STUDENT ACHIEVEMENT IN A CROSS-COUNTRY PERSPECTIVE: A MULTILEVEL ANALYSIS OF PISA 2006 DATA FOR ITALY AND SPAIN

TOMMASO AGASISTI
JOSE MANUEL CORDERO-FERRERA

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STUDENT ACHIEVEMENT IN A CROSS-COUNTRY PERSPECTIVE: A MULTILEVEL ANALYSIS OF PISA2006 DATA FOR ITALY AND SPAIN

Tommaso Agasisti*
Jose Manuel Cordero-Ferrera*

Abstract

In this paper, we applied a multilevel analysis to the OECD-PISA2006 data with the aim to compare factors affecting students' achievement across Italy and Spain. The cross-country comparison appears as useful given the increasing role of European Union in setting priorities for European educational systems. Moreover, Italy and Spain share some common institutional features (low autonomy, choice and accountability) that make the comparison meaningful. The findings show that both countries are affected by strong internal regional heterogeneity, with some Regions clearly obtain higher students' achievement than others. Moreover, the results suggest that main determinants of achievement are different in the two countries. In Italy, a major role is for "tracking" - students are divided among comprehensive schools (Licei), technical and vocational ones. In Spain, an important distinction is between public schools and private ones – with the former outperform the latter.

Key words: Education, Cross-country comparison, PISA,

JEL classification: I21, H52

Corresponding author: José Manuel Cordero Ferrera, Department of Economics, Faculty of Business and Economics, University of Extremadura, Badajoz (06011), Spain. E-mail: jmcordero@unex.es

*Politecnico di Milano (Italy), Department of Management, Economics and Industrial Engineering.

1. Motivation and objectives

In recent years, the European Commission emphasized the necessity to strengthen the educational systems in the (European) Area. Among the many objectives, efficiency and equity assume a clear priority (EU Commission, 2006). Efficiency is defined as the ability to produce the maximum output given the available inputs, while equity is viewed as the extent to which individuals can take advantage of education and training in terms of opportunity, access, treatment and outcomes. For both these objectives, it is crucial to understand the factors behind students and schools' results. Moreover, to the extent that European Union is involved in defining common priorities and strategies for education, the scope for cross-country comparisons is broadening. A recent stream of the economic literature aimed at indentifying factors that can explain international variations of students' achievement (Fuchs & Woessman, 2007; Hanushek & Woessman, 2010). The primary objective of these studies is to estimate an "international" education production function, to find out which educational characteristics are associated with higher average performances (in a pure cross-country comparison). The main datasets employed in this research are the OECD-PISA data, which are based on standardized tests compiled by representative samples of 15 years old students. The most recent evidence suggests that while many variables (students and schools' characteristics, home inputs, teachers' quality, etc.) do play a role in explaining students' performances, much part of international variation is due to different "institutions".

> "(…) the institutional structures of the education system is again found to be strongly associated with how much students learn in different countries. (…) institutions account for roughly one quarter of the international variation in students' performance"
> (Fuchs & Woessman, 2007; p. 460)

> "On family and background and school inputs, the international results tend to mirror the existing national evidence on education production. Many dimensions of students' family background are important factors for their educational achievement. At the same time, it is hard to find evidence of

> substantial positive effects of most resource inputs, in particular class sizes and expenditure levels. (…) the impact of schools comes through teacher quality and institutional structures that determine incentives. Institutional features of school systems can account for a substantial part of the cross-country variation in student achievement".
> (Hanushek & Woessman, 2010; p. 34)

However, these studies do not look at specific situations of single countries. A different approach (proposed in this paper) looks promising too, as some countries have common features. Moreover, focusing on countries with similar institutional settings (e.g. similar levels of school autonomy, choice, accountability etc.) will allow the researchers to investigate other interesting patterns, related to schools' characteristics as well as to students' background. This is the rationale for choosing to undertake an analysis focused on Italy and Spain.

According to OECD PISA 2006 results, Italy and Spain are placed at the bottom of the EU ranking in terms of educational attainment, as both performing clearly below the OECD average of 500 points. However, behind the average score at country level we can find a common feature in both countries: the existence of strong internal divergences across regions, as we can see in Table 1. It is worth noting that the students from some Italian and Spanish regions perform as well as students from countries placed at the top of the EU ranking[1].

The aim of this paper is to look inside the performance of each country to explore which are the main causes that explain those divergences in achievement and whether those factors coincide in both countries. For this purpose, we use data at student level about a total of 23 regions (13 from Italy and 10 from Spain) that participate in PISA 2006 with a representative sample.

[1] Those regions are Friuli Venezia, Bolzano, Trento and Veneto in Italy and Castile Leon and La Rioja in Spain.

Table 1. Differences of outcomes across Regions within Italy and Spain

	Science		Reading		Math	
	Score	**SE**	**Score**	**SE**	**Score**	**SE**
Italy (Provincia Autonoma di Bolzano)	526.00	1.96	502.30	2.16	513.20	1.83
Italy (Provincia Autonoma di Trento)	521.00	2.02	508.48	2.46	508.49	2.33
Italy (Provincia Basilicata)	451.00	4.99	445.74	6.26	443.22	5.05
Italy (Provincia Campania)	442.00	5.87	438.40	5.77	436.39	9.02
Italy (Provincia Emilia Romagna)	510.00	3.70	496.19	4.49	494.15	3.39
Italy (Provincia Friuli Venezia Giulia)	534.00	3.26	518.82	4.20	512.69	3.63
Italy (Provincia Liguria)	488.00	6.70	483.42	6.88	472.56	6.41
Italy (Provincia Puglia)	447.00	4.25	440.42	6.67	434.56	4.84
Italy (Provincia Sardegna)	449.00	6.11	435.38	8.18	429.30	6.95
Italy (Provincia Sicilia)	433.00	7.25	423.74	8.42	423.19	6.49
Italy (Regione Lombardia)	499.00	6.23	490.53	7.15	486.71	6.64
Italy (Regione Piemonte)	508.00	4.70	505.81	5.14	491.72	4.85
Italy (Regione Veneto)	524.00	5.40	511.33	5.87	510.40	6.21
ITALY	**475.00**	**2.10**	**469.17**	**2.38**	**462.10**	**2.31**
Spain (Andalusia)	474.00	3.97	444.65	4.11	462.72	4.19
Spain (Aragon)	513.00	3.92	483.35	5.20	512.65	4.49
Spain (Asturias)	508.00	4.94	477.24	4.69	497.31	4.85
Spain (Basque Country)	495.00	3.46	487.42	4.24	501.09	3.43
Spain (Cantabria)	509.00	3.56	474.74	4.04	501.51	2.65
Spain (Castile and Leon)	520.00	3.91	478.11	3.45	515.14	3.34
Spain (Catalonia)	491.00	5.07	476.82	5.06	487.72	5.19
Spain (Galicia)	505.00	3.43	478.72	3.40	493.88	4.07
Spain (La Rioja)	520.00	2.51	491.66	2.59	525.98	2.17
Spain (Navarre)	511.00	2.94	480.54	2.69	515.03	3.46
SPAIN	**488.00**	**2.61**	**461.08**	**2.19**	**480.01**	**2.32**
OECD Average	**500.00**	**0.53**	**491.79**	**0.60**	**497.68**	**0.54**

The remainder of the paper is organized as follows. Section 2 briefly reviews a part of the relevant literature. Section 3 describes the methodological approach and gives details about data. Section 4 contains the main results, while section 5 discusses them and concludes.

2. Literature review

In the literature there are many papers devoted to the analysis of potential factors influencing the achievement from an international perspective (Fertig & Schmidt, 2002; Fertig, 2003; Woessman, 2003; 2007; Wolter & Vellacott, 2003; Wilson, 2005; Fuch & Woessman, 2007, Woessman, 2007; Raitano & Vona, 2010). Some of them also compare the performance of two countries with

similar educational structures, with the aim of explaining potential similarities or disparities. For instance, Lamb & Fullerton (2001) use the TIMSS database to investigate the interrelationships among different factors at the student, classroom and school levels in both Australia and United States (Lamb and Fullerton, 2001). Ammermuller (2007) compares the performance of Finnish and German students using Oaxaca-Blinder and Muhn-Murphy-Pierce decomposition methods with the aim of explaining the gap between both countries in PISA 2000 results.

Likewise, there are also studies analyzing PISA results specifically for the two countries that focus our attention. In the case of Italy, Checchi (2004) analysed the effect of family background and school level peer effects on students' performance using PISA 2000 survey and found that there are significant regional disparities in student performance, even after controlling for the type of school attended. Tramonte (2004) applied a multilevel model to the same dataset controlling for individual characteristics in order to decompose the total variance of student test scores. His results show that more than a half was explained by between-region variance. Bratti *et al*. (2006) use data from PISA 2003 in a clustered-robust linear regression analysis to investigate the causes of territorial differences. Their results show that environmental variables have a crucial effect on student outcomes. Quintano *et al*. (2009) apply a multilevel model to PISA 2006 data and conclude that socio-economic background play a main role for determining learning outcomes and explaining the territorial differences. Agasisti (forthcoming a,b) used different techniques (namely, a clustered-robust linear regression and Data Envelopment Analysis) to investigate the potential role of competition among schools as a factor affecting schools' performances (positively). His results suggest an association (albeit low in magnitude) between high competitive pressure and schools' average achievement scores.

All the studies about Italy pointed out, however, a wide gap between schools located in Northern Italy and those located in the South, with the former clearly outperform the latter.

In Spain, Calero & Escardibul (2007) use PISA 2003 dataset in a multilevel model to analyze the divergences among public and private schools and conclude that socioeconomic variables and peer effects mainly explain them. Perelman & Santín (2011) use the same dataset with a similar purpose, but they adopt an approach focused on measuring educational inefficiency though Parametric Distance Function. Their results suggest that, once educational inputs and potential bias due to school choice endogeneity are taken into account, no further unexplained difference remains between students' efficiency levels across public and private-voucher schools. The same approach is also employed in Cordero et al. (2010) but, in this case, they use PISA 2006 data and focus on the explanation of territorial divergences. According to their results, most of those divergences are attributable to students' characteristics with the condition of immigrant or retaking some course as main explicative factors. Precisely, these two specific issues represent the main focus of the analysis performed in Zinovyeva *et al*. (2008) –immigration– and García et al. (2010) –retention–. The former uses an Oaxaca Blinder decomposition in order to explain the gap between native and immigrant students, which is mainly explained by the time of arrival, parental education and occupation and family possessions. The latter uses a swithching regression model in order to control for endogenous selection between retaker and non-retaker students and concludes that divergences across regions are lower for those who have retaken some course.

However, to the best of our knowledge, there are no previous studies making a comparison between these two countries.

3. Methodology and data

In this section, we provide a brief description of the methodological approach adopted in the paper. Given the hierarchical nature of data (students nested into schools, schools nested into regions), we adopted a multilevel technique to investigating the impact of schools and students' characteristics on performance, while properly accounting for the multilevel structure of the dataset (Goldstein, 1995 for details on multilevel models). The procedure adopted in the paper, namely the Hierarchical Linear Modelling (HLM) is useful to analyse the performances at different levels (e.g. student-level, school-level, etc.) while controlling for the variance across levels (for a detailed explanation of the statistical model, see Bryk & Raudenbush, 1992).

We followed a consolidated tradition in the applied statistics literature about student-level/school-level data, that is to use an "additive" approach, that is by adding covariates to a baseline specification (e.g. Lamb & Fullarton, 2001; Dronkers & Robert, 2008). The estimation has been made separately for Italy and Spain. The variables included in each model are described in the following lines:

a. The first model (baseline model) aims at decomposing the variance between two levels: students (level 1) and schools (level 2), without adding any explanatory variable.
b. The second model adds variables at student level which include those referred to students´ background (gender, foreign status, immigrant condition, parents´ education and occupation) and related to home resources (possession of own room or computer, the number of books at home, etc.).
c. The third model includes a further set of variables, referred to the school factors and characteristics (e.g. size, number of computers, proportion of girls, etc.).
d. The forth and fifth models provide useful information about the type of school in which the students are enrolled. In the case of Spain this information refers only to the public or private status and where it is

placed (village or city), but in Italy this classification also distinguishes among vocational, technical or comprehensive *(Licei)*, as the previous literature showed the latter outperform the technical ones, which in turn outperform vocational ones.

e. The final model also includes dummy variables representing every region with the aim of verifying whether significant divergences across them arise within the country. The inclusion of regional dummies allows a direct comparison of each specific region's average efficiency (in terms of students' achievement). To correctly estimate the region's effect, the worst region for each of the two countries has been excluded as the reference region (Sicily for Italy, Andalusia for Spain).

The precise list of the variables employed at student and school-level is provided in the next section (Data). The examination of the changes that occurred at the level of variance components by adding different groups of variables, allow us to measure the effects of the covariates in explaining factors that are influencing performances. As the set of covariates is identical for Italy and Spain, the comparison of variables' coefficients allows us to underline the main differences between the two countries.

In a second step of our evaluation, we perform a specific analysis for each region in Italy and Spain for which there is a representative sample available with the aim of identifying potential divergences across regions within a country. For this purpose we have followed the same "additive" approach used in the previous analysis, although we only present the results obtained in the final model (complete results available from the authors).

In order to avoid potential bias in the statistical models because of the different number of cases in each region we follow the same approach used in Dronkers and Roberts (2008) and select only Regions for which at least 1,500 observations are available. However, there are some regions where this number is slightly lower, since they do not reach this number due to some

exclusion. Specifically, those regions are Campania, Piemonte, Sardegna and Sicilia in Italy and Andalucia, Cantabria and La Rioja in Spain[2].

Data

The selection of variables has been driven by the necessity to find out a common core of features to be compared between Italy and Spain. Thus, we select variables that turned out as significant in international comparisons about the determinants of students' performances (e.g., Fuchs & Woessmann, 2007). All the data comes from the PISA2006 dataset (see http://pisa2006.acer.edu.au/ for an overview).

Output-variables

We use Science scores as performance measure, as it is the main focus of OECD-PISA 2006 edition. The PISA dataset provides not a unique measure of output, but five plausible values for each discipline (estimated by considering a plausible distribution according to the results of the test). As a consequence, our analysis considers the average coefficients derived from using all the five plausible values for each subject.

Student-level variables

We include several covariates to explain scores' variance across individuals. The list of these variables includes variables related to the students´ background and resources at home (in brackets, the name of the original variable in the PISA dataset is reported):

Students´ background

- Age in years and months (AGE), represents the age of the student using the information drawn from the question referred to the month of birth.
- Gender (ST04Q01), dummy that takes the value one if the student is female.

[2] Campania has 1406 observations, Piemonte, 1478, Sardegna 1390, Sicilia 1335, Andalusia, 1463 Cantabria, 1496 and La Rioja 1335.

- Repeat_once (ST01Q01): it represents whether the student have retaken one year of schooling because of insufficient academic results;
- Repeat_more (ST01Q01): it indicates whether the student have retaken more than once.
- Inmmigrant_1 (ST11Q01), dummy=1 if not born in country;
- Inmigrant_2 (ST11Q02 and ST11Q03), dummy = 1 if one of his/her parents were not born in country;
- ISCED level (ISCEDL);
- Highest parental education in years (PARED);
- Mother highest schooling (ST06Q01), dummy = 1 if mother has a university degree.
- Father highest schooling (ST09Q01), dummy = 1 if father has a university degree.
- Mother white collar classification (MSECATEG), dummy = 1 if mother has a white-collar occupation
- Father white collar classification (FSECATEG), dummy = 1 if father has a white-collar occupation

Home resources

- Possession of own individual room or study place (ST13Q02 and ST13Q03), dummy=1 if yes;
- Possession of a computer (ST13Q04), dummy=1 if yes;
- Books at home (ST15Q01), we have constructed two variables as indicators of low and high levels: less than 25 and more than 200.
- Cultural possession at home (CULTPOSS), that is a composite indicator of cultural facilities (books, magazines, movies) available at home;

School-level variables

Again, in this section we report all the indicators employed in our analysis:

School factors

- Proportion of girls at school (PCGILRS);

- Proportion of immigrants in school (aggregation from question ST11Q01) in order to control for this peer-effect, dummy = 1 if the percentage of immigrant students is higher than 20%.
- Average of cultural possession at home (aggregation from CULTPOSS).
- Proportion of computers connected to the web (COMPWEB);
- Proportion of computers for instruction, defined as the number of computers divided by the school size (IRATCOMP);
- Teachers per students ratio (STRATIO);
- Quality of educational resources, defined as a question answered by schools' heads in the PISA questionnaire (SCMATEDU, also defined WLE indicator).
- School size (SCHSIZE).
- Class size (SC06Q01), dummy = 1 if there are less than 25 students in the class.

Type of school

- Public/private status (SCHLTYPE), by separating public schools, private government-dependent, and private independent (the difference is in the amount of public money provided to the school, the latter defined as <50%);
- School community (SC07Q01), dummy = 1 if the school is located in a village or small town.
- Technical and Licei (STRATUM), two different dummies that take value one for each type of school (used for the Italian case only). Thus, vocational schools are the reference for comparison.

Regional dummies

- A total number of 21 dummy variables have been constructed (9 for Spain and 12 for Italy) in order to disentangle whether divergences in terms of results are significantly different for each region. In both countries, the regions with the lowest results in Science in PISA

(Andalusia in Spain and Sicilia in Italy according to information showed in Table 1) act as a reference.

According to the values showed in table 2, which reports the descriptive statistics for all these variables in both countries, there are some noteworthy divergences between Italy and Spain. For instance, among level-1 variables, the number of students that retake one course is clearly higher in Spain, although the main difference arise with regard to the variable that represent those who retake more than one course, which present a mean value close to zero in Italy. Another significant statement comes from the fact that the proportion of parents that have completed university studies is higher in Spain, whereas the proportion of high skilled workers (mothers and fathers) is higher in Italy. Regarding the home sources, apart from the bigger proportion of students with own room in Spain, the most significative aspect that must be pointed out is that Italian household seem to have a lower number of books at home, albeit the index of cultural possessions reflects a higher mean value for this country.

The divergences between the countries are less significant in most of school resources, although the average quality, represented by SCMATEDU, is notably superior in Italy as well as the proportion of small classes (with less than 25 students). However, the most remarkably difference arises in the number of private and, especially, government-dependent schools, which is much higher in Spain.

Table 2. Descriptive Statistics for Italy and Spain

VARIABLES	ITALY				VARIABLES	SPAIN			
LEVEL 1	**Min**	**Max**	**Mean**	**Dev**	**LEVEL 1**	**Min**	**Max**	**Mean**	**Dev**
AGE	15.25	16.33	15.76	0.28	AGE	15.30	16.33	15.838	0.28
GENDER	0	1	0.50	0.50	GENDER	0	1	0.50	0.50
REPEATONCE	0	1	0.17	0.38	REPEATONCE	0	1	0.25	0.43
REPEATMORE	0	1	0.003	0.00	REPEATMORE	0	1	0.05	0.22
IMMIG1	0	1	0.05	0.21	IMMIG1	0	1	0.05	0.22
IMMIG2	0	1	0.08	0.26	IMMIG2	0	1	0.09	0.29
PARYEARS	3.0	17.0	12.50	3.25	PARYEARS	3.0	16.50	11.94	3.82
MOTUNIV	0	1	0.12	0.32	MOTUNIV	0	1	0.21	0.41
FATUNIV	0	1	0.12	0.33	FATUNIV	0	1	0.20	0.40
MOTWHITE	0	1	0.27	0.44	MOTWHITE	0	1	0.24	0.43
FATWHITE	0	1	0.36	0.48	FATWHITE	0	1	0.32	0.47
OWNROOM	0	1	0.68	0.46	OWNROOM	0	1	0.87	0.33
OWNCPU	0	1	0.90	0.29	OWNCPU	0	1	0.90	0.29
BOOKS<25	0	1	0.24	0.43	BOOKS<25	0	1	0.16	0.36
BOOKS>200	0	1	0.22	0.41	BOOKS>200	0	1	0.28	0.45
CULTPOSS	-1.38	1.01	0.20	0.81	CULTPOSS	-1.42	1.07	0.17	0.86
LEVEL 2					**LEVEL 2**				
PCGIRLS	0	1	0.50	0.24	PCGIRLS	0	1	0.49	0.08
IMMIG20pct	0	1	0.03	0.17	IMMIG20pct	0	1	0.05	0.22
CULTPOSS	-1.38	1.01	0.20	0.35	CULTPOSS	-1.10	0.97	0.17	0.31
COMPWEB	0	1	0.86	0.20	COMPWEB	0.07	1	0.89	0.17
IRATCOMP	0	1.36	0.16	0.15	IRATCOMP	0.02	0.72	0.10	0.07
STRATIO	1.82	19.64	8.76	2.56	STRATIO	1.19	29.60	11.91	4.31
SCMATEDU	-2.64	2.14	0.21	0.96	SCMATEDU	-3.43	2.13	0.08	0.93
SCHOOLSIZE	9	2536	662.32	416.56	SCHOOLSIZE	34	2539	680.58	399.64
CLASSIZE	0	1	0.81	0.39	CLASSIZE	0	1	0.60	0.49
PRIVATE	0	1	0.02	0.13	PRIVATE	0	1	0.08	0.27
GOVDEP	0	1	0.04	0.20	GOVDEP	0	1	0.36	0.48
VILLAGE/TOWN	0	1	0.25	0.43	VILLAGE/TOWN	0	1	0.35	0.47
BOLZANO	0	1	0.11	0.31	ANDALUSIA	0	1	0.08	0.28
BASILICATA	0	1	0.08	0.27	ARAGON	0	1	0.08	0.28
CAMPANIA	0	1	0.07	0.25	ASTURIAS	0	1	0.09	0.28
E. ROMANA	0	1	0.07	0.26	CANTABRIA	0	1	0.09	0.28
F. VENEZIA	0	1	0.08	0.27	CASTILE LEON	0	1	0.08	0.28
LIGURIA	0	1	0.10	0.30	CATALONIA	0	1	0.08	0.28
LOMBARDIA	0	1	0.07	0.26	GALICIA	0	1	0.09	0.28
PIEMONTE	0	1	0.07	0.25	LA RIOJA	0	1	0.07	0.26
PUGLIA	0	1	0.07	0.25	NAVARRE	0	1	0.08	0.28
SARDEGNA	0	1	0.07	0.25	B. COUNTRY	0	1	0.25	0.43
SICILIA	0	1	0.07	0.25	-	-	-	-	-
TRENTO	0	1	0.08	0.28	-	-	-	-	-
VENETO	0	1	0.07	0.26	-	-	-	-	-
TECHNICAL	0	1	0.323	0.468	-	-	-	-	-
LICEI	0	1	0.398	0.489	-	-	-	-	-

4. Results

4.1. Comparison at country level

In this section, we present the main results obtained in our multilevel analysis. In a first stage, we have estimated separate models for Italy and Spain using the whole dataset for each country. Although we have made five estimations for each model (one for each plausible value in Science)[3], we only interpret the average values.

As we mentioned in the previous section, the first step of our analysis consists of estimating the baseline model in order to decompose the variance between student and school level. According to data in tables 3 and 4, where variance decomposition of every estimated model is reported, there are significant divergences between the role of schools in explaining the results between these countries, with values placed between 35% and 50% in Italy (with the exception of the model that includes regional dummies) while this percentage only reaches an average 15% in Spain. The finding of a high between-schools variance in Italy is not new. Other analyses, based on standardized tests at the end of lower secondary education, showed that this phenomenon exists since lower grades (Invalsi, 2010). When analyzing OECD-PISA data, the simpler explanation for this is "tracking": PISA examinations are taken when students are 15 years old, and they are already tracked into three different types of schools (Licei, technical, vocational). Moreover, some forms of student sorting are likely to exist also within homogenous school types, even though Agasisti & Vittadini (2010) demonstrated that schools' average SES is not able to capture this sorting, suggesting a role for different dimensions, like cultural profiles of families.

[3] Regarding the calculation of standard errors, we follow the recommendations of the PISA Data Analysis Manual (PISA, 2009), which consists of using a *balanced repeated replication with 80* replicates. This technique allows us to avoid potential bias derived from the stratification process of the sampling design in PISA.

Table 3: Variance decomposition in different multilevel models for Italy

	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6
Schools (u_{oj})	4856.080	3758.176	2822.953	2774.246	2223.387	856.081
Students (r_{ij})	4621.957	4216.481	4216.492	4216.486	4215.424	4218.318
Total ($u_{0j} + r_{ij}$)	9478.037	7974.657	7039.445	6990.732	6438.811	5074.399
% Var. Schools	51.24%	47.13%	40.10%	39.68%	34.53%	16.87%

Table 4: Variance decomposition in different multilevel models for Spain

	Model 1	Model 2	Model 3	Model 4	Model 5
Schools (u_{oj})	1122.306	657.287	584.566	571.259	449.422
Students (r_{ij})	6235.640	4141.270	4140.245	4140.571	4140.735
Total ($u_{0j} + r_{ij}$)	7357.946	4798.557	4724.811	4711.830	4590,157
% Var. Schools	15.25%	13.70%	12.37%	12.12%	9.79%

Afterwards, we have estimated alternative models in which student and school variables are included. The average values of those estimates, which are showed in tables 5 and 6, provide us very helpful information to identify divergences between both countries.

Table 5. HLM estimates for Italy

VARIABLES	*Model 1*			*Model 2*			*Model 3*			*Model 4*			*Model 5*			Model 6		
	Coeff.	**SE**	**p-value**	**Coeff.**	**SE**	**p-vale**	**Coeff.**	**SE**	**p-value**	**Coeff.**	**SE**	**p-value**	**Coeff.**	**SE**	**p-value**	**Coeff.**	**SE**	**p-value**
Intercept	481.100	2.656	0.000	407.723	26.295	0.000	337.104	28.553	0.000	336.836	28.611	0.000	324.401	29.040	0.000	284,807	27,640	0.000
Level 1																		
AGE				5.205	1.649	0.002	5.148	1.649	0.002	5.155	1.649	0.002	5.111	1.648	0.002	4,980	1,644	0,003
GENDER				-13.707	1.089	0.000	-14.195	1.095	0.000	-14.170	1.095	0.000	-14.171	1.095	0.000	-14,307	1,091	0,000
REPEATONCE				-41.936	1.371	0.000	-41.296	1.372	0.000	-41.336	1.372	0.000	-40.860	1.371	0.000	-41,219	1,364	0,000
REPEATMORE				42.509	89.727	0.635	59.362	84.017	0.480	56.671	83.779	0.499	92.205	80.458	0.223	26,379	71,481	0,712
IMMIG1				-20.118	2.765	0.000	-19.812	2.765	0.000	-19.790	2.765	0.000	-19.924	2.764	0.000	-20,389	2,760	0,000
IMMIG2				1.318	2.208	0.550	1.431	2.208	0.517	1.417	2.207	0.521	1.467	2.206	0.506	0,584	2,203	0,791
PARYEARS				-0.492	0.192	0.011	-0.511	0.192	0.008	-0.512	0.192	0.008	-0.519	0.192	0.007	-0,618	0,191	0,002
MOTUNIV				0.637	1.818	0.726	0.263	1.818	0.885	0.295	1.818	0.872	0.324	1.817	0.859	0.352	1.814	0.846
FATUNIV				5.206	1.781	0.004	4.923	1.781	0.006	4.960	1.781	0.006	4.926	1.780	0.006	5.035	1.777	0.005
MOTWHITE				4.657	1.198	0.000	4.469	1.198	0.000	4.481	1.198	0.000	4.369	1.197	0.000	4.411	1.195	0.000
FATWHITE				2.822	1.114	0.012	2.431	1.114	0.029	2.451	1.114	0.028	2.319	1.114	0.037	2.272	1.112	0.041
OWNROOM				1.278	1.028	0.214	1.233	1.028	0.231	1.244	1.028	0.226	1.259	1.027	0.221	0.959	1.025	0.350
OWNCPU				12.106	1.648	0.000	11.945	1.648	0.000	11.971	1.648	0.000	11.704	1.648	0.000	11.328	1.644	0.000
BOOKS<25				-14.166	1.242	0.000	-13.690	1.243	0.000	-13.694	1.24288	0.000	-13.674	1.242	0.000	-13.093	1.240	0.000
BOOKS>200				11.872	1.268	0.000	11.553	1.268	0.000	11.594	1.268	0.000	11.661	1.268	0.000	11.157	1.266	0.000
CULTPOSS				3.325	0.674	0.000	3.563	0.674	0.000	3.550	0.674	0.000	3.588	0.674	0.000	3.779	0.674	0.000
Level 2																		
PCGIRLS							-4.119	8.799	0.639	-6.560	8.761	0.455	-13.066	8.380	0.119	-16.749	5.567	0.003
IMMIG20pct							-30.842	10.021	0.003	-24.107	10.246	0.019	-8.682	9.408	0.357	-15.329	6.472	0.018
CULTPOSS							63.483	6.612	0.000	65.324	6.704	0.000	5.013	7.769	0.519	31.885	5.36	0.000
COMPWEB							25.222	10.189	0.014	24.616	10.127	0.016	12.947	9.178	0.002	5.995	6.089	0.326
IRATCOMP							49.093	15.934	0.003	56.299	16.128	0.001	45.587	14.605	0.333	1.843	10.042	0.855
STRATIO							3.724	0.980	0.000	4.251	0.985	0.000	0.907	0.936	0.003	1.494	0.636	0.019
SCMATEDU							9.294	2.220	0.000	9.635	2.210	0.000	6.199	2.028	0.462	0.242	1.356	0.858
SCHOOLSIZE							0.009	0.006	0.117	0.004	0.006	0.514	0.004	0.006	0.000	0.016	0.003	0.000
CLASSIZE							19.244	5.396	0.001	19.792	5.355	0.000	18.513	4.858	0.000	4.596	3.251	0.158
School ownership																		
PRIVATE										-43.549	13.788	0.000	-52.736	12.505	0.118	-54.002	8.438	0.000
GOVDEP										-23.019	9.713	0.002	-13.967	8.918	0.601	-16.720	6.173	0.007
VILLAGE/TOWN										-0.128	5.099	0.980	-2.397	4.601	0.119	2.717	3.153	0.389
Type of school																		
TECHNICAL													46.981	5.323	0.000	45.879	3.527	0.000
LICEI													90.227	7.073	0.000	71.104	4.804	0.000
Region																		
BOLZANO																120.465	6.388	0.000
BASILICATA																22.218	6.579	0.001
CAMPANIA																0.753	6.521	0.909
E. ROMANA																73.395	6.473	0.000
F. VENEZIA																101.246	6.501	0.000
LIGURIA																61.472	6.319	0.000
LOMBARDIA																73.147	6.523	0.000
PIEMONTE																76.101	6.636	0.000
PUGLIA																16.472	6.523	0.012
SARDEGNA																12.271	6.601	0.063
TRENTO																96.507	6.627	0.000
VENETO																97.348	6.581	0.000

Table 6. HLM estimates for Spain

VARIABLES	*Model 1*			*Model 2*			*Model 3*			*Model 4*			**Model 5**		
	Coeff.	**SE**	**p-value**	**Coeff.**	**SE**	**p-value**	**Coeff.**	**SE**	**p-value**	**Coeff.**	**SE**	**p-value**	**Coeff.**	**SE**	**p-value**
Intercept	504.990	1.490	0.000	339.215	27.827	0.000	321.463	27.929	0.000	317.666	29.300	0.000	310.424	29.350	0.000
Level 1															
AGE				11.113	1.741	0.000	10.992	1.741	0.000	10.991	1.743	0.000	11.036	1.746	0.000
GENDER				-17.309	1.089	0.000	-17.587	1.088	0.000	-17.596	1.092	0.000	-17.398	1.091	0.000
REPEATONCE				-70.184	1.265	0.000	-70.086	1.263	0.000	-70.200	1.264	0.000	-70.489	1.263	0.000
REPEATMORE				-119.803	2.296	0.000	-119.809	2.296	0.000	-119.527	2.285	0.000	-120.04	2.274	0.000
IMMIG1				-8.207	3.300	0.013	-7.690	3.297	0.012	-7.585	3.324	0.023	-7.754	3.321	0.020
IMMIG2				-2.371	2.189	0.279	-2.140	2.191	0.252	-2.209	2.183	0.312	-2.316	2.176	0.288
PARYEARS				0.861	0.208	0.000	0.803	0.209	0.000	0.826	0.208	0.000	0.831	0.208	0.000
MOTUNIV				-4.816	1.811	0.008	-5.001	1.809	0.008	-5.087	1.807	0.005	-4.797	1.804	0.008
FATUNIV				-0.225	1.715	0.896	-0.477	1.712	0.909	-0.506	1.707	0.767	-0.228	1.704	0.894
MOTWHITE				9.464	1.434	0.000	9.078	1.435	0.000	9.030	1.438	0.000	9.024	1.438	0.000
FATWHITE				8.054	1.292	0.000	7.680	1.295	0.000	7.668	1.301	0.000	7.831	1.299	0.000
OWNROOM				-2.205	1.545	0.154	-2.289	1.544	0.159	-2.277	1.551	0.142	-2.419	1.542	0.117
OWNCPU				10.627	1.884	0.000	10.420	1.885	0.000	10.434	1.881	0.000	10.728	1.879	0.000
BOOKS<25				-23.013	1.569	0.000	-22.754	1.570	0.000	-22.816	1.570	0.000	-22.606	1.570	0.000
BOOKS>200				18.598	1.228	0.000	18.446	1.226	0.000	18.482	1.226	0.000	18.411	1.224	0.000
CULTPOSS				5.716	0.688	0.000	5.229	0.697	0.000	5.197	0.695	0.000	5.110	0.694	0.000
Level 2															
PCGIRLS							33.122	13.083	0.012	28.939	13.280	0.030	23.930	12.337	0.052
IMMIG20pct							-5.447	4.073	0.182	-5.494	4.059	0.177	-3.302	4.232	0.436
CULTPOSS							25.976	4.100	0.000	26.381	4.152	0.000	13.753	4.384	0.002
COMPWEB							2.824	5.543	0.610	-2.206	5.596	0.693	0.357	0.473	0.451
IRATCOMP							-16.652	16.245	0.306	-9.277	15.687	0.554	2.544	5.207	0.625
STRATIO							-0.348	0.347	0.316	1.037	0.488	0.034	-11.769	13.718	0.392
SCMATEDU							0.518	1.062	0.626	0.738	1.065	0.488	0.438	1.008	0.664
SCHOOLSIZE							0.004	0.003	0.188	0.002	0.003	0.468	0.008	0.003	0.008
CLASSIZE							2.281	2.391	0.341	2.946	2.364	0.214	2.303	2.262	0.310
School ownership															
PRIVATE										-9.980	4.786	0.037	-4.488	4.856	0.356
GOVDEP										-14.793	3.720	0.000	-6.014	3.821	0.116
VILLAGE/TOWN										-0.477	2.607	0.855	-3.661	2.293	0.111
Region															
ARAGON													15.404	4.236	0.001
ASTURIAS													12.505	4.671	0.008
CANTABRIA													19.391	4.514	0.000
CASTILE Y LEON													24.262	4.692	0.000
CATALONIA													-0.916	4.729	0.847
GALICIA													21.277	4.481	0.000
LA RIOJA													22.7611	4.911	0.000
NAVARRE													10.937	5.904	0.064
BASQUE COUNTRY													-8.729	4.085	0.033

Among students´ background variables, the age has a positive and significant effect in both countries although its magnitude is higher in Spain. On the contrary, being a girl, a one-year retaker or being born out of the country has a negative effect on achievement in both countries. Among those variables, the effect of retaking is higher in Spain while being a first-generation immigrant leads to clearly worst results in Italy.

The variable "*Repeat_more*" deserve a specific comment. It does not affect the results in Italy since there are few cases in the sample whereas in Spain, where the number of students in this situation is high, this variable emerges as the main cause to explain lower outcomes for students. However, the proportion of students who repeated one or more years in Italy is traditionally low; we also checked the information through a companion dataset, the information provided by the Italian Ministry of Education, which shows how less than 13% of students repeated one year in the academic year 2005/06.

The rest of background variables present similar values for both countries, although the variables related to the qualification of parents´ jobs (a measure of socio-economic status) present significantly higher values in Spain.

With regard to variables representing home resources, the possession of own room does not have a significant effect on achievement in any country, but having a computer does have. Coefficients associated with variables representing the number of books present the expected values, i.e., negative for those who have less than 25 and positive for students living in household with more than 200 books, however these effect are again higher for Spain in both cases. Finally, the variable representing cultural possessions has a positive, significant and similar value in both countries.

The estimation for school factors also reflects significant divergences between the countries. The percentage of girls and the average of cultural possessions present are only significant (and positive) effect in Spain while the number of

computers with internet connection and the class size has only a significant (and positive) effect on results for Italy. However, we can find some similarities as well, thus the variable that represents the quality of school resources does not have influence in any country, but the teacher per student ratio does in both of them.

The estimates for the complete model without taking into account regional dummies reveal notable divergences in the classification of schools. In Italy, there are not significant differences among public, private and government dependent schools or between schools placed in towns or cities, but this fact could be mainly explained because the noteworthy divergences emerge where technical, vocational and comprehensive schools are compared. Regarding this point, we must point out that our results coincide with previous studies, since the outcome of *licei* schools is higher than the technical ones, which in turn do better than the vocational ones. Thus, while previous studies reported the negative role of private schooling (Bratti *et al.*, 2007) we should underline that such effect disappears once taken adequately into account the hierarchical nature of data (HLM modelling) and the gap between Licei and other school types. In Spain, significant divergences across schools arise in the comparison among public, private and government dependent ones, with the first ones outperforming the rest. These results are in the same line of other studies that have used the latest PISA dataset in Spain (Calero and Waisgrais, 2009; Cordero *et al*., 2010).

However, the former results change drastically when regional dummies are included in the analysis. Hence, in Italy, the divergences among vocational, technical and *licei* schools are still significant, but we can also notice that government dependent schools and especially the private ones obtain clearly worse results than their public counterparts. On the contrary, in Spain the consideration of regional variables in the analysis eliminates the divergences across schools according to the type of ownership.

Likewise, the final model estimated for each country allow us to corroborate that divergences across regions are relevant, since only two regions (Campania in Italy and Catalonia in Spain) obtain results that are not significantly different from those considered as reference (Sicilia in Italy and Andalusia in Spain)[4].

These final statements provide us with an additional support to the importance of performing the analysis at regional level.

4.2. Comparison at regional level

Following the same approach used in the first analysis, the first step consists of decomposing the variance in the baseline level. Tables 7 and 8 show the values calculated for each of 23 regions. As it could be expected, Italian regions present higher values of the percentage explained by schools than Spanish ones, although there are notably divergences among them. For instance, in Friuli Venezia this value is below 40%, while in Campania, Liguria, Lombardia and Trento it presents values higher than 50%. These results are rather different from those reported by national statistics. More specifically, Invalsi – the National Evaluation Committee for the Educational System – illustrates that, at the end of lower secondary education, between-schools is much higher in the South than in the North (Invalsi, 2010). Just as an example, between-schools variance is 14.8% in Lombardy versus 60.5% in Campania (data refer to Math scores). There are many potential reasons to explain these different figures. Among them, the first is that Invalsi and OECD-PISA tests are taken at different stages (lower secondary and upper secondary level, respectively). Second, the high between-schools variance revealed by PISA tests is probably due to "tracking" that occur at upper secondary school level – a situation that is identical in all the Italian Regions.

[4] These two regions present significant values at the 90% level of confidence. If we consider the 95% level, Sardegna and Navarre should also be mentioned.

Table 7. Variance decomposition in baseline model for Italian regions

	Bolzano	Basilicata	Campania	E.Romana	F.Venezia	Liguria	Lombardia	Piemonte	Puglia	Sardegna	Sicilia	Trento	Veneto
Schools (u_{oj})	3414.86	3494.54	4856.08	3925.90	2948.28	5742.74	4902.41	3281.49	2444.01	3705.56	3682.49	4647.05	3600.81
Students (r_{ij})	4777.78	4124.31	4621.95	5407.65	4600.94	4840.93	4681.25	4801.87	4449.61	4528.88	4703.73	4501.47	4263.49
Total ($u_{0j} + r_{ij}$)	8192.64	7618.86	9478.03	9333.55	7549.22	10583.67	9583.66	8083.37	6893.63	8234.45	8386.23	9148.53	7864.31
% Var. Schools	41.68%	45.87%	51.24%	42.06%	39.05%	54.26%	51.15%	40.60%	35.45%	45.00%	43.91%	50.80%	45.79%

Table 8. Variance decomposition in baseline model for Spanish regions

	Andalucia	Aragon	Asturias	Cantabria	Castile and Leon	Catalonia	Galicia	La Rioja	Navarre	Basque Country
Schools (u_{oj})	651.74	802.78	944.71	641.55	583.01	1273.66	632.07	930.62	1019.90	1479.29
Students (r_{ij})	6942.99	6870.13	5644.23	6430.44	5523.16	6744.05	6980.99	6859.47	6604.01	5294.18
Total ($u_{0j} + r_{ij}$)	7594.73	7672.92	6588.95	7071.99	6106.17	8017.72	7613.06	7790.09	7623.92	6773.48
% Var. Schools	8.58%	10.46%	14.34%	9.07%	9.55%	15.89%	8.30%	11.95%	13.38%	21.84%

Although in Spain the role of schools in explaining the results is significantly lower, we can also detect differences across regions. Hence, the proportion of variance in Basque Country is 22%, which is twice as much as in Andalusia, Galicia, Castile Leon or Cantabria where this percentage does not reach 10%.

After this initial approach, the complete models that include all the variables have been estimated (Model 5 for Italian regions and Model 4 for Spanish regions). Tables 9 and 10 report those estimates, for which it can be noticed at first sight that there are less significant variables that in the analysis carried out at country level (this is mainly due to the lower number of observations available for each region).

With regard to the variables related to the students´ background, there are few variables that have a significant effect on results in most regions. Actually, only the gender and the condition of retaker or immigrant can be included in this category. Their effect are negative in all cases and the values are similar across regions, but it could be noteworthy to mention Bolzano as an example of region where girls perform worse and Veneto as an example of region where student that were not born in Italy obtain clearly worse results. The effect of the variable Repeat_once varies notably across regions, thus there are 20 points of divergence between Friuli Venezia and Sicilia. For the rest of the variables, their influence on achievement is scarce or statistically insignificant in most of regions, although there are some cases that should be emphasized such as the high effect of fathers´ university studies in Puglia or the importance of mothers´ qualification in Piemonte and Sicilia. In Spain, the list of significant variables coincide with those mentioned for Italy, although there is a main addition, Repeat_more, which has a key impact on results in every region with a negative value above 100 in every region.

The variables that represent home resources also present divergences in their values and significance in both countries. In most of Italian regions, the possession of own room does not seen to matter, but possessing a computer

does in most of them. The influence of the variables related to the number of books is significant, although there are some exceptions, while the effect of the variable representing other cultural possessions is weaker. Those results coincide in general with those obtained for Spanish regions, though the significance of the indicator representing cultural possessions is more extended and the possession of a computer seems to matter less. The variables that represent school inputs are clearly affected more by the reduction of the number of observations. As a result, most of them appear to be non-significant in most of Regions. However, there are some interesting results that must be highlighted. For instance, the decisive negative effect of having more than 20 per cent of immigrants in class for some regions (Basilicata and Friuli Venezia in Italy and La Rioja and Navarra in Navarre) or the positive influence of the peers, represented by the average of the cultural possession indicator, in other regions (Friuli Venezia, Puglia and Veneto in Italy and Catalonia, Navarre and Basque Country in Spain).

Finally, with regard to the type of school, it has been already mentioned previously that main divergences in Italy arise when we compare technical, vocational and comprehensive centres. However, there are some regions where private schools present significantly worse results than public ones (Friuli Venezia, Lombardia, Sardegna, Sicilia and Veneto) and one (Puglia) where private ones perform better. The comprehensive schools have clearly better results than the other ones in every region with the exception of Trento and Emilia Romagna, where the technical ones present similar values. In Spain, the lack of differences among public and private centres detected in most of regions (except in La Rioja) can be explained by the lower number of observations, since this variable does have a significant influence at country level, however it is possible to find significant and notable divergences between public and government dependent schools in Aragon, Cantabria and La Rioja, where the former outperform the latter. Moreover, in two Spanish regions, Cantabria and Basque Country, the schools placed in a village/town have significantly worse results.

Table 9. HLM estimates for Italian Regions

VARIABLES	*BOLZANO*			*BASILICATA*			*CAMPANIA*			*EMILIA ROMANA*			FRIULI VENEZIA		
	Coeff.	**SE**	**p-value**	**Coeff.**	**SE**	**p-value**	**Coeff.**	**SE**	**p-value**	**Coeff.**	**SE**	**p-value**	**Coeff.**	**SE**	**p-value**
Intercept	255.403	93.877	0.009	204.715	99.457	0.045	237.014	89.783	0.012	264.137	107.557	0.019	451.308	100.696	0.000
Level 1															
AGE	11.228	5.226	0.032	10.555	5.820	0.069	9.539	5.710	0.095	6.914	6.336	0.276	1.253	5.928	0.833
GENDER	-22.418	3.548	0.000	-14.458	4.509	0.002	-24.375	4.644	0.000	-13.459	4.334	0.002	-16.318	3.641	0.000
REPEATONCE	-45.657	3.807	0.000	-35.217	5.034	0.000	-40.860	1.371	0.000	-47.415	5.702	0.000	-28.872	5.514	0.000
REPEATMORE	0.626	76.233	0.994	-71.847	112.842	0.458	42.260	85.226	0.802	37.548	64.546	0.874	-54.548	64.424	0.688
IMMIG1	-22.196	9.169	0.016	-18.034	15.481	0.245	-25.576	14.702	0.082	-37.242	10.315	0.001	-28.198	8.148	0.001
IMMIG2	3.763	7.479	0.614	0.817	8.896	0.927	1.467	2.206	0.506	3.555	8.792	0.686	4.443	5.186	0.392
PARYEARS	0.225	0.719	0.754	-1.308	0.766	0.088	-0.519	0.192	0.007	-1.174	0.763	0.124	-1.000	0.802	0.213
MOTUNIV	1.402	6.220	0.822	-1.281	9.524	0.893	0.324	1.817	0.859	12.105	0.624	0.052	2.619	7.283	0.719
FATUNIV	-3.308	5.894	0.574	8.144	7.078	0.251	9.370	9.053	0.301	-8.321	6.163	0.177	14.469	5.997	0.016
MOTWHITE	5.305	3.501	0.130	5.443	3.890	0.162	4.200	4.626	0.364	5.483	4.454	0.219	0.101	4.058	0.980
FATWHITE	7.311	3.413	0.032	5.480	3.301	0.100	2.319	1.114	0.037	2.417	4.307	0.574	-4.469	3.670	0.225
OWNROOM	-1.966	3.544	0.579	-1.514	3.485	0.663	1.259	1.027	0.221	4.536	4.162	0.277	-3.088	3.963	0.436
OWNCPU	19.178	6.182	0.002	18.941	6.149	0.003	11.704	1.648	0.000	8.841	6.511	0.175	2.039	7.990	0.799
BOOKS<25	-7.032	3.981	0.077	-10.373	4.262	0.015	-13.6711	1.242	0.000	-22.629	5.194	0.000	-20.049	5.130	0.000
BOOKS>200	15.503	4.048	0.000	19.612	5.984	0.001	11.661	1.268	0.000	4.069	4.626	0.379	13.6527	4.470	0.003
CULTPOSS	2.890	2.100	0.169	2.214	2.298	0.336	3.588	0.674	0.000	3.739	2.656	0.159	3.258	2.222	0.143
Level 2															
PCGIRLS	-18.241	18.767	0.335	-19.638	22.215	0.382	-13.080	8.379	0.356	13.656	23.229	0.560	-12.904	17.571	0.467
IMMIG20pct	-35.894	23.622	0.133	-83.858	15.460	0.000	-8.694	9.408	0.271	48.956	32.097	0.136	-60.343	18.566	0.003
CULTPOSS	10.614	21.380	0.621	33.797	19.654	0.092	8.556	7.753	0.159	31.855	22.917	0.173	35.151	11.399	0.004
COMPWEB	23.501	40.584	0.564	13.202	15.631	0.403	12.954	9.177	0.002	-3.588	30.180	0.906	-4.117	20.552	0.842
IRATCOMP	-42.416	34.742	0.227	60.285	43.971	0.178	45.622	14.605	0.333	2.808	43.258	0.949	69.966	23.971	0.006
STRATIO	5.488	2.832	0.057	2.651	2.240	0.244	0.907	0.936	0.003	2.164	2.951	0.468	1.268	1.699	0.459
SCMATEDU	1.258	4.815	0.795	-3.479	5.376	0.521	6.199	2.028	0.462	-3.453	5.111	0.503	4.828	3.071	0.123
SCHOOLSIZE	-0.016	0.033	0.630	0.027	0.022	0.217	0.004	0.006	0.000	0.039	0.012	0.003	0.034	0.008	0.000
CLASSIZE	27.396	16.679	0.105	-2.588	9.305	0.782	18.502	4.858	0.000	12.317	9.812	0.218	0.034	0.008	0.087
School ownership															
PRIVATE	-38.159	45.156	0.401	-42.874	51.875	0.401	-52.736	12.505	0.118	8.424	36.256	0.818	-45.064	15.905	0.007
GOVDEP	0.576	20.480	0.978	-11.248	15.614	0.395	-13.937	8.917	0.601	-20.586	31.049	0.511	-15.487	29.445	0.608
VILLAGE/TOWN	16.211	11.417	0.161	-13.780	11.147	0.224	-2.401	4.601	0.119	6.115	22.057	0.783	1.679	8.606	0.846
Type of school															
Technical	39.992	12.502	0.003	39.838	10.237	0.000	20.186	11.585	0.089	81.242	17.821	0.000	35.465	10.529	0.002
Licei	56.431	15.575	0.001	74.002	19.061	0.000	45.443	13.876	0.003	80.959	21.448	0.001	49.005	13.237	0.001

Table 9. HLM estimates for Italian Regions (cont.)

VARIABLES	*LIGURIA*			*LOMBARDIA*			*PIEMONTE*			*PUGLIA*			SARDEGNA		
	Coeff.	**SE**	**p-value**	**Coeff.**	**SE**	**p-value**	**Coeff.**	**SE**	**p-value**	**Coeff.**	**SE**	**p-value**	**Coeff.**	**SE**	**p-value**
Intercept	492.857	96.430	0.000	319.381	103.800	0.004	463.153	106.431	0.000	455.402	99.276	0.000	-11.435	107.933	0.917
Level 1															
AGE	-5.471	5.352	0.307	4.644	5.999	0.439	0.861	6.171	0.889	-4.329	6.140	0.481	23.634	6.187	0.000
GENDER	-14.090	4.116	0.001	-16.565	4.429	0.000	-10.197	3.863	0.009	-6.318	3.976	0.112	-12.388	4.019	0.003
REPEATONCE	-33.049	5.059	0.000	-42.465	4.829	0.000	-46.907	5.108	0.000	-44.342	6.779	0.000	-42.838	4.518	0.000
REPEATMORE	41.241	83.424	0.799	-70.711	110.687	0.498	-82.546	134.545	0.398	43.545	81.541	0.798	-71.541	111.544	0.581
IMMIG1	-12.281	8.147	0.132	-15.902	10.179	0.118	-6.327	10.782	0.557	9.035	10.601	0.394	26.847	16.580	0.105
IMMIG2	-10.258	7.061	0.146	-6.566	8.629	0.447	-4.803	8.617	0.577	6.291	7.966	0.430	-4.741	10.924	0.664
PARYEARS	-0.191	0.730	0.793	0.000	0.702	1.000	-0.678	0.721	0.348	-2.022	0.634	0.002	-1.193	0.692	0.084
MOTUNIV	0.106	4.726	0.982	-17.418	6.840	0.011	2.767	5.957	0.642	0.057	7.346	0.994	3.822	7.395	0.605
FATUNIV	-3.150	5.147	0.540	3.587	6.738	0.594	4.911	6.035	0.416	31.577	5.664	0.000	12.660	7.153	0.077
MOTWHITE	7.419	3.786	0.050	6.241	4.441	0.160	10.699	4.275	0.013	4.886	4.948	0.324	3.250	4.840	0.502
FATWHITE	5.984	3.527	0.090	3.475	4.121	0.399	-1.489	4.289	0.728	0.137	4.258	0.974	2.257	4.349	0.603
OWNROOM	1.692	3.374	0.616	1.176	3.581	0.742	-0.979	3.804	0.797	0.849	3.464	0.806	0.328	4.275	0.939
OWNCPU	16.388	4.830	0.001	14.777	6.755	0.029	4.979	6.991	0.476	11.573	4.439	0.010	7.606	5.466	0.164
BOOKS<25	-17.988	4.738	0.000	-9.642	4.722	0.041	-21.474	4.896	0.000	-4.813	3.462	0.165	-12.068	5.072	0.018
BOOKS>200	8.184	5.053	0.105	8.869	4.562	0.052	23.312	4.540	0.000	6.756	6.774	0.319	5.27	4.468	0.239
CULTPOSS	6.508	2.318	0.006	3.017	2.471	0.223	0.226	2.568	0.930	5.138	2.511	0.041	3.794	2.702	0.161
Level 2															
PCGIRLS	20.785	19.886	0.301	-5.411	22.658	0.813	-7.320	25.342	0.774	-40.060	12.544	0.003	-27.034	25.780	0.302
IMMIG20pct	1.266	13.459	0.926	25.039	33.872	0.464	9.194	34.418	0.791	-7.545	11.546	0.320	-7.878	8.682	0.291
CULTPOSS	10.779	16.693	0.521	14.445	26.427	0.587	28.795	23.344	0.226	48.674	13.247	0.001	-4.168	30.404	0.892
COMPWEB	30.042	17.313	0.088	-37.024	24.944	0.146	-31.945	28.552	0.272	18.279	12.532	0.153	48.686	29.112	0.103
IRATCOMP	-35.510	21.550	0.105	-5.124	35.805	0.887	85.644	93.748	0.368	123.744	35.156	0.001	62.438	60.175	0.307
STRATIO	-3.076	2.033	0.136	7.495	3.605	0.044	-0.929	2.722	0.735	2.497	1.874	0.191	-1.104	3.224	0.734
SCMATEDU	-2.020	4.877	0.680	3.254	8.696	0.710	1.042	6.893	0.881	-5.733	6.545	0.389	5.625	6.742	0.410
SCHOOLSIZE	0.020	0.014	0.153	0.006	0.016	0.715	0.014	0.011	0.226	0.008	0.007	0.253	-0.001	0.020	0.963
CLASSIZE	16.059	12.771	0.214	-2.172	15.580	0.890	2.147	15.558	0.892	-6.145	7.022	0.388	41.173	15.355	0.011
School ownership															
PRIVATE	-65.379	41.398	0.120	-68.173	28.614	0.023	-26.679	19.963	0.191	30.118	11.532	0.013	-112.820	46.886	0.022
GOVDEP	-13.057	12.232	0.291	33.444	45.790	0.470	-12.546	9.714	0.487	-17.845	11.581	0.584	-24.547	29.454	0.338
VILLAGE/TOWN	-11.578	9.586	0.233	26.149	14.045	0.070	16.573	14.686	0.268	-5.605	6.032	0.359	-26.445	14.090	0.068
Type of school															
Technical	54.364	11.818	0.000	91.670	17.189	0.000	48.287	15.392	0.004	20.606	10.573	0.059	22.024	14.65	0.141
Licei	90.465	19.827	0.000	98.928	24.973	0.000	92.559	22.192	0.000	67.206	16.614	0.000	113.527	20.795	0.000

Table 9. HLM estimates for Italian Regions (cont.)

VARIABLES	*SICILIA*			*TRENTO*			VENETO		
	Coeff.	**SE**	**p-value**	**Coeff.**	**SE**	**p-value**	**Coeff.**	**SE**	**p-value**
Intercept	409.659	113.003	0.001	295.360	88.879	0.002	461.520	78.736	0.000
Level 1									
AGE	-0.633	6.583	0.924	9.880	5.406	0.067	-3.085	4.920	0.530
GENDER	-11.324	4.091	0.006	-7.354	4.496	0.102	-10.207	4.027	0.012
REPEATONCE	-49.027	5.944	0.000	-35.955	4.569	0.000	-43.111	4.951	0.000
REPEATMORE	35.546	70.771	0.788	-15.987	47.874	0.881	13.549	48.548	0.714
IMMIG1	2.755	12.195	0.821	-30.273	9.676	0.002	-44.882	12.977	0.001
IMMIG2	-4.733	10.142	0.640	7.919	7.031	0.261	12.492	8.282	0.132
PARYEARS	0.231	0.717	0.747	-1.097	0.728	0.132	-0.071	0.634	0.911
MOTUNIV	4.948	7.564	0.513	2.133	7.272	0.768	0.224	8.153	0.978
FATUNIV	3.529	7.469	0.636	-4.286	6.639	0.518	10.666	6.566	0.104
MOTWHITE	11.998	4.998	0.017	-3.099	3.987	0.437	-8.992	3.901	0.021
FATWHITE	0.866	4.330	0.842	4.622	4.304	0.284	2.694	3.503	0.442
OWNROOM	6.907	4.082	0.091	2.783	3.164	0.380	3.517	3.063	0.252
OWNCPU	9.868	5.545	0.075	15.531	5.153	0.003	6.154	7.069	0.384
BOOKS<25	-10.439	4.589	0.023	-16.366	3.657	0.000	-19.622	4.097	0.000
BOOKS>200	10.895	5.782	0.059	4.070	4.837	0.400	8.936	4.082	0.029
CULTPOSS	-1.492	2.813	0.596	2.996	2.174	0.168	4.782	2.115	0.024
Level 2									
PCGIRLS	-36.858	32.612	0.267	-14.657	15.042	0.333	-38.247	16.311	0.025
IMMIG20pct	-10.547	9.487	0.202	28.079	20.416	0.176	14.650	17.156	0.399
CULTPOSS	52.038	27.689	0.068	28.720	21.464	0.188	36.250	15.205	0.023
COMPWEB	-9.265	28.115	0.744	12.672	21.375	0.556	50.037	27.700	0.079
IRATCOMP	-16.396	79.035	0.837	11.884	30.148	0.695	42.487	27.615	0.132
STRATIO	-1.161	3.399	0.734	3.536	2.930	0.234	-0.415	1.566	0.792
SCMATEDU	-1.145	7.423	0.879	-8.417	5.322	0.120	-0.374	4.399	0.933
SCHOOLSIZE	0.017	0.015	0.256	0.013	0.015	0.371	0.023	0.010	0.032
CLASSIZE	-3.402	12.499	0.787	-25.699	11.853	0.035	41.725	11.131	0.001
School ownership									
PRIVATE	-141.164	49.590	0.008	-21.044	11.472	0.073	-93.617	18.664	0.000
GOVDEP	22.584	44.733	0.616	-8.754	18.568	0.401	-42.264	14.214	0.006
VILLAGE/TOWN	-4.711	20.444	0.819	9.114	7.908	0.256	-0.113	12.953	0.993
Type of school									
Technical	38.475	16.039	0.022	82.298	13.879	0.000	39.888	9.317	0.000
Licei	74.749	19.772	0.001	80.247	19.576	0.000	60.865	13.614	0.000

Table 10. HLM estimates for Spanish Regions

VARIABLES	*ANDALUCÍA*			*ARAGON*			*ASTURIAS*			*CANTABRIA*			CASTILE AND LEON		
	Coeff.	**SE**	**p-**	**Coeff.**	**SE**	**p-**	**Coeff.**	**SE**	**p-**	**Coeff.**	**SE**	**p-value**	**Coeff.**	**SE**	**p-value**
Intercept	281.2746	110.709	0.015	83.613	92.985	0.375	438.400	90.906	0.000	401.663	98.944	0.000	426.221	96.039	0.000
Level 1															
AGE	12.813	6.030	0.034	24.633	5.883	0.000	6.452	5.450	0.237	8.806	5.953	0.139	4.520	5.981	0.450
GENDER	-23.994	3.437	0.000	-12.669	3.767	0.001	-19.158	3.844	0.000	-15.335	3.486	0.000	-16.977	2.551	0.000
REPEATONCE	-68.922	4.019	0.000	-62.926	3.706	0.000	-67.663	3.723	0.000	-72.609	3.890	0.000	-68.875	3.574	0.000
REPEATMORE	-121.196	6.381	0.000	-123.635	5.790	0.000	-114.561	9.039	0.000	-110.765	6.775	0.000	-104.944	5.287	0.000
IMMIG1	-21.545	13.205	0.103	3.890	9.543	0.683	1.917	9.189	0.835	-16.276	9.147	0.075	-14.303	8.776	0.103
IMMIG2	12.662	7.707	0.100	-20.193	8.115	0.013	-0.326	5.580	0.954	-2.705	6.960	0.696	2.615	7.027	0.709
PARYEARS	1.617	0.582	0.006	1.406	0.726	0.053	0.557	0.693	0.421	0.131	0.780	0.867	-0.464	0.558	0.405
MOTUNIV	-16.029	6.769	0.018	-10.638	6.077	0.080	-4.164	5.814	0.474	1.840	6.084	0.762	3.002	5.598	0.591
FATUNIV	2.371	6.631	0.720	-2.055	6.197	0.740	-3.393	5.162	0.511	-4.996	5.572	0.370	10.608	5.563	0.056
MOTWHITE	9.473	5.447	0.082	14.798	4.705	0.002	11.891	4.585	0.010	12.313	5.392	0.023	0.945	5.380	0.861
FATWHITE	8.379	4.547	0.065	11.196	4.563	0.014	13.142	3.884	0.001	14.175	3.890	0.001	2.661	4.682	0.569
OWNROOM	5.571	4.408	0.207	-5.911	5.511	0.284	0.506	4.582	0.913	3.022	4.581	0.509	-10.004	8.972	0.181
OWNCPU	16.154	4.967	0.002	13.957	6.821	0.041	-0.663	6.742	0.922	10.757	6.259	0.085	10.113	5.947	0.089
BOOKS<25	-22.038	4.396	0.000	-25.260	6.423	0.000	-17.8016	4.291	0.000	-28.289	4.722	0.000	-25.706	5.918	0.000
BOOKS>200	25.085	5.155	0.000	16.186	4.286	0.000	14.251	3.6018	0.000	25.022	4.192	0.000	20.038	3.442	0.000
CULTPOSS	5.231	2.324	0.024	6.312	2.564	0.014	6.478	2.288	0.005	6.042	2.174	0.006	8.249	2.603	0.002
Level 2															
PCGIRLS	-8.180	77.732	0.917	49.857	28.111	0.084	-51.721	39.444	0.197	-48.426	34.411	0.167	63.094	41.224	0.134
IMMIG20pct	-20.548	35.487	0.411	-3.080	6.587	0.642	-25.391	13.600	0.069	-16.821	7.624	0.049	-11.245	13.545	0.411
CULTPOSS	18.158	13.839	0.197	20.486	11.227	0.075	-6.379	17.910	0.723	-8.840	11.876	0.461	11.498	17.416	0.513
COMPWEB	8.959	25.823	0.730	-13.704	13.936	0.332	5.699	24.192	0.815	8.711	11.006	0.433	23.072	15.068	0.133
IRATCOMP	28.937	53.030	0.588	-41.824	62.192	0.505	-28.022	67.070	0.678	-89.933	37.035	0.020	79.244	77.570	0.314
STRATIO	0.262	3.004	0.931	2.121	1.403	0.139	-0.783	2.034	0.702	3.747	1.604	0.025	-1.288	1.272	0.318
SCMATEDU	-1.344	3.467	0.700	2.428	3.164	0.447	-0.260	3.906	0.948	-4.461	4.004	0.272	5.468	2.392	0.028
SCHOOLSIZE	0.001	0.014	0.967	0.005	0.007	0.491	0.024	0.018	0.197	-0.013	0.014	0.363	0.006	0.011	0.596
CLASSIZE	1.109	8.171	0.893	11.047	4.995	0.033	10.110	10.409	0.338	-1.002	8.564	0.908	3.341	6.269	0.597
School ownership															
PRIVATE	-13.294	33.709	0.695	-5.379	8.988	0.553	25.099	20.856	0.236	-8.636	10.939	0.435	-13.338	9.469	0.167
GOVDEP	-14.836	23.244	0.527	-31.763	11.688	0.010	11.152	17.512	0.528	-42.402	12.712	0.002	13.234	10.277	0.205
VILLAGE/TOWN	-4.783	8.469	0.575	0.577	8.551	0.947	-12.454	7.825	0.119	-11.718	5.817	0.050	0.668	7.861	0.933

Table 10. HLM estimates for Spanish Regions (cont.)

VARIABLES	*CATALONIA*			*GALICIA*			*LA RIOJA*			*NAVARRE*			BASQUE COUNTRY		
	Coeff.	**SE**	**p-value**	**Coeff.**	**SE**	**p-value**	**Coeff.**	**SE**	**p-value**	**Coeff.**	**SE**	**p-value**	**Coeff.**	**SE**	**p-value**
Intercept	310.517	112.565	0.009	433.807	102.138	0.000	197.417	92.094	0.040	229.692	108.748	0.041	320.538	57.193	0.000
Level 1															
AGE	8.211	5.838	0.160	7.788	5.987	0.194	16.327	5.747	0.005	14.372	5.687	0.012	10.190	3.530	0.004
GENDER	-22.310	3.666	0.000	-25.712	3.575	0.000	-12.842	4.522	0.005	-18.849	4.080	0.000	-12.385	2.381	0.000
REPEATONCE	-65.726	4.180	0.000	-76.234	4.182	0.000	-74.000	4.628	0.000	-77.554	4.458	0.000	-70.971	3.125	0.000
REPEATMORE	-116.734	10.168	0.000	-133.225	6.272	0.000	-113.136	8.314	0.000	-123.678	9.024	0.000	-125.012	6.330	0.000
IMMIG1	-23.234	10.424	0.026	10.404	8.616	0.228	9.889	14.211	0.486	-3.546	10.699	0.740	-9.371	8.320	0.261
IMMIG2	-0.755	0.631	0.905	2.039	5.891	0.729	-18.199	9.061	0.044	3.891	7.267	0.592	-6.831	5.496	0.214
PARYEARS	1.400	0.749	0.061	1.452	0.661	0.028	1.864	0.786	0.018	-0.180	0.736	0.807	0.686	0.413	0.096
MOTUNIV	4.377	6.936	0.528	-10.030	6.164	0.104	17.885	8.133	0.028	1.302	5.937	0.827	-3.272	3.147	0.299
FATUNIV	-9.309	5.780	0.107	-2.442	6.161	0.692	-7.333	5.470	0.181	14.112	6.066	0.020	1.496	3.374	0.657
MOTWHITE	9.035	4.185	0.031	9.372	5.099	0.066	10.893	5.212	0.037	5.561	4.028	0.168	7.846	2.925	0.008
FATWHITE	0.897	4.314	0.836	8.068	4.584	0.078	9.141	4.017	0.023	9.832	4.462	0.028	3.707	2.552	0.146
OWNROOM	-7.595	5.931	0.201	-11.480	5.472	0.036	6.898	5.708	0.227	-8.846	5.546	0.111	-0.996	3.057	0.744
OWNCPU	8.607	7.568	0.256	7.542	4.854	0.120	21.655	7.728	0.006	12.028	6.381	0.059	8.591	4.491	0.055
BOOKS<25	-26.788	5.178	0.000	-23.528	5.074	0.000	-32.2146	6.151	0.000	-21.774	6.093	0.001	-12.674	3.307	0.000
BOOKS>200	19.744	5.118	0.000	7.517	4.371	0.085	19.286	3.44	0.000	22.368	4.532	0.000	19.244	2.329	0.000
CULTPOSS	3.050	2.488	0.221	3.275	2.271	0.150	2.726	2.344	0.246	5.296	2.629	0.044	4.310	1.332	0.002
Level 2															
PCGIRLS	45.724	65.437	0.489	16.364	35.410	0.646	92.625	31.956	0.007	-24.342	27.782	0.387	29.114	17.553	0.099
IMMIG20pct	4.417	8.733	0.616	-28.732	23.279	0.225	-53.972	16.437	0.003	-38.331	10.454	0.001	4.181	7.218	0.563
CULTPOSS	27.997	13.803	0.049	-14.544	17.043	0.399	-17.143	27.530	0.538	37.121	14.960	0.018	22.180	7.186	0.003
COMPWEB	0.154	23.136	0.995	3.914	22.033	0.860	-17.206	18.486	0.359	3.455	43.445	0.937	0.317	9.602	0.974
IRATCOMP	91.132	62.044	0.150	-111.387	49.043	0.029	-0.624	42.049	0.988	69.956	61.762	0.265	-21.515	30.124	0.476
STRATIO	2.239	1.779	0.216	-1.518	2.172	0.489	2.621	1.936	0.185	6.307	3.067	0.046	0.416	0.748	0.579
SCMATEDU	3.712	2.618	0.164	4.284	4.567	0.354	-1.546	3.663	0.675	-8.139	4.758	0.095	3.423	2.129	0.110
SCHOOLSIZE	0.017	0.014	0.255	0.006	0.017	0.738	0.006	0.010	0.529	-0.014	0.015	0.370	0.011	0.005	0.041
CLASSIZE	-1.564	6.818	0.820	-2.551	8.174	0.756	2.139	7.306	0.771	10.784	8.491	0.212	-5.193	5.116	0.312
School ownership															
PRIVATE	-10.453	18.403	0.573	0.764	18.642	0.968	-36.489	12.747	0.008	3.610	20.363	0.861	-5.661	13.670	0.679
GOVDEP	0.076	13.573	0.996	13.787	16.937	0.421	-24.977	8.986	0.009	-12.294	20.376	0.549	-7.813	6.891	0.259
VILLAGE/TOWN	2.768	7.770	0.723	-5.137	9.473	0.590	-0.134	6.575	0.984	11.509	12.257	0.354	-13.589	4.226	0.002

5. Discussion and concluding remarks

In this paper, we applied a multilevel model to the OECD-PISA2006 data about Italy and Spain, with the aim of identifying common patterns between the two countries. More specifically, we were interested in discussing whether the factors behind the students' achievement are similar or not. Moreover, a deeper analysis concerned the regional differences that characterize both countries. The findings can be interesting for policy purposes, given the growing necessity to provide evidences about the results and their determinants in educational systems within Europe.

The first evidence is that the Italian educational setting shows a much higher between-schools variance than the Spanish case. The reason for such difference is that Italian students are tracked in three different secondary school types: Licei (comprehensive schools), technical and vocational schools. The students who attend the former group clearly outperform their counterparts attending the other two groups. Previous literature on educational tracking pointed out the risk of increasing inequality. Hanushek & Woessman (2005) studied the differences between "tracked" and "untracked" systems, by means of several international datasets (e.g. OECD-PISA, TIMSS, PIRLS) and conclude that early tracking at age 10, while no evidence is provided about tracking at secondary level – in the latter case, the analysis should undertake the effects on higher education. Data about Italy actually shows that there is a statistical difference between different school types in terms of OECD-PISA 2006 test scores. The average score for Licei is 425 (all other things equal) compared with 382 of technical schools, and even 335 of vocational schools (table 5). In some Italian regions, this difference is even wider (see Lombardia in table 6).

A judgment about the consequences for equity is beyond the scope of this paper; nevertheless, when studying the effects behind students' performances, such influence should be adequately kept in mind. Moreover, a point should be raised about the tracking procedure in Italy. Indeed, students sort themselves

into the three different school types, typically on the basis of their expectations and/or previous results. To the extent that expectations and previous results are influenced by families' background, the resulting output can be easily challenged on the equity ground.

The second evidence is that a strong negative obstacle in terms of achievement affects Spanish students who repeated more than once. Table 5 shows that they perform more than 100 points below the other students' average – that is, a 25% disadvantage. Such effect is enormous in magnitude, and calls for a serious reflection in terms of policy implications, since this piece of evidence is clearly correlated with higher levels of school dropout, one of the main problems in the Spanish education system (Fuentes, 2009; Mora *et al*., 2010). Even though the proportion of students in such conditions is low (5%) an equitable educational system should take care of them by means of appropriate initiatives. Some recent educational literature discussed potential actions to be implemented; for instance, Ritter *et al.* (2009) reviewed some papers on the effect of volunteer tutoring and demonstrate its effectiveness. Other potential strategies could be improving teachers' training or strengthening the role of social workers when it comes to make parents aware of the importance of education. It is important to recall here that such compensatory programs should be realized at the lower level of education, as the bad results of students at secondary schooling levels are probably related to previous educational experiences.

Third, several common features characterized the two countries (tables 4 and 5). Among them, (i) the disadvantage for students from immigrant families (between 7 and 13 points) and (ii) a negative effect due to low cultural families' profile (13-23 points) are the most evident. These findings are coherent with previous studies that underlined the relevant role played by families' socio-economic background (Causa & Chapuis, 2009).

The last evidence comes from the analysis carried out at regional level. The Italian and Spanish educational settings are interesting given the high heterogeneity across regions in both countries. Some Regions perform well

above the OECD average (e.g. Friuli Venezia Giulia and La Rioja – Italy and Spain respectively), while others look characterized by low performance levels (e.g. Campania and Andalusia). These differences among Regions raise a question about the role of central and regional governments. Indeed, while Regions are committed to a high role in regulating and financing education in Spain, the same does not hold for Italy; thus, it is odd that higher variations among schools exist for the latter than for the former. Moreover, investigating the reasons associated with regional differences is an interesting subject *per se*. Our paper provides preliminary insights in this respect, by describing the factors affecting students' performances for each Region. The picture that emerges is useful as it claims for a different role of some variables – depending upon each single Region.

An illustrative example derives from the role of computer possession in Italy. Students who have a computer perform better in Basilicata, Campania, Puglia and Sicily but not in Emilia Romagna, Friuli Venezia Giulia and Veneto. It is noticeable that the former group comprises poor regions in the South, while the latter rich regions in Northern Italy. A plausible explanation is that having a computer matters in contexts where schools' facilities are poor; or having a computer is an indirect measure of socio-economic status. A detailed discussion of the single results for each region is not the primary objective of this paper; instead, the findings could be useful for national and regional policy-makers who want to better understand the patterns behind students' achievement scores.

Along with the growing role of the European Union in educational policy making, detailed cross-country comparisons between educational systems of European countries will be required. Our paper goes into this direction, by providing some methodological suggestions and empirical findings.

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