.00	1.00	15686	3.3
Economic, social and cultural status	475743	0.00	1.00	-2.59	2.47		

Level-2 Descriptive Statistics (schools)

<i>Variables</i>	<i>Obs</i>	<i>Mean</i>	<i>Std.Dev.</i>	<i>Min.</i>	<i>Max.</i>	<i>Freq.</i>	<i>%</i>
Proportion of low ESCS students	5790	27.14	19.57	0.00	100.00		
Aggregated students' socioeconomic status	5790	-0.01	0.48	-2.04	1.95		
Proportion of females	5790	48.15	8.21	0.00	100.00		
Proportion of grade retention	5790	7.21	6.07	0.00	100.00		
Proportion of native and non native students with non native parents	5790	9.47	9.13	0.00	95.57		
Metropolitan area	5790	0.14	0.35	0.00	1.00	817	14.1

Level-3 Descriptive Statistics (provinces)

<i>Variables</i>	<i>Obs</i>	<i>Mean</i>	<i>Std.Dev.</i>	<i>Min.</i>	<i>Max.</i>	<i>Freq.</i>	<i>%</i>	
Macro-area of residence	North-West	103	0.23	0.42	0.00	1.00	24	23.3
	North-East	103	0.21	0.41	0.00	1.00	22	21.4
	Centre	103	0.20	0.40	0.00	1.00	21	20.4
	South	103	0.16	0.36	0.00	1.00	16	15.5
	South and Islands	103	0.19	0.40	0.00	1.00	20	19.4
Proportion of dropouts	103	19.19	5.86	7.60	35.80			
Province GDP per capita	103	0.00	1.00	-1.72	2.19			
School social segregation	103	0.00	1.00	-1.52	3.80			
Classroom social segregation	103	0.00	1.00	-1.75	2.61			
Rate of precarious teachers	103	0.00	1.00	-4.19	1.14			
Aggregated students' socioeconomic status	103	0.01	0.18	-0.40	0.41			

Table 6. Step-by-step hierarchical regression analysis

<i>Fixed effects</i>	[0]	[1]	[2]	[3]	[4]	[5]	[6]	[7]	[8]	[9]	[10]
Constant	61.548*** [0.288]	62.332*** [0.274]	62.426*** [0.274]	62.420*** [0.162]	63.883*** [0.360]	63.731*** [0.364]	63.703*** [0.347]	63.660*** [0.344]	63.739*** [0.357]	64.023*** [0.274]	59.750*** [0.649]
<i>Level 3 model: provinces</i>	[0]	[1]	[2]	[3]	[4]	[5]	[6]	[7]	[8]	[9]	[10]
GDP per capita (province)				2.205*** [0.162]	0.634* [0.308]	0.536* [0.306]	0.182 [0.293]	0.288 [0.272]	0.390 [0.291]	0.390 [0.288]	0.149 [0.323]
North-West					0.106 [0.300]	0.337 [0.296]	0.316 [0.298]	0.347 [0.294]	0.334 [0.307]	0.285 [0.288]	
Centre					-0.713* [0.387]	-0.744* [0.393]	-0.776** [0.360]	-0.785** [0.356]	-0.790** [0.370]	-0.988*** [0.363]	
South					-2.735*** [0.724]	-2.513*** [0.749]	-2.322*** [0.676]	-2.163*** [0.647]	-2.583*** [0.662]	-3.196*** [0.469]	
South and Islands					-4.636*** [0.860]	-4.290*** [0.759]	-4.244*** [0.759]	-4.094*** [0.709]	-4.209*** [0.731]	-4.892*** [0.486]	
Proportion of dropouts					-0.068*** [0.020]	-0.058*** [0.019]	-0.049*** [0.019]	-0.049*** [0.019]	-0.046** [0.020]	-0.050*** [0.020]	-0.042** [0.021]
Level of classroom social segregation											
Level of school social segregation											
Rate of precarious teachers											
Region of residence fixed effects	No	No	No	No	No	No	No	No	No	No	Yes
<i>Level 2 model: schools</i>	[0]	[1]	[2]	[3]	[4]	[5]	[6]	[7]	[8]	[9]	[10]
Proportion of females											
Proportion of grade retention											
Proportion of native and non native students with non native parents											

	[0]	[1]	[2]	[3]	[4]	[5]	[6]	[7]	[8]	[9]	[10]
Proportion of low ESCS students		-0.016*** [0.005]	-0.015*** [0.005]	-0.015*** [0.005]	-0.015*** [0.005]	-0.015*** [0.005]	-0.015*** [0.005]	-0.015*** [0.005]	-0.015*** [0.005]	-0.015*** [0.005]	-0.015*** [0.005]
Metropolitan area		-0.796* [0.464]	-0.860* [0.464]	-0.829* [0.473]	-0.837* [0.462]	-0.819* [0.461]	-0.771* [0.470]	-0.782* [0.468]	-0.768 [0.469]	-0.745 [0.477]	
<i>Level 1 model: students</i>											
Female		1.189*** [0.064]	1.187*** [0.063]	1.187*** [0.063]	1.187*** [0.063]	1.187*** [0.063]	1.187*** [0.063]	1.187*** [0.063]	1.187*** [0.063]	1.187*** [0.063]	1.187*** [0.063]
Grade retention		-8.721*** [0.111]	-8.656*** [0.110]	-8.657*** [0.110]	-8.657*** [0.110]	-8.657*** [0.110]	-8.657*** [0.110]	-8.657*** [0.110]	-8.657*** [0.110]	-8.657*** [0.110]	-8.657*** [0.110]
Non native with non native parents		-7.861*** [0.411]	-7.851*** [0.411]	-7.852*** [0.411]	-7.852*** [0.411]	-7.852*** [0.411]	-7.852*** [0.411]	-7.852*** [0.411]	-7.852*** [0.411]	-7.852*** [0.411]	-7.852*** [0.411]
Native with non native parents		-4.933*** [0.275]	-4.911*** [0.269]	-4.912*** [0.269]	-4.911*** [0.269]	-4.911*** [0.269]	-4.912*** [0.269]	-4.912*** [0.269]	-4.912*** [0.269]	-4.912*** [0.269]	-4.912*** [0.269]
Economic, social and cultural status		3.576*** [0.055]	3.556*** [0.055]	3.555*** [0.055]	3.554*** [0.055]	3.554*** [0.055]	3.554*** [0.055]	3.554*** [0.055]	3.554*** [0.055]	3.554*** [0.055]	3.554*** [0.054]
<i>Random effects</i>											
Students	475743	475743	475743	475743	475743	475743	475743	475743	475743	475743	475743
Schools	5790	5790	5790	5790	5790	5790	5790	5790	5790	5790	5790
Provinces	103	103	103	103	103	103	103	103	103	103	103
Var. prop. attributed to students	88.33										
Var. prop. attributed to schools	8.32										
Var. prop. attributed to provinces	3.35										
Within-schools variance explained	12.37	12.37	12.37	12.37	12.37	12.37	12.37	12.37	12.37	12.37	12.37
Between-schools variance explained	33.16	36.80	36.84	36.88	36.88	36.88	36.89	36.90	36.89	36.87	36.95
Between-provinces variance explained	15.16	14.16	74.48	84.71	86.16	88.55	89.09	89.99	89.99	89.88	94.80