FISCAL DECENTRALISATION, PRIVATE SCHOOL FUNDING, AND STUDENTS' ACHIEVEMENTS. A TALE FROM TWO ROMAN CATHOLIC COUNTRIES

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Fiscal Decentralisation, Private School Funding, and Students' Achievements. A Tale from Two Roman Catholic Countries[♣]

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Abstract

The objective of the paper is to study the disciplining role of both market forces and sub-national governments' own resources in the provision of educational services. The historical evolution of school regulation in Italy and Spain – in particular regarding the funding of private schools run by the Roman Catholic Church and the role of regional governments in financing education – created different institutions in terms of both dimensions, private funds and sub-national (regional) governments' funds. We take advantage of these institutional diversities rooted in history to estimate the disciplining role of these different sources of funding in the context of an educational production function using PISA data. Our results provide support to both accountability mechanisms and point to the presence of a remarkable interplay between them. We also confirm the available evidence on the major role of standardized external exams in providing adequate incentives to improve schools' performance.

Keywords: public and private schools, fiscal decentralization, sub-national government accountability, market incentives

JEL Codes: H75, I22

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1. Introduction

Historical accounts of the evolution in school regulation all around the world suggest that this is a policy issue subject of bitter ideological confrontations. Two questions emerge as important in the debate: first, what is the role that *private schools* should play in the provision of education. In countries where the Roman Catholic Church is still an important actor in social life, this question is basically centred on the role, if any, private schools run by the Catholic Church should play in education, and whether these schools needs to be financed with *public funds*. A second question is on the role *sub-national governments* should play in the provision of education. Opponents to decentralisation argue that public free-for-all education is a way to guarantee equal opportunity to all citizens, and a device to build a shared national identity; hence, education should be centrally managed. From an economist point of view, these two issues really hide two different "accountability mechanisms". The first mechanism – i.e., the private market incentives – is as old as economics. The comparison between private and public schools suggests that – in the presence of external exams to assess the level of students' achievements – private schools should be more productive than public schools in providing better attainments, given that households pay a higher price to access the service. This first "market-accountability" effect should be stronger the higher the share of funding coming *directly* from the "users" of the service. According to this reasoning, private schools are then better to be financed with private funds. The role of the second accountability mechanism – sub-national government's own resources – has been recently emphasised by the second-generation theories of fiscal federalism (e.g., Weingast, 2009). Taking this view, schools funded with sub-national governments' own resources should be more productive than schools centrally funded, given the "fiscal-accountability" incentives exerted by decentralized revenues. The policy suggestion would be to finance the schools with sub-national governments' funds.

Evidence supporting the role played by these two mechanisms in the case of schooling have been recently provided, e.g., by West and Woessmann (2010), Galiani

et al. (2008), and Barankay and Lockwood (2007). On the one hand, using PISA 2003 data, West and Woessmann (2010) show that a fiercer competition from private schools (here measured by their market share) lead to better students' achievements in mathematics, science and reading, and to lower total education spending, indirectly supporting the role of the "market-accountability" mechanism. The result is obtained controlling for the average share of funding that private schools receive from the government and the current Catholic share. The authors also account for the likely endogeneity of the contemporary private school share, by showing that countries with larger shares of Catholics in 1900 (but without a Catholic state religion, like Italy or Spain) tend to have larger shares of privately operated schools even today. On the other hand, Galiani *et al.* (2008) and Barankay and Lockwood (2007) both find evidence supporting the "fiscal-accountability" mechanism. Galiani *et al.* (2008) show that decentralization of educational policies in Argentina – where federal schools co-existed with provincial schools until the structural reforms undertaken early in the Nineties – had an overall positive effect on student test scores. Barankay and Lockwood (2007) consider Swiss cantons; they first offer evidence that expenditure decentralisation is a powerful proxy for factual autonomy in education policy, and then show that more decentralisation in spending is associated with higher educational attainments.

Despite the literature has so far considered independently the two issues of private schools and fiscal decentralisation, they can hardly be separated when evaluating schools outcomes, both within and across countries. The historical evolution of school regulation in Italy and Spain – two countries where the Roman Catholic Church is still considered a sort of "state religion" – is a vivid example of this point: it created different types of schools, in particular regarding the funding of private schools run by the Roman Catholic Church, and the role of regional governments. In Italy, starting from the Unification in the second half of the XIX century, there was a strong push towards a public free-for-all education centrally provided, and public funds to private schools (as their role) have been severely limited. In Spain, after the

success of Franco's *coup d'etat* in 1939, the schools run by the Catholic Church were largely financed with government funds, and are still now receiving a high share of public monies. Not surprisingly, they also play an important role as providers of education. But Italy and Spain have also followed different paths with regard to decentralisation. In the last thirty years, Spain has moved from being a unitary state to a much more decentralized one, with the regions (*Comunidades Autónomas*) having Parliaments and Governments that can decide on a broad range of public services, among which educational services represent a large share of regional public expenditures (e.g., López-Laborda *et al.*, 2007; Davies *et al.*, 2002; Vinuela, 2000). On the other hand, consistently with the process of centralization and secularization of education, Italian regional governments (*Regioni*) play, in general, a very minor role in deciding over public expenditures for education. However, also in Italy, the two Autonomous Provinces of Trento and Bolzano are in charge of funding and managing also their schools, increasing the within-country variability in terms of different institutions.

Given these combinations of private funds (coming from households paying a price for educational services) and public funds (coming from both regional and central governments), it is not clear how the two "accountability mechanisms" identified by previous literature really impact on the production of education. The goal of the paper is to explore this issue. To this end, we exploit historical institutional diversities between Italy and Spain to assess the disciplining role of different sources of funding, specifically, private funds and sub-national governments' own resources. Results obtained by estimating an "education production function" using PISA data for the year 2003 on the sample of Italian and Spanish regions provide support to both the "market-accountability" and the "fiscal-accountability" effects. In particular, we find that a larger share of private funding and a larger share of decentralised public funding are consistently associated with better outcomes in terms of students' achievements. Moreover, we confirm the evidence on the role

played by external exams in providing adequate incentives to improve schools' performance.

The remainder of the paper is structured as follows. Section 2 provides a brief introduction on schooling systems in Italy and Spain, along both an historical and an institutional perspective. Section 3 discusses our empirical strategy, and presents the PISA data and estimation results, including robustness tests and a brief policy discussion. Section 4 collects the final remarks.

2. Italy and Spain: historical and institutional differences

2.1. Educational systems: role and public funding of private schools

While sharing a number of cultural traits characterising Mediterranean countries, Italy and Spain show large institutional differences rooted in the historical evolution of the two countries. Limiting the analysis to schooling, one can highlight two important sources of variation: on the one hand, the role of private schools and their funding with public monies; on the other hand, the role of fiscal decentralisation and regional funding for schools. The present day situation is the result of different historical patterns. The Italian school system has been heavily influenced after the unification of the country in 1861 by the Coppino Law promulgated in 1877. This law was introduced by a left-wing government headed by Agostino Depretis, establishing two basic principles: first, free-of-charge public elementary schooling for all the citizens, with municipalities responsible of managing and funding schools; second, compulsory education for all, with sanctions and fines for all the citizens not attending schools. The implicit aim of this model was to create a national identity in a country with substantial differences across regions. Catholics strongly criticised this law with a secular taste, that excluded religion from curricula in public schools, and sent their children to private institutions run by the Catholic Church. The compulsory free-for-all public schooling system designed at the end of the XIX century was further reinforced with the Law Daneo-Credaro in 1911, which

centralized schools' funding and management, basically assigning the central government both the decisions on hiring and firing teachers, and the payment of teachers' wages, in order to help municipalities in financial troubles for running schools. Decisions and funding remained almost totally centralised also with the Republican Constitution in 1948. The Constitution also stated the possibility to establish and run private schools, but "without any financial burden for the State". This is a formula that was (and still is) subject to harsh debates in the following years, with supporters of the public school system strongly opposing to any transfer of public funds to private schools, especially the religious ones. The solution proposed by the different governments that run the country was mainly ideological, with centre-left coalitions cutting funds to private schools and increasing those for public schools, and centre-right coalitions making exactly the opposite, without any reference to the performance of the two types of schools in terms of students' attainments. The Italian schooling system was subjected to a number of different reforms since then, but none changed the two fundamental principles of a compulsory and free-of-charge public schooling centrally managed and financed.

The Spanish system followed a different route, with the Catholic Church playing a more or less prominent role according to the specific historical period. The 1812 Constitution established that schooling was the basic responsibility of the State. However, throughout the XIX century, liberals and conservatives engaged in sour battles over educational issues and the role of the Catholic Church. In particular, the Revolution of 1868 and the subsequent advent of the First Republic pointed to the importance of academic freedom, and the separation of the Church and the State in the matter of education. On the contrary, in the period of the Bourbon Restoration (1874 - 1931), the conservatives sought to re-establish the control of the Catholic Church over education, supported by a series of *Concordats* with the Vatican that went in the direction of solidifying the relationship between the State and the Church. The new Constitution, promulgated with the advent of the Second Republic in 1931, revoked the 1851 Concordat with the Vatican – which established

Catholicism as the official state religion in Spain – and brought new important educational reforms, including the call for free compulsory primary education and non-religious instruction. All these changes came to an end with the failure of the Republic and the success of the fascist forces of General Franco at the end of the Spanish Civil War in 1939. During subsequent years, education in Spain was converted into the transmission of Franco's views of Spanish Nationalism and Catholic ideology, and the power of the Catholic Church was restored with the approval of the 1952 Concordat. This agreement had important implications for education: Catholic religious instruction was to be mandatory in all schools, even in the public ones; moreover, the Catholic Church was given the right to establish their own universities. With the democratic regime following Franco's death in 1975, new laws were issued aimed at reducing the role of State subsidies for education. In particular, the Law on the General Organization of the Educational System (LOGSE), introduced in 1990, was a profound reform of the educational system that tried to take into account the new reality of Spain, which was no longer a centralised country but an increasingly decentralised one, with some regions having competencies to legislate on education from the early Eighties. However, the issues surrounding government subsidies to schools run by the Catholic Church had not been solved and, at the end of the XX century, the government continued (and still continue) to subsidize private church-affiliated schools. Notice that, as in Italy, also in Spain the funding of private (but also public) schools is not related at all to their performance and simply follows historical spending.

2.2 Decentralization patterns: the rationales for regional autonomy

As for fiscal decentralisation, Italy and Spain have also followed different patterns (e.g., Davies *et al.*, 2002). Nowadays, considering taxes and revenues managed by regional governments, Italy can be considered a "centralised" country compared to Spain. IMF data from Government Finances Statistics show that sub-national governments in Italy (including regions, provinces and municipalities) account in

2007 for around 28% of total revenue and 27% of total spending. On the contrary, in Spain, the 1978 democratic Constitution created the *Comunidades Autónomas* (CA) as an intermediate level of government aimed at recognizing the internal heterogeneity of the country. This level of government soon took responsibility over matters related to the Welfare State, such as education and health, that were before in the hands of the central government. In 2005, IMF figures show that 55.3% of total spending in Spain is decided by the central government, while the remaining 44.7 refers to sub-national governments (31.6% to regional governments, and 13.1% to local governments).

Starting from these premises, it does not come as a surprise that – with respect to education – the share of funding coming from regional governments to finance schools is remarkably different between Italy and Spain. The centralisation of management and funding of schools in Italy has been threatened only in 2005 by the proposed Constitutional Reform, which identified schooling as an exclusive responsibility of regional governments, like health care (the most important task currently devolved to regions in Italy). However, a national referendum rejected this project, confirming the favour towards a strongly centralised public schooling. As a result, only schools belonging to the two Autonomous Provinces of Trento and Bolzano (*de facto*, two regional governments) and to the Valle d'Aosta Region are financed by own regional funds, while schools in the other regions are almost totally financed by the central government, which assigns the resources to each school according to historical spending. Considering the national level, available statistics for 2003 show that more than 82.7% of total spending in education is allocated by the central government, 2.3% is decided by regional governments, and 15% by local governments (see, e.g., MIUR, 2007). Notice that the reasons for granting autonomy to the three regional governments (Trento, Bolzano and Valle d'Aosta) are neither specific to the educational sector nor related to the performance of local schools. They are grounded in history, and specifically connected to the protection of language minorities and territorial cultures. More precisely, the autonomy was the

result of the efforts put forward by local politicians and their pressures on both Allied Forces and the main national antifascist personalities sharp after the end of the II World War. As for the Valle d'Aosta, the autonomy was formalised with the two Lieutenancy Decrees 545 and 546 issued in 1945. As for Trento and Bolzano, the autonomy dates back to the Agreement De Gasperi-Gruber signed in Paris in 1946. As already mentioned, the autonomy has been granted to these three regional governments along several dimensions, including schooling. And these governments exercised autonomy by designing different educational systems with respect to the national one. For instance, the Provincial Law n. 5/2006 disciplines the educational system in the Province of Trento by assigning full autonomy – managerial as well as financial – to each school. It has also introduced additional tools for evaluating the productivity of schools at the provincial level, an issue which is being debated at the national level only in the last few years. Notice that fiscal decentralisation also resulted in a higher share of income devoted to public education: in 2002, the spending-to-GDP ratio for schooling was 6.2% in the Autonomous Province of Trento, while 4.7% on average in Italy.

Regional autonomy in Spain as we know it now is more recent, but also in this case the reason for decentralisation of powers is unrelated at all to the performance of local schools. The rationale was mainly political, stemming from the recognition of the cultural heterogeneity within the country (e.g., Vinuela, 2000). The unification in the XVIII century operated by the Bourbons was never accepted, and during the Second Republic (1931-1936) there were attempts to solve the "regional problem" (as it was called it at that time), by granting autonomy to some of the regions. The Statute of Autonomy for Catalonia was approved in 1931, while those for Galicia and Basque Country were stopped by the Civil War. The fascist view by General Franco pushed toward centralisation, strengthening the role of the central government and cutting autonomy back. But with the transition to democracy after Franco's death in 1975, the pendulum turned back again in favour of devolving power to local communities, and the quest for autonomy by regions was finally met

in the new 1978 Constitution, which acknowledged the right for each region to obtain the assignment of spending powers over a number of issues. As for education, regions such as Andalusia, Basque Country, Canary Islands, Catalonia, Galicia and Comunidad Valenciana received responsibility for primary and secondary schools between 1980 and 1983, and between 1985 and 1987 for higher education. Navarra received responsibility for all schools' grades in 1990. The remaining regions joined between 1995 and 2000. The decentralisation of spending in education in Spain is pretty clear from aggregate data: in 2005, IMF figures show that 4.5% of total spending is decided by the central government; 89.5% by regional governments, and 6% by local governments.

The historical patterns described above provide a sort of "quasi-natural" experiment for testing the impact of institutional changes with respect to both private schooling system and decentralised funding of educational services. In the remainder of the paper, we take advantage of these institutional differences in terms of the role played by public funds in financing private schools and of the degree of fiscal decentralisation in order to identify the "accountability effects" exerted by both market forces and (regional) tax autonomy.

3. Empirical analysis

3.1. The identification strategy

According to the institutional differences summarised in the previous section, we basically have two exogenous sources of variation to identify the effects of the two accountability mechanisms:

a. The first one is the degree of fiscal decentralisation, which is different *within* Italy, between Ordinary Statute Regions and the Autonomous Provinces of Trento and Bolzano; and *between* Italy and Spain. The degree of fiscal decentralisation is important because, as suggested by, e.g., Oates (2005) and Weingast (2009), the higher the share of resources generated by sub-national

(regional) governments to finance the services to citizens, the lower the Vertical Fiscal Imbalance, the higher their electoral accountability, hence the efficiency of public spending. In terms of schooling, we should expect that a higher degree of fiscal decentralisation will lead to improved educational outcomes.

b. The second source of variation is the public/private dimension of schooling system, which is different between Spain and Italy, both for the role assigned to private providers of education and, more importantly, for the share of public funding granted to private schools. In particular, private schools in Spain (especially *escuelas concertadas*) are important actors in the national education system and are consistently financed with public funds (e.g., Calero and Escardíbul, 2007), whereas private schools in Italy (both secular and religious schools) play a marginal role, and receive a relatively little financial support from the government. Besides the issues of public funding, the private nature of schools is important in itself, especially in the presence of a nationally administered test. As suggested by, e.g., Hanushek and Woessmann (2011) and Woessmann *et al.* (2009), external exams increase schools' accountability along several dimensions, including the enhanced monitoring of teachers and schools. This effect is expected to be stronger the higher the share of educational costs directly paid by citizens. However, while in Spain, at the end of secondary (non compulsory) education, there is a unique (global) exam for students aiming at enrolling in a university course (*selectividad*), similar evaluation exercises have not been systematically introduced so far in Italy.

Starting from these premises, the disciplining effects stemming from both fiscal decentralisation and market incentives provide a ranking of different types of school institutions in terms of expected accountability:

i. At one extreme, Italian private schools are those financed mostly with fees paid by households (i.e., they are "private-independent" schools; e.g., Dronkers and Avram, 2009; Dronkers and Robert, 2008). In principle, therefore, market forces should strongly discipline them. However, this argument can be displaced by the

fact that – in the absence of a national standardised test on attainments in Italy – these schools do not need to be as productive in terms of educational outcomes as they should be in the presence of an external exam, just providing students with a "certificate" to enter the labour market. That Italian private schools may provide lower quality education than public schools is not only theoretically feasible, but also somewhat consistent with available evidence (e.g., Bertola *et al.*, 2007, and Brunello and Rocco, 2008).

ii. At the other extreme, Italian public schools in Ordinary Statute Regions are financed (almost) completely and staffed completely by the central government. They are not subject to any evaluation program (as their private counterparts), and enjoy a very modest degree of autonomy over their budget. According to theoretical insights, they should be the less accountable type of school.

iii. In between, we have Spanish public and private schools and Italian public schools in the Autonomous Provinces of Bolzano and Trento. Their degree of accountability is expected to increase with the share of funding coming from regional governments' own resources, and – in the case of private schools – with the share of funding coming from the market. In this respect, notice that Spanish private schools are mostly "private-government dependent" schools (the *escuelas concertadas*; see, e.g., Dronkers and Avram, 2008 and 2009, for a more general classification) and receive an important share of regional funding. Hence, they allow us to understand how the two accountability mechanisms interact.

Having created a ranking of different school institutions according to their potential accountability, our strategy is now to define a proper set of variables which basically identify each school type on the basis of the "degree of accountability", measured by the share of funding from regional governments, the share of public funding, and their nature (public or private). Specifically, we define the dummy *DECENTR* to identify the schools located in regions where this level of government plays a prominent role in education, and the variable *PUB_FUND*, which measures the percentage of total funding in a typical school year coming from public sources

(including municipal, regional and central governments). The interaction of the two variables, *DECENTR*×*PUB_FUND*, allows us to differentiate schools according to the incidence of regional funding, hence testing for the "fiscal-accountability" effect. The variable *PUB_FUND* is also important to distinguish private-dependent schools from private-independent ones, thus allowing us to assess the accountability role played by market incentives. Finally, the dummy *PUBLIC* identifies the public *nature* of school institutions. Notice that, in most of the literature on schooling, accountability is defined according to the role played by standardised external exams and other monitoring devices, but the role of fiscal decentralisation is hardly mentioned (e.g., Hanushek and Raymond, 2005). In our exercise, we build a direct link with the modern fiscal federalism literature, and explicitly control also for the effect of fiscal decentralisation in order to provide a more clear evidence on the accountability role played by the different sources of public and private funding.

As for the econometric specification, we take a very simple route considering an education production function where the dependent variable is the test score (*SCORE*), and the covariates can be grouped in regional controls, school controls, and (eventually) student-specific controls (e.g., Hanushek and Woessmann, 2011). The general model to be estimated can be written as follows:

$$SCORE_i = \alpha + \beta_1 DECENTR_i + \beta_2 PUB\_FUND_i + \beta_3 DECENTR \times PUB\_FUND_i + \\ + \beta_4 PUBLIC_i + \sum \beta_k PUBLIC \times X_{ki} + \sum \beta_h X_{hi} + \varepsilon_i \qquad [1]$$

where i identifies the different schools, the $\boldsymbol{X_h}$'s are a set of controls deemed to be important determinants of school outcomes (including, for instance, the total number of students, the share of female students, and the pupils per teacher ratio), while $\boldsymbol{X_k}$ are variables to be interacted with *PUBLIC* in order to identify the different school institutions providing educational services in Spain and in Italy. According to our "accountability" story, we are particularly interested in the estimated coefficients on *DECENTR*, *PUB_FUND*, *PUBLIC*, and their interactions.

3.2. The data

We consider the 2003 data from the OECD Programme for International Student Assessment (PISA), a widely used survey which takes place every three years to collect information on educational competencies of 15-years-old students in various countries (OECD, 2005a and 2005b). The 2003 wave is particularly interesting for our purposes, since it allows us to identify a number of different regions within each country. To be more precise, while usually conducted at the country level, the 2003 wave is the first and only one so far that makes publicly available for both Italy and Spain information on some participating regions. In particular, we are able to identify Lombardia, Piemonte, Toscana and Veneto as Ordinary Statute Regions, and the two Autonomous Provinces of Bolzano and Trento in Italy (data for Valle d'Aosta are unfortunately unavailable); the Basque Country, Catalonia and Castilla y León in Spain. In both countries, we also have a residual category of "Other Regions". According to institutional details discussed above, we set the dummy *DECENTR* equal to one for all the Spanish regions and for the two Autonomous Provinces in Italy. Regional funding of schools represents an important share of total funding in all these regions, even though there are some institutional differences across regions. To catch this variability in the intensity of fiscal decentralization, we look at the interaction $DECENTR \times PUB\_FUND$.

Educational attainments. PISA surveys report students' performance through *plausible values*. These need to be thought as random draws from posterior distributions of students' test scores. In other words, instead of obtaining a point estimate of student ability, once collecting the raw score for each student on the number of correct answers, the distribution of student proficiency is computed, and the survey reports random values from this (estimated) posterior distribution. This requires appropriate tools for the empirical analysis, even for descriptive statistics. We will take into account the particular nature of the data by considering the PV Stata module discussed in Lauzon (2004) and MacDonald (2008) for all our estimates.

Table 1. Public and private schools performance: problem solving

Schools	Nr. obs.	Mean	SE	t-stat
All sample	789	442.56	31.89	13.87
Spain	383	479.29	3.61	132.73
Spain - public	199	462.62	8.24	56.14
Spain - private	175	498.50	11.69	42.63
Italy	406	413.35	61.41	6.73
Italy – public	380	412.46	67.02	6.15
Italy - private	25	417.74	26.83	15.57

Table 2. Public and private schools performance: mathematical literacy

Schools	Nr. obs.	Mean	SE	t-stat
All sample	789	446.29	26.24	17.01
Spain	383	482.11	3.31	145.44
Spain - public	199	467.33	7.61	61.38
Spain - private	175	499.35	10.91	45.78
Italy	406	417.81	51.70	8.08
Italy – public	380	417.81	55.90	7.47
Italy - private	25	417.37	16.90	24.70

Table 3. Public and private schools performance: reading literacy

Schools	Nr. obs.	Mean	SE	t-stat
All sample	789	448.11	30.79	14.55
Spain	383	475.78	5.64	84.43
Spain - public	199	459.92	10.41	44.19
Spain - private	175	493.84	13.81	35.77
Italy	406	426.09	55.40	7.69
Italy – public	380	424.98	60.20	7.06
Italy - private	25	431.79	27.24	15.85

Table 4. Public and private schools performance: scientific literacy

Schools	Nr. obs.	Mean	SE	t-stat
All sample	789	449.85	38.25	11.76
Spain	383	482.09	6.46	74.66
Spain - public	199	466.71	11.80	39.55
Spain - private	175	499.43	13.53	36.91
Italy	406	424.21	68.39	6.20
Italy – public	380	421.08	76.68	5.49
Italy - private	25	440.65	24.73	17.82

Students' knowledge and ability (our dependent variable *SCORE* in Equation [1]) is assessed along four main domains: problem solving (*PV_PROB*), mathematical literacy (*PV_MATH*), reading literacy (*PV_READ*), and scientific literacy (*PV_SCIE*). Descriptive statistics for these variables for all the schools in the sample are in Tables 1-4, distinguishing also schools according to their public/private nature. Several interesting preliminary insights emerge from these raw data. First, Spanish schools appear to perform better than Italian ones along all the four domains. Second, the variance characterising Spanish schools' performance is lower than the variance characterising scores for Italian schools. Third, private schools in Spain seem to perform consistently better than public schools, while in Italy the difference in scores between public and private schools is sizeable only for scientific literacy.

We also preliminary investigate the "market-accountability" effect, by considering how average scores in the four domains change according to the share of public funding, irrespective of whether the money comes from regional governments or it is centrally allocated. There is a clear evidence in raw data that the higher the share of public funding (the lower the share of private funds), the lower the achievements (Table 5).

Table 5. Performance of schools depending on public funding

Schools	Nr. obs.	Mean	SE	t-stat
	PUB_FUND < 25%			
PV_PROB	40	481.15	18.75	25.65
PV_MATH	40	472.99	22.99	20.56
PV_READ	40	481.53	19.88	24.21
PV_SCIE	40	497.32	21.39	23.23
	PUB_FUND > 25% & < 50%			
PV_PROB	45	489.99	17.30	20.30
PV_MATH	45	486.50	15.74	30.89
PV_READ	45	485.87	21.45	22.64
PV_SCIE	45	496.86	20.38	24.36
	PUB_FUND > 50% & < 75%			
PV_PROB	152	470.05	40.08	11.7
PV_MATH	152	472.25	33.52	14.08
PV_READ	152	474.91	39.88	11.90
PV_SCIE	152	479.16	48.10	9.96
	PUB_FUND > 75%			
PV_PROB	552	429.17	34.25	12.52
PV_MATH	552	435.22	27.18	16.00
PV_READ	552	436.19	31.54	13.82
PV_SCIE	552	435.03	40.81	10.65

In addition, in Table 6, we explore the "fiscal-accountability" effect, by analysing the means of test scores in the four domains along the decentralisation dimension. Schools in regions where their funding is largely decentralised turn out to perform better in all domains than schools in regions where funding is centralised. Notice that this is not merely the reflection of results for Spain and Italy, as the group of

decentralised regions also includes the two Autonomous Provinces of Trento and Bolzano.

Table 6. Performance of schools depending on fiscal decentralisation

Schools	Nr. obs.	Mean	SE	t-stat
	DECENTRALISED			
PV_PROB	459	479.98	3.92	122.47
PV_MATH	459	482.71	3.69	130.69
PV_READ	459	476.63	5.98	79.65
PV_SCIE	459	482.91	6.85	70.47
	NON-DECENTRALISED			
PV_PROB	330	411.72	62.38	6.60
PV_MATH	330	416.28	52.49	7.93
PV_READ	330	424.59	56.29	7.54
PV_SCIE	330	422.60	69.46	6.08

Other determinants of educational achievements. Besides our main variables, *DECENTR*, *PUB_FUND*, and *PUBLIC*, the set of our covariates include a number of variables at the school level (X_h) that previous literature deems to be important in affecting students' performance: *PUP_TEACH_RATIO* is defined as the number of students per (full time equivalent) teacher (part-time teachers has been considered equivalent to ½ full time ones); *TOT_ENROLL* measures the total number of students enrolled in each institution; *SHARE_FEM* captures the share of female students out of the total number of students. We also consider potential difficulties stemming from differences in language among students. In particular, foreigners may find more difficulties than natives to understand the questions in the test: the dummy *LANGUAGE* is equal to one if at least 10% of all students enrolled in the school have a first language that is not the test language (as this variable is missing for Catalan schools and Catalonia is an important region in the history of

Spanish autonomy, we will run additional estimates omitting this variable). As for teachers, we also take into account the potential shortage that can hinder the ability of schools to provide adequate education. In particular, *SHORTAGE_SCIENCE*, *SHORTAGE_MATH*, and *SHORTAGE_READ* are dummy variables equal to one when schools declare that the ability to provide a good knowledge of subject matters is hampered 'to some extent' or 'a lot' by scarcity of qualified teachers, respectively for science, mathematics and test language. Controls for schools' location are provided by three dummy variables: *SMALL* is equal to one when the school is located in a village or a small town with less than 15,000 inhabitants; *MEDIUM* is for location in towns from 15,000 up to 100,000 inhabitants; finally, *LARGE* is for cities with more than 100,000 inhabitants. Finally, we consider a whole set of country and region dummy variables to control for unobserved residual heterogeneity. Descriptive statistics for all the variables included in the empirical analysis are collected in Appendix Table A.1.

3.3. The results

We begin our analysis by estimating a very simple model, in which the production of education is a function of "structural" characteristics of schools only. We consider in particular *PUP_TEACH_RATIO, TOT_ENROLL, SHARE_FEM, LANGUAGE,* the dummy for the shortage of qualified teachers, and the dummies for schools location. As considering the variable *LANGUAGE* automatically exclude schools in Catalonia, we drop this variable and estimate an additional model including only the other structural factors. Table 7 reports our estimates using *PV_PROB* as the dependent variable *SCORE*; results obtained using alternative definitions of *SCORE* are included in the Appendix, but largely mirror those described here. Results are pretty much consistent across the two models, and confirm previous findings based on PISA data (e.g., Woessmann *et al.*, 2009). Coefficient for *TOT_ENROLL* is positive and statistically significant at the usual confidence levels: an increase of one student at the school raises the test score by about 0.04 points. Coefficient for

PUP_TEACH_RATIO is also positive, but statistically (marginally) insignificant: one more pupil per teachers raises the test score by about 4 points. Though a positive sign can appear counterintuitive, this is also a common result in the literature, which has been shown to be sensible to the level of aggregation used to measure class size. For instance, findings by Fertig and Wright (2005) suggest that this "class size" effect turns from being positive and statistically significant when using individual level data to being positive but not statistically significant when considering school level variables, and even to being negative and statistically significant when considering country level data. Also the share of female students exerts a positive effect on the score, but coefficient is not statistically significant. Much stronger impacts emerge when considering school location and the shortage of qualified teachers in the subject – for instance, coefficient on *SHORTAGE_MATH* decreases average school performance by about 80 points – but again coefficients are not statistically significant. Finally, coefficient for *LANGUAGE* is not statistically significant. When including in these models also regional and country fixed effects, results are largely confirmed, in terms of both signs and magnitudes. Now the coefficient for *PUP_TEACH_RATIO* is statistically significant, while the one for *TOT_ENROLL* turns to be insignificant. Coefficient for *LANGUAGE* still remains insignificant, and we decided to drop this variable from the following analysis.

[Table 7 about here]

We now augment the "structural" specification of our education production function by taking into account (first alternatively, and then together) variables aimed at capturing the main dimensions of accountability: the public funding of the schools, in order to consider accountability effects generated by *private markets*; and the role of regional funding, so as to catch the accountability mechanism driven by *fiscal decentralisation*. The public/private nature of school institutions is also considered. We use again *PV_PROB* as an example; notice, however, that results are largely

consistent when relying on alternative definitions of *SCORE* (see Appendix Tables). Table 8 shows our estimates of the education production function when considering the "accountability" variables one at a time. Coefficients for both *PUB_FUND* and *DECENTR* are statistically significant and hold controlling also for regional and country fixed effects, providing support to our two "accountability" stories. In particular, the negative coefficient for *PUB_FUND* shows that the higher the share of public funding, the lower the incentives to perform well from private markets, the lower the score. This is in contrast with results by, e.g., Woessmann *et al.* (2009), who find a positive and statistically significant coefficient for the share of public funding on students' achievements. The authors interpret this result by claiming that – in the absence of public funds – poor families would not have resources to opt out for private schooling. This will reduce competition between public and private schools, affecting negatively students' performance. Our results seem to point toward a different explanation, suggesting the existence of a likely interplay between public funding, decentralisation, and the role and funding of private schools. Indeed, the positive coefficient for *DECENTR* implies that where regional governments enjoy a higher autonomy in both managing and funding schools – i.e., they are more fiscally responsible towards their citizens – performances are better. In this simple exercise, however, the coefficients for *DECENTR*×*PUB_FUND*, the dummy *PUBLIC* and its interactions with country dummies are positive but not significant. Notice that, among the structural variables, only coefficient for *PUP_TEACH_RATIO* appears consistently significant: the positive correlation with schools' performance and the magnitude – that remains close to about 4 points – are confirmed.

[Table 8 about here]

As a final step, we consider a complete version of our model [1], pooling together all the accountability drivers. Estimates are in Table 9. All the models – which include regional and country fixed effects – tell fairly the same story. First, the share of

public funding is negatively correlated with the performance, and the correlation is statistically significant: *ceteris paribus*, a ten percent increase in *PUB_FUND* reduces the *PV_PROB* score by about ten points, from -8.30 to -12.13, depending on model specification. Similar magnitudes emerge also for other definitions of *SCORE*; only for PV_MATH the impact is smaller, with estimated coefficient ranging from -0.603 to -0.856. Second, the coefficient for *DECENTR* is positive and statistically significant: where regional governments rely more on own resources in funding schools, students' performances are better. The magnitude, however, range from about +140 points to +70: the coefficient halves when adding to the model the interaction term *DECENTR*×*PUB_FUND*, and the interaction of *PUBLIC* with the two country dummies. Third, the coefficient for *DECENTR*×*PUB_FUND* is positive and statistically significant at the usual levels only when considering in the model the interaction of *PUBLIC* with the two country dummies. In this case, a ten percent increase in the share of public funding, where these funds come from regional governments, implies an additional impact of +8.42 points compared to schools in regions that do not enjoy fiscal autonomy. The magnitude and significance is similar also for alternative definitions of *SCORE*. There are two ways to read this result. On one side, considering the negative sign of the first-order coefficient for *PUB_FUND*, it means that the incentives from *private market pricing* are *less* strong if regional governments have to finance autonomously their school: summing up coefficients, the negative impact of *PUB_FUND* on performance reduces from -1.213 to -0.371 in regions where governments enjoy some degree of autonomy in funding schools. On the other side, looking at the positive sign for the first-order coefficient for *DECENTR*, the positive coefficient for the interaction with *PUB_FUND* provides further support to the "fiscal-accountability" role played by own resources for regional governments: a ten percent increase in regional public funds improve average schools performance by +8.42, summing to the average performance (+71.32 points) in all fiscally decentralized regions. Fourth, the coefficient for *PUBLIC* is positive and statistically significant, but when interacted with country dummies, it

turns out that only the coefficient for *PUBLIC×D_ITA* remains significantly positive. *Ceteris paribus*, students at Italian public schools score 76.78 points more than students at private institutions, whereas no difference between public and private schools can be spotted in Spain. We interpret this result as evidence in favour of a disciplining role played by a standardised national test, which is currently lacking in Italy, while being compulsory in Spain (on the positive effects exerted by external exams on students' performance, see, e.g., Woessmann *et al.*, 2009). If we consider jointly the impact of *PUB_FUND* and *PUBLIC×D_ITA*, Italian public schools (almost completely financed by the State in almost all regions, but in the two Autonomous Provinces) do not appear having any market incentives to perform well, whereas private schools (almost completely financed with private fees) do have these incentives, but the absence of an external exam let them live a "quiet-life". On the contrary, Spanish public and private schools both receive a large quantity of public funds, so that the "market-accountability" effect is lacking also there, but the performance of Spanish schools is positively affected by both the standardised national test, and the "fiscal-accountability" mechanism generated by the widespread use of regional government funds. Finally, among structural variables, only the coefficient for *PUP_TEACH_RATIO* appears to be consistently significant: the positive correlation with schools' performance and the magnitude – that remains close to about 4 points – are again confirmed.

[Table 9 about here]

3.4. Discussion and policy implications

The results discussed in previous section provide support to both accountability drivers, the market incentives on the one hand, and the decentralised funding incentives on the other hand. There are two possible comments to the robustness of these findings. First, we do not take explicitly into account important dimensions of schools' autonomy, like managerial autonomy, that can be the true drivers of an

improved accountability (e.g., Hanushek and Raymond, 2005). Second, previous literature on PISA data confirms the importance of the family background on students' scores (e.g., Hanushek and Woessmann, 2011; Woessmann *et al.*, 2009). Hence, our accountability explanation can hide a better family background in more fiscally decentralised regions. We explore each of these alternative explanations in turn.

Autonomy. In order to capture the impact of schools autonomy, we include two variables (*AUTCURR* and *AUTRES*) that are thought to increase (indirectly) the accountability (e.g., Woessmann *et al.*, 2009). In particular, we consider a first index of autonomy computed by the OECD to measure the degree of school autonomy in defining assessment policies, textbooks, and course contents (*AUTCURR*); and a second index of autonomy – again computed by the OECD – to measure the degree of school autonomy in managing resources like, for instance, hiring and firing teachers, deciding budget allocations within the school, determining teachers' career (*AUTRES*). Results for models augmented also with these variables are in Table 10. Coefficients for both *AUTCURR* and *AUTRES* are never statistically significant. More importantly, all previous findings are confirmed. One main explanation is that regulation is defined at country and/or regional level for public as well as for private schools. As we already control for country and regional fixed effects, these variables do not add much to the explanatory power of our model.

[Table 10 about here]

Parental background. As a final test, in order to capture the impact of parental background (e.g., Meghir and Palm, 2005; Bonesrønning, 2012), we define from the questionnaire two dummies, *FATHER_HIGH* and *MOTHER_HIGH*, to identify those students whose parents hold a college degree or a PhD. At the school level, these variables measure the percentage of students with highly educated parents. As the two variables are highly collinear, we use just the one for mother education in

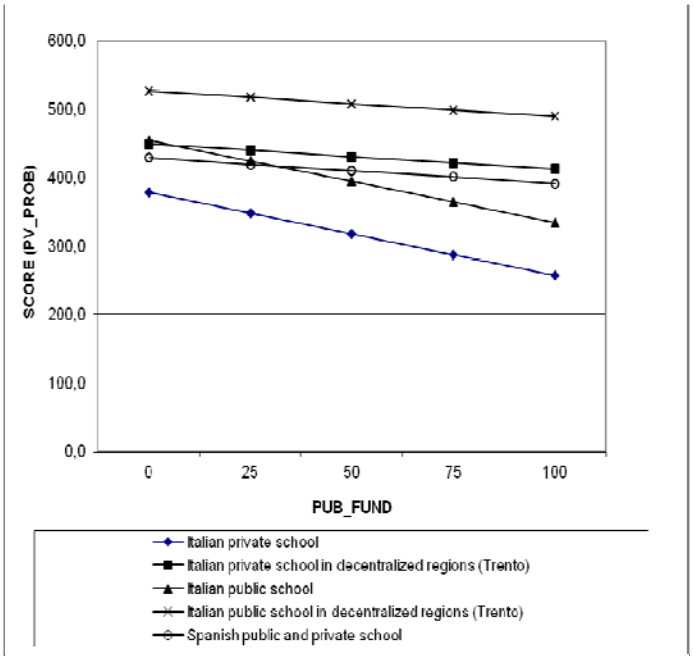
the empirical models below. We also compute an alternative variable, *BACKGROUND*, which is obtained summing up the two variables *FATHER_HIGH* and *MOTHER_HIGH*; since the results are robust to the choice of the parental background variable, we just include those with *MOTHER_HIGH* in Table 11. As before, the estimates are quite close to those obtained with the full model: coefficient for *MOTHER_HIGH* is positive, but never statistically significant at the usual confidence levels in all the four specifications. Interestingly, the inclusion of a variable capturing parental background considerably reduces the magnitude of the coefficient for *PUB_FUND*, as well as its statistical significance. The coefficient for *PUP_TEACH_RATIO* also turns to be insignificant when measuring *SCORE* using *PV_PROB*, *PV_READ* and *PV_SCIE*. A likely explanation for the interactions among these variables is the stratification of schools by students' types, despite public and private schools – both in Spain and Italy – do not receive funds according to their performance and have little autonomy in the control of pupil admission (see, e.g., Gibbons and Telhaj, 2007, for evidence on stratification in a largely public system like the English one).

[Table 11 about here]

Policy implications. Overall, our results – which appear robust to different model perturbations – suggest a number of thoughts on important issues in educational policy. First, decentralised schools' funding is consistently associated with a better performance with respect to centralised funding. This is emphasised by coefficients for *DECENTR* and the interaction *DECENTR*×*PUB_FUND*. Starting from our estimates and computing predicted scores for different types of schools, those operating in regions where funding is decentralised perform better (see Figure 1). The clear ranking is independent of *PUB_FUND*: public schools in the fiscally decentralised Autonomous Province of Trento (and Bolzano, not reported in the figure) perform better than private schools in the same context. In turn, these score

better than public and private schools in Spain (that are statistically indistinguishable, given that the coefficient on *PUBLIC×D_ESP* is not significant). At the bottom of the ranking we find public and private schools in Italian Ordinary Statute Regions that do not enjoy any autonomy in school funding. This finding confirms results by Barankay and Lockwood (2007) and Galiani *et al.* (2008), and supports theoretical predictions of second-generation theories of fiscal federalism (e.g., Oates, 2005, and Weingast, 2009): the higher the share of funding provided by sub-national governments to finance decentralized services to citizens (i.e., the lower the Vertical Fiscal Imbalance), the higher their electoral accountability, hence the efficiency of public spending (here measured in terms of better students' attainments). The implied policy suggestion would be to finance public schools with own regional funds.

Figure 1. Predicted scores for different types of schools



Note: predicted scores computed using results in Table 8 – Model (4)

Second, the negative sign on the coefficient for *PUB_FUND* supports the "market-accountability" mechanism. *Ceteris paribus*, schools completely financed with tuition fees paid by households (i.e., the private-independent schools) perform better than schools largely (or even completely) financed with public funds (i.e., the private-dependent schools; see Figure 1). This evidence suggests that private schools should not be financed with public monies. However, if one wants to increase competition among schools by offering poor households the choice to opt out for private institutions, our first result suggest that decentralized funding works as a strong substitute for the "market-accountability" mechanism. According to our estimates, if we take a school completely financed with private funds operating in a region where schooling is centralised, and we allow to decentralise education switching to a complete financing with regional resources, the final effect on students' attainments will be an increase of about +34 points (-121 +71 +84, see Table 9) in the performance. Hence, the "fiscal-accountability" mechanism seems even more powerful than the "market-accountability" mechanism.

Finally, the importance of regional and country dummies, together with the controls for the public nature of the schools (*PUBLIC*) suggest that institutional differences are important drivers of students' performance: public schools in Italian Ordinary Statute Regions are different institutions from public schools in Spain, because they are not subject to any assessment exercise carried out at the national level, and are mainly financed and staffed by the national government, with limited autonomy for regional governments to effectively manage them. At the same time, private schools in Italy are different institutions from private schools in Spain, both when looking at private-dependent schools (almost absent in Italy) and when considering private-independent schools (almost absent in Spain). As such, any generalization on the role of public and private institutions in schooling should be subject to a careful scrutiny before any policy recommendations is implemented.

4. Concluding remarks

In this paper we investigate the disciplining role of both fiscal decentralisation and market forces in the provision of educational services. We jointly consider two different accountability mechanisms: on the one hand, the difference between schools funded with regional governments' own resources and schools funded by the central government suggests that the former should be more productive than the latter, given the "fiscal-accountability" incentives induced by the use of revenues collected at a sub-national level. On the other hand, the difference between private and public schools, suggests that – in the presence of standardised national tests – private schools should be more productive than public schools, given that households pay a price to access the service.

The historical evolution of school regulation in Italy and Spain, in particular regarding the public funding of private schools run by the Roman Catholic Church and the role played by regional governments in education, created different institutions in terms of both dimensions, decentralised funds and private funds. We take advantage of these institutional diversities to estimate the disciplining role of different sources of funds in the context of an educational production function using PISA data. We provide three main conclusions. First, decentralised public funding is consistently associated with a better schools' performance with respect to centralised funding. Second, the higher the share of government funding, the lower the "market-accountability" effect, the lower the performance. *Ceteris paribus*, private schools completely financed with tuition fees paid by the households perform better than schools completely (or largely) financed with public funds. Third, the public/private nature of school institutions also matters in itself, but only in Italy, where public schools outperform private ones. Hence, the presence of a standardised test at the national level (available in Spain, but not in Italy) is an important mechanism to improve schools' performances. Overall, our findings highlight that institutional differences are important drivers of the performance: public and private schools in

Spain and Italy are different institutions. This issue should be taken into account when designing educational policies aimed at improving students' performance.

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Table 7. Structural variables only (*PV_PROB*)

VARIABLES	(1)	(2)	(3)	(4)
PUP_TEACH_RATIO	4.193	4.541	3.919**	4.471*
	[2.784]	[3.288]	[1.924]	[2.519]
TOT_ENROLL	0.0410***	0.0366**	0.0333	0.0319
	[0.0152]	[0.0182]	[0.0228]	[0.0215]
SHARE_FEM	0.438	0.530	0.426	0.404
	[0.379]	[0.514]	[0.283]	[0.305]
SHORTAGE_MATH	-79.87	-88.05	-59.49	-68.39
	[63.60]	[65.78]	[39.81]	[43.20]
D_SMALL	3.903	-2.724	-13.11	-18.41
	[17.19]	[19.06]	[25.83]	[27.11]
D_LARGE	0.439	-4.300	-6.739	-10.23
	[16.51]	[20.58]	[25.88]	[28.12]
D_LANGUAGE		4.199		-5.128
		[31.38]		[20.43]
Constant	368.2***	364.5***		
	[56.71]	[70.80]		
Regional fixed effects	no	no	yes	yes
Country fixed effects	no	no	yes	yes
Observations	638	581	638	581
R^2	0.2480	0.2577	0.9557	0.9738

Note: Standard errors in brackets *** p<0.01, ** p<0.05, * p<0.1

Table 8. "Market accountability" and "fiscal accountability" (*PV_PROB*)

VARIABLES	(1)	(2)	(3)	(4)	(5)
PUP_TEACH_RATIO	3.469**	3.919**	4.210*	4.291**	4.373*
	[1.641]	[1.924]	[2.172]	[2.114]	[2.629]
TOT_ENROLL	0.0325*	0.0333	0.0273	0.0286	0.0302
	[0.0180]	[0.0228]	[0.0255]	[0.0254]	[0.0189]
SHARE_FEM	0.336	0.426	0.400	0.427	0.420
	[0.229]	[0.283]	[0.317]	[0.307]	[0.282]
SHORTAGE_MATH	-46.69	-59.49	-48.96	-61.22	-61.34
	[34.59]	[39.81]	[34.95]	[41.12]	[41.41]
D_SMALL	-0.770	-13.11	-4.547	-14.24	-13.66
	[18.82]	[25.83]	[21.97]	[26.36]	[24.10]
D_LARGE	-7.249	-6.739	-9.002	-5.212	-5.531
	[24.39]	[25.88]	[27.96]	[25.07]	[26.55]
PUB_FUND	-0.538***				
	[0.184]				
DECENTR		138.9***			
		[31.61]			
PUB_FUND×DECENTR			0.0201		
			[0.195]		
PUBLIC				11.69	
				[13.22]	
PUBLIC×D_ESP					15.22
					[26.18]
PUBLIC×D_ITA					7.606
					[41.76]
Regional fixed effects	yes	yes	yes	yes	yes
Country fixed effects	yes	yes	yes	yes	yes
Observations	620	638	620	638	638
R^2	0.9780	0.9757	0.9768	0.9758	0.9758

Note: Standard errors in brackets *** p<0.01, ** p<0.05, * p<0.1

Table 9. The complete model (*PV_PROB*)

VARIABLES	(1)	(2)	(3)	(4)
PUP_TEACH_RATIO	4.423**	4.113*	4.449**	3.887**
	[2.047]	[2.175]	[2.030]	[1.934]
TOT_ENROLL	0.0203	0.0133	0.0239	0.0149
	[0.0256]	[0.0271]	[0.0218]	[0.0240]
SHARE_FEM	0.305	0.325	0.286	0.301
	[0.258]	[0.261]	[0.236]	[0.228]
SHORTAGE_MATH	-50.83	-49.74	-51.54	-50.34
	[38.29]	[38.10]	[39.22]	[39.09]
D_SMALL	-2.081	-3.976	-0.577	-2.316
	[18.53]	[18.33]	[17.38]	[16.88]
D_LARGE	-1.115	0.893	-1.465	1.938
	[18.49]	[16.89]	[18.68]	[15.01]
PUB_FUND	-0.830***	-0.919***	-0.925**	-1.213**
	[0.294]	[0.313]	[0.378]	[0.491]
DECENTR	136.2***	137.7***	108.4***	71.32**
	[28.31]	[29.14]	[28.54]	[27.80]
PUB_FUND×DECENTR			0.374	0.842*
			[0.405]	[0.434]
PUBLIC	40.83**		38.56**	
	[18.51]		[18.17]	
PUBLIC×D_ESP		30.20		15.36
		[22.67]		[22.17]
PUBLIC×D_ITA		62.30**		76.78***
		[30.00]		[25.83]
Regional fixed effects	yes	yes	yes	yes
Country fixed effects	yes	yes	yes	yes
Observations	620	620	620	620
R^2	0.9787	0.9789	0.9788	0.9793

Note: Standard errors in brackets *** p<0.01, ** p<0.05, * p<0.1

Table 10. The role of school autonomy (*PV_PROB*)

VARIABLES	(1)	(2)	(3)	(4)
PUP_TEACH_RATIO	4.442**	4.133*	4.464**	3.926**
	[2.075]	[2.176]	[2.065]	[1.965]
TOT_ENROLL	0.0207	0.0129	0.0241	0.0143
	[0.0253]	[0.0276]	[0.0217]	[0.0247]
SHARE_FEM	0.303	0.323	0.285	0.297
	[0.257]	[0.261]	[0.236]	[0.226]
SHORTAGE_MATH	-50.81	-49.50	-51.50	-50.05
	[38.30]	[38.14]	[39.17]	[39.06]
D_SMALL	-2.020	-4.119	-0.593	-2.485
	[18.50]	[18.57]	[17.40]	[17.11]
D_LARGE	-1.451	0.729	-1.769	1.798
	[18.44]	[16.66]	[18.61]	[14.86]
AUTCURR	-1.855	-4.383	-1.243	-5.046
	[7.501]	[7.383]	[7.134]	[8.158]
AUTRES	0.184	-0.0747	0.0485	-0.613
	[6.350]	[6.246]	[6.184]	[5.560]
PUB_FUND	-0.828***	-0.930***	-0.921**	-1.236**
	[0.280]	[0.313]	[0.367]	[0.522]
DECENTR	135.8***	137.1***	107.0***	69.70**
	[27.74]	[28.40]	[27.68]	[27.35]
PUB_FUND×DECENTR			0.360	0.855*
			[0.397]	[0.471]
PUBLIC	40.31		38.11	
	[26.92]		[25.91]	
PUBLIC×D_ESP		26.95		10.55
		[28.71]		[24.67]
PUBLIC×D_ITA		63.46**		77.61***
		[32.34]		[29.70]
Regional fixed effects	yes	yes	Yes	yes
Country fixed effects	yes	yes	Yes	yes
Observations	618	618	618	618
R^2	0.9789	0.9788	0.9793	0.9797

Note: Standard errors in brackets *** p<0.01, ** p<0.05, * p<0.1.

Table 11. The role of parental background (*PV_PROB*)

VARIABLES	(1)	(2)	(3)	(4)
PUP_TEACH_RATIO	4.069	3.777	4.094*	3.547
	[2.480]	[2.689]	[2.454]	[2.458]
TOT_ENROLL	0.0204	0.0138	0.0242	0.0154
	[0.0216]	[0.0224]	[0.0182]	[0.0195]
SHARE_FEM	0.284	0.304	0.264	0.279
	[0.257]	[0.254]	[0.235]	[0.221]
SHORTAGE_MATH	-50.13	-49.09	-50.88	-49.70
	[39.00]	[38.92]	[40.00]	[40.00]
D_SMALL	1.645	-0.185	3.252	1.514
	[15.88]	[15.56]	[14.88]	[14.32]
D_LARGE	-4.686	-2.756	-5.074	-1.718
	[14.11]	[12.69]	[14.18]	[11.07]
MOTHER_HIGH	74.06	73.53	74.47	73.92
	[94.90]	[96.44]	[94.96]	[98.48]
PUB_FUND	-0.627	-0.713*	-0.726	-1.010*
	[0.388]	[0.396]	[0.466]	[0.543]
DECENTR	131.9***	133.4***	100.2***	66.10**
	[27.47]	[28.26]	[21.70]	[28.70]
PUB_FUND×DECENTR			0.394	0.853***
			[0.351]	[0.329]
PUBLIC	37.88***		35.47**	
	[14.61]		[14.64]	
PUBLIC×D_ESP		27.80		12.77
		[21.55]		[23.27]
PUBLIC×D_ITA		58.28**		72.91***
		[27.99]		[23.07]
Regional fixed effects	yes	yes	yes	yes
Country fixed effects	yes	yes	yes	yes
Observations	619	619	619	619
R^2	0.9797	0.9799	0.9798	0.9803

Note: Standard errors in brackets *** p<0.01, ** p<0.05, * p<0.1.

Appendix Table A.1. Descriptive statistics

Variable	Obs	Mean	Std. Dev.	Min	Max
PUP_TEACH_RATIO	648	11.01765	5.685349	1.38	70
TOT_ENROLLMENT	745	643.9638	404.5179	26	2,819
SHARE_FEM	745	50.1802	20.48196	0	100
SHORTAGE_MATH	767	.1694915	.3754303	0	1
SHORTAGE_SCIENCE	766	.1449086	.3522387	0	1
SHORTAGE_READ	766	.1436031	.350916	0	1
D_SMALL	779	.2439024	.4297105	0	1
D_LARGE	779	.322208	.4676224	0	1
AUTCURR	773	3.483829	.7524122	1	4
AUTRES	773	2.165589	1.491255	0	6
MOTHER_HIGH	788	.286683	.1757495	0	1
D_ITA	789	.5145754	.5001045	0	1
D_ESP	789	.4854246	.5001045	0	1
D_VENETO	789	.0659062	.2482755	0	1
D_TOSCANA	789	.0659062	.2482755	0	1
D_PIEMONTE	789	.0722433	.2590546	0	1
D_LOMBARDIA	789	.0659062	.2482755	0	1
D_BOLZANO	789	.0544994	.2271444	0	1
D_TRENTO	789	.0418251	.2003163	0	1
D_CASTILLA	789	.0646388	.2460434	0	1
D_CATALUNYA	789	.0633714	.2437842	0	1
D_BASQUE	789	.1787072	.38335	0	1
PUB_FUND	750	78.71044	23.859	0	100
DECENTR	789	.581749	.4935847	0	1
PUB_FUND×DECENTR	750	48.9528	44.4882	0	100
PUBLIC	779	.7432606	.437115	0	1
D_ESP_PUB	779	.2554557	.4363973	0	1
D_ITA_PUB	779	.4878049	.5001724	0	1

Appendix Tables. Results considering alternative definitions of *SCORE*[*]

Table A.7. Structural variables only (PV_MATH)

VARIABLES	(1)	(2)	(3)	(4)
PUP_TEACH_RATIO	3.738*	3.995	3.404**	3.832**
	[2.107]	[2.508]	[1.378]	[1.807]
TOT_ENROLL	0.0428***	0.0371**	0.0340**	0.0307*
	[0.0137]	[0.0151]	[0.0151]	[0.0164]
SHARE_FEM	0.0672	0.227	0.0569	0.115
	[0.307]	[0.491]	[0.217]	[0.301]
SHORTAGE_MATH	-64.99	-72.07	-44.19	-51.94*
	[48.44]	[50.27]	[28.00]	[30.75]
D_SMALL	8.016	0.686	-9.528	-15.74
	[15.25]	[16.83]	[21.38]	[23.11]
D_LARGE	5.089	0.330	-2.689	-6.400
	[11.66]	[14.07]	[17.71]	[19.64]
D_LANGUAGE		2.471		-7.708
		[24.98]		[15.95]
Constant	389.9***	385.5***		
	[49.21]	[62.79]		
Regional fixed effects	no	no	yes	yes
Country fixed effects	no	no	yes	yes
Observations	638	581	638	581
R^2	0.2421	0.2442	0.9819	0.9808

Note: Standard errors in brackets *** p<0.01, ** p<0.05, * p<0.1

[*] The numbers of these Tables follow closely the numbers of those in the main text, to facilitate comparison of results.

Table A.8. "Market accountability" and "fiscal accountability" (PV_MATH)

VARIABLES	(1)	(2)	(3)	(4)	(5)
PUP_TEACH_RATIO	3.226**	3.404**	3.659**	3.791**	3.818*
	[1.313]	[1.378]	[1.598]	[1.539]	[1.958]
TOT_ENROLL	0.0317**	0.0340**	0.0273	0.0292*	0.0297**
	[0.0135]	[0.0151]	[0.0182]	[0.0171]	[0.0127]
SHARE_FEM	-0.00133	0.0569	0.0438	0.0577	0.0552
	[0.200]	[0.217]	[0.240]	[0.235]	[0.219]
SHORTAGE_MATH	-33.99	-44.19	-34.89	-45.98	-46.02
	[24.46]	[28.00]	[24.04]	[29.09]	[29.29]
D_SMALL	-0.538	-9.528	-4.038	-10.70	-10.50
	[16.67]	[21.38]	[18.88]	[21.79]	[20.06]
D_LARGE	-3.913	-2.689	-5.242	-1.107	-1.216
	[17.18]	[17.71]	[19.38]	[16.92]	[17.89]
PUB_FUND	-0.369**				
	[0.177]				
DECENTR		140.0***			
		[25.37]			
PUB_FUND×DECENTR			-0.137		
			[0.175]		
PUBLIC				12.11	
				[9.551]	
PUBLIC×D_ESP					13.31
					[20.61]
PUBLIC×D_ITA					10.72
					[32.70]
Regional fixed effects	yes	yes	yes	yes	yes
Country fixed effects	yes	yes	yes	yes	yes
Observations	620	638	620	638	638
R^2	0.9834	0.9819	0.9830	0.9820	0.9820

Note: Standard errors in brackets *** p<0.01, ** p<0.05, * p<0.1

Table A.9. The complete model (PV_MATH)

VARIABLES	(1)	(2)	(3)	(4)
PUP_TEACH_RATIO	3.991***	3.741**	4.004***	3.602**
	[1.541]	[1.682]	[1.533]	[1.563]
TOT_ENROLL	0.0220	0.0163	0.0237	0.0173
	[0.0171]	[0.0170]	[0.0158]	[0.0154]
SHARE_FEM	-0.0263	-0.00956	-0.0357	-0.0245
	[0.219]	[0.216]	[0.210]	[0.199]
SHORTAGE_MATH	-37.32	-36.43	-37.66	-36.80
	[26.63]	[26.74]	[26.99]	[27.25]
D_SMALL	-1.590	-3.120	-0.855	-2.099
	[16.26]	[15.81]	[15.78]	[15.03]
D_LARGE	1.007	2.629	0.837	3.271
	[12.99]	[11.84]	[13.07]	[10.84]
PUB_FUND	-0.603***	-0.675***	-0.649***	-0.856***
	[0.192]	[0.192]	[0.238]	[0.280]
DECENTR	137.5***	138.7***	122.8***	97.93***
	[21.64]	[21.99]	[24.47]	[34.53]
PUB_FUND×DECENTR			0.182	0.518
			[0.291]	[0.334]
PUBLIC	32.75***		31.64***	
	[11.98]		[11.91]	
PUBLIC×D_ESP		24.16		15.05
		[16.07]		[18.78]
PUBLIC×D_ITA		50.08*		58.98**
		[26.63]		[25.49]
Regional fixed effects	yes	yes	yes	yes
Country fixed effects	yes	yes	yes	yes
Observations	620	620	620	620
R^2	0.9839	0.9840	0.9839	0.9841

Note: Standard errors in brackets *** p<0.01, ** p<0.05, * p<0.1

Table A.10. The role of school autonomy (PV_MATH)

VARIABLES	(1)	(2)	(3)	(4)
PUP_TEACH_RATIO	4.103**	3.829**	4.113**	3.697**
	[1.674]	[1.772]	[1.671]	[1.661]
TOT_ENROLL	0.0223	0.0153	0.0238	0.0162
	[0.0168]	[0.0180]	[0.0158]	[0.0164]
SHARE_FEM	-0.0347	-0.0167	-0.0428	-0.0334
	[0.214]	[0.212]	[0.206]	[0.193]
SHORTAGE_MATH	-37.22	-36.06	-37.53	-36.41
	[26.72]	[26.76]	[27.02]	[27.26]
D_SMALL	-1.553	-3.419	-0.917	-2.381
	[16.37]	[16.26]	[15.94]	[15.41]
D_LARGE	0.426	2.364	0.284	3.043
	[13.29]	[11.85]	[13.36]	[10.87]
AUTCURR	-3.654	-5.902	-3.382	-6.323
	[7.318]	[7.324]	[7.156]	[7.802]
AUTRES	-1.563	-1.793	-1.623	-2.135
	[4.759]	[4.557]	[4.729]	[4.260]
PUB_FUND	-0.619***	-0.710***	-0.661***	-0.905***
	[0.194]	[0.206]	[0.241]	[0.316]
DECENTR	137.2***	138.3***	124.3***	95.50***
	[21.44]	[21.84]	[40.34]	[31.39]
PUB_FUND×DECENTR			0.160	0.543
			[0.290]	[0.342]
PUBLIC	28.76*		27.78*	
	[16.90]		[16.38]	
PUBLIC×D_ESP		16.89		6.464
		[18.94]		[18.92]
PUBLIC×D_ITA		49.35**		58.34**
		[25.02]		[23.47]
Regional fixed effects	yes	yes	yes	yes
Country fixed effects	yes	yes	yes	yes
Observations	618	618	618	618
R^2	0.9839	0.9841	0.9839	0.942

Note: Standard errors in brackets *** p<0.01, ** p<0.05, * p<0.1.

Table A.11. The role of parental background (PV_MATH)

VARIABLES	(1)	(2)	(3)	(4)
PUP_TEACH_RATIO	3.624*	3.392	3.637**	3.249*
	[1.867]	[2.077]	[1.850]	[1.966]
TOT_ENROLL	0.0221	0.0168	0.0241*	0.0178
	[0.0141]	[0.0134]	[0.0132]	[0.0122]
SHARE_FEM	-0.0478	-0.0320	-0.0583	-0.0474
	[0.216]	[0.208]	[0.207]	[0.190]
SHORTAGE_MATH	-36.57	-35.75	-36.96	-36.12
	[26.37]	[26.58]	[26.80]	[27.18]
D_SMALL	2.240	0.784	3.070	1.837
	[13.55]	[13.08]	[13.20]	[12.51]
D_LARGE	-2.715	-1.178	-2.915	-0.534
	[10.02]	[9.158]	[10.00]	[8.476]
MOTHER_HIGH	76.86	76.45	77.08	76.69
	[69.37]	[70.91]	[69.50]	[72.62]
PUB_FUND	-0.393*	-0.461**	-0.443*	-0.645**
	[0.215]	[0.213]	[0.259]	[0.285]
DECENTR	133.1***	134.2***	116.7***	92.51**
	[19.87]	[20.20]	[31.44]	[38.07]
PUB_FUND×DECENTR			0.203	0.529
			[0.261]	[0.332]
PUBLIC	29.64***		28.40***	
	[9.526]		[9.667]	
PUBLIC×D_ESP		21.61		12.29
		[14.38]		[19.01]
PUBLIC×D_ITA		45.88		54.96*
		[31.14]		[32.09]
Regional fixed effects	yes	yes	yes	yes
Country fixed effects	yes	yes	yes	yes
Observations	619	619	619	619
R^2	0.9850	0.9849	0.9851	0.9835

Note: Standard errors in brackets *** p<0.01, ** p<0.05, * p<0.1.

Table A.7. Structural variables only (PV_READ)

VARIABLES	(1)	(2)	(3)	(4)
PUP_TEACH_RATIO	3.788	4.052	3.696**	4.055*
	[2.345]	[2.719]	[1.622]	[2.071]
TOT_ENROLL	0.0458***	0.0430**	0.0402***	0.0387**
	[0.0163]	[0.0182]	[0.0137]	[0.0162]
SHARE_FEM	0.899**	1.006**	0.884***	0.906***
	[0.367]	[0.501]	[0.300]	[0.347]
SHORTAGE_READ	-67.43	-69.37	-55.34	-56.95
	[49.71]	[50.02]	[36.64]	[38.08]
D_SMALL	-0.551	-5.449	-12.01	-16.93
	[15.17]	[17.98]	[23.74]	[25.90]
D_LARGE	-1.003	-4.590	-5.482	-8.995
	[18.66]	[23.87]	[27.72]	[31.84]
D_LANGUAGE		-2.122		-10.21
		[29.15]		[19.41]
Constant	352.0***	348.3***		
	[55.27]	[69.07]		
Regional fixed effects	no	no	yes	yes
Country fixed effects	no	no	yes	yes
Observations	638	581	638	581
R^2	0.2937	0.2910	0.9812	0.9794

Note: Standard errors in brackets *** p<0.01, ** p<0.05, * p<0.1

Table A.8. "Market accountability" and "fiscal accountability" (PV_READ)

VARIABLES	(1)	(2)	(3)	(4)	(5)
PUP_TEACH_RATIO	3.214**	3.696**	3.880**	3.884**	4.011*
	[1.310]	[1.622]	[1.767]	[1.692]	[2.174]
TOT_ENROLL	0.0405***	0.0402***	0.0348**	0.0378***	0.0403**
	[0.0146]	[0.0137]	[0.0139]	[0.0131]	[0.0158]
SHARE_FEM	0.782***	0.884***	0.849**	0.885***	0.873***
	[0.244]	[0.300]	[0.331]	[0.316]	[0.292]
SHORTAGE_READ	-42.39	-55.34	-42.73	-56.11	-56.36
	[32.33]	[36.64]	[30.29]	[37.03]	[37.56]
D_SMALL	-0.467	-12.01	-4.437	-12.65	-11.74
	[17.29]	[23.74]	[20.75]	[23.96]	[21.43]
D_LARGE	-6.226	-5.482	-7.872	-4.723	-5.230
	[25.38]	[27.72]	[28.98]	[27.56]	[29.22]
PUB_FUND	-0.524***				
	[0.168]				
DECENTR		114.8***			
		[19.12]			
PUB_FUND×DECENTR			-0.0660		
			[0.198]		
PUBLIC				5.919	
				[11.43]	
PUBLIC×D_ESP					11.45
					[22.79]
PUBLIC×D_ITA					-0.461
					[39.17]
Regional fixed effects	yes	yes	yes	yes	yes
Country fixed effects	yes	yes	yes	yes	yes
Observations	620	638	638	638	638
R^2	0.9830	0.9812	0.9820	0.9812	0.9812

Note: Standard errors in brackets *** p<0.01, ** p<0.05, * p<0.1

Table A.9. The complete model (PV_READ)

VARIABLES	(1)	(2)	(3)	(4)
PUP_TEACH_RATIO	3.966***	3.749**	3.986***	3.582**
	[1.539]	[1.733]	[1.531]	[1.580]
TOT_ENROLL	0.0309**	0.0259**	0.0338**	0.0273**
	[0.0121]	[0.0121]	[0.0138]	[0.0131]
SHARE_FEM	0.758***	0.773***	0.743***	0.753***
	[0.274]	[0.269]	[0.257]	[0.245]
SHORTAGE_READ	-45.83	-45.04	-46.69	-46.13
	[35.53]	[35.61]	[36.86]	[37.45]
D_SMALL	-1.694	-2.990	-0.535	-1.739
	[17.00]	[16.21]	[16.00]	[15.14]
D_LARGE	-1.375	0.0547	-1.654	0.835
	[20.93]	[20.08]	[21.05]	[18.29]
PUB_FUND	-0.758***	-0.820***	-0.832***	-1.040***
	[0.226]	[0.217]	[0.290]	[0.317]
DECENTR	111.8***	112.8***	88.29***	62.89**
	[15.52]	[15.73]	[25.05]	[26.64]
PUB_FUND×DECENTR			0.292	0.630**
			[0.357]	[0.318]
PUBLIC	32.44***		30.70**	
	[12.16]		[12.01]	
PUBLIC×D_ESP		24.96		13.96
		[18.00]		[19.95]
PUBLIC×D_ITA		47.55		58.39**
		[31.28]		[26.67]
Regional fixed effects	yes	yes	yes	yes
Country fixed effects	yes	yes	yes	yes
Observations	620	620	620	620
R^2	0.9835	0.9836	0.9836	0.9838

Note: Standard errors in brackets *** p<0.01, ** p<0.05, * p<0.1

Table A.10. The role of school autonomy (PV_READ)

VARIABLES	(1)	(2)	(3)	(4)
PUP_TEACH_RATIO	4.084**	3.869**	4.103**	3.715**
	[1.683]	[1.855]	[1.680]	[1.717]
TOT_ENROLL	0.0310***	0.0254**	0.0338**	0.0266**
	[0.0120]	[0.0119]	[0.0134]	[0.0125]
SHARE_FEM	0.749***	0.763***	0.734***	0.743***
	[0.267]	[0.264]	[0.250]	[0.237]
SHORTAGE_READ	-46.13	-45.19	-47.01	-46.29
	[35.42]	[35.36]	[36.78]	[37.25]
D_SMALL	-1.805	-3.231	-0.671	-1.980
	[16.94]	[16.38]	[15.94]	[15.28]
D_LARGE	-2.105	-0.556	-2.369	0.249
	[20.82]	[19.83]	[20.94]	[18.10]
AUTCURR	0.325	-1.458	0.828	-1.940
	[6.791]	[6.291]	[6.462]	[6.762]
AUTRES	-3.006	-3.165	-3.129	-3.586
	[4.980]	[4.946]	[4.865]	[4.451]
PUB_FUND	-0.792***	-0.863***	-0.868***	-1.096***
	[0.233]	[0.235]	[0.305]	[0.367]
DECENTR	112.5***	113.4***	89.27***	62.06**
	[16.36]	[16.64]	[23.00]	[26.24]
PUB_FUND×DECENTR			0.290	0.649*
			[0.356]	[0.343]
PUBLIC	27.36		25.60	
	[18.65]		[18.02]	
PUBLIC×D_ESP		18.04		5.689
		[22.98]		[21.91]
PUBLIC×D_ITA		43.62		54.33**
		[30.29]		[26.08]
Regional fixed effects	yes	yes	yes	yes
Country fixed effects	yes	yes	yes	yes
Observations	618	618	618	618
R^2	0.9836	0.9836	0.9838	0.9845

Note: Standard errors in brackets *** p<0.01, ** p<0.05, * p<0.1.

Table A.11. The role of parental background (PV_READ)

VARIABLES	(1)	(2)	(3)	(4)
PUP_TEACH_RATIO	3.619*	3.423	3.639*	3.252
	[1.882]	[2.149]	[1.863]	[2.000]
TOT_ENROLL	0.0314***	0.0268**	0.0345**	0.0282**
	[0.0119]	[0.0126]	[0.0143]	[0.0144]
SHARE_FEM	0.735***	0.749***	0.719***	0.729***
	[0.277]	[0.268]	[0.259]	[0.243]
SHORTAGE_READ	-46.70	-45.97	-47.63	-47.09
	[32.42]	[32.62]	[33.82]	[34.46]
D_SMALL	2.176	0.968	3.454	2.262
	[14.23]	[13.39]	[13.35]	[12.50]
D_LARGE	-4.920	-3.595	-5.242	-2.818
	[16.05]	[15.32]	[16.03]	[13.42]
MOTHER_HIGH	73.86	73.43	74.27	73.79
	[81.84]	[82.77]	[81.92]	[84.57]
PUB_FUND	-0.557*	-0.615**	-0.637*	-0.839**
	[0.287]	[0.267]	[0.348]	[0.345]
DECENTR	107.6***	108.5***	82.04***	57.55**
	[14.66]	[14.91]	[24.79]	[27.68]
PUB_FUND×DECENTR			0.316	0.643**
			[0.311]	[0.278]
PUBLIC	29.73***		27.82***	
	[9.438]		[9.553]	
PUBLIC×D_ESP		22.91		11.66
		[16.68]		[20.71]
PUBLIC×D_ITA		43.53		54.57*
		[33.52]		[30.85]
Regional fixed effects	yes	yes	yes	yes
Country fixed effects	yes	yes	yes	yes
Observations	619	619	619	619
R^2	0.9846	0.9846	0.9848	0.9806

Note: Standard errors in brackets *** p<0.01, ** p<0.05, * p<0.1.

Table A.7. Structural variables only (PV_SCIE)

VARIABLES	(1)	(2)	(3)	(4)
PUP_TEACH_RATIO	3.943	4.215	4.038*	4.462*
	[3.064]	[3.508]	[2.214]	[2.701]
TOT_ENROLL	0.0353	0.0318	0.0304	0.0288
	[0.0232]	[0.0264]	[0.0285]	[0.0274]
SHARE_FEM	0.444	0.591	0.400	0.425
	[0.328]	[0.477]	[0.249]	[0.279]
SHORTAGE_SCIE	-101.4	-109.8	-82.46	-89.53
	[77.58]	[84.21]	[50.68]	[57.67]
D_SMALL	-5.247	-12.98	-17.30	-24.63
	[19.17]	[23.18]	[30.15]	[33.24]
D_LARGE	2.190	-2.892	-2.773	-7.274
	[16.95]	[22.93]	[26.93]	[31.51]
D_LANGUAGE	3.943	4.215	4.038*	4.462*
	[3.064]	[3.508]	[2.214]	[2.701]
Constant	386.5***	385.2***		
	[48.51]	[59.26]		
Regional fixed effects	no	no	yes	yes
Country fixed effects	no	no	yes	yes
Observations	637	580	637	580
R^2	0.2973	0.3168	0.9972	0.9757

Note: Standard errors in brackets *** p<0.01, ** p<0.05, * p<0.1

Table A.8. "Market accountability" and "fiscal accountability" (PV_SCIE)

VARIABLES	(1)	(2)	(3)	(4)	(5)
PUP_TEACH_RATIO	3.640*	4.038*	4.433*	4.453*	4.687
	[1.924]	[2.214]	[2.472]	[2.405]	[2.953]
TOT_ENROLL	0.0315	0.0304	0.0261	0.0251	0.0297
	[0.0220]	[0.0285]	[0.0307]	[0.0319]	[0.0227]
SHARE_FEM	0.278	0.400	0.345	0.402	0.381
	[0.211]	[0.249]	[0.279]	[0.270]	[0.256]
SHORTAGE_SCIE	-69.28	-82.46	-73.24	-84.64	-84.34
	[48.01]	[50.68]	[50.39]	[52.77]	[51.97]
D_SMALL	-4.426	-17.30	-8.452	-18.67	-17.06
	[23.26]	[30.15]	[26.80]	[30.83]	[27.84]
D_LARGE	-4.025	-2.773	-5.917	-1.118	-2.085
	[24.94]	[26.93]	[28.88]	[25.91]	[28.01]
PUB_FUND	-0.563***				
	[0.180]				
DECENTR		143.0***			
		[28.01]			
PUB_FUND×DECENTR			0.0423		
			[0.227]		
PUBLIC				13.01	
				[12.70]	
PUBLIC×D_ESP					23.27
					[27.97]
PUBLIC×D_ITA					0.984
					[38.33]
Regional fixed effects	yes	yes	yes	yes	yes
Country fixed effects	yes	yes	yes	yes	yes
Observations	619	637	619	637	637
R^2	0.9796	0.9772	0.9783	0.9773	0.9774

Note: Standard errors in brackets *** p<0.01, ** p<0.05, * p<0.1

Table A.9. The complete model (PV_SCIE)

VARIABLES	(1)	(2)	(3)	(4)
PUP_TEACH_RATIO	4.715**	4.556*	4.740**	4.361*
	[2.314]	[2.559]	[2.289]	[2.354]
TOT_ENROLL	0.0176	0.0139	0.0213	0.0153
	[0.0315]	[0.0298]	[0.0270]	[0.0271]
SHARE_FEM	0.246	0.256	0.226	0.235
	[0.232]	[0.231]	[0.213]	[0.209]
SHORTAGE_SCIE	-74.43	-74.38	-74.79	-74.94
	[53.21]	[53.02]	[53.67]	[53.47]
D_SMALL	-6.302	-7.240	-4.760	-5.872
	[23.07]	[22.02]	[21.61]	[20.56]
D_LARGE	2.706	3.780	2.298	4.661
	[18.33]	[18.00]	[18.54]	[16.17]
PUB_FUND	-0.889***	-0.936***	-0.991***	-1.190***
	[0.271]	[0.266]	[0.356]	[0.419]
DECENTR	143.9***	144.7***	99.38***	87.35***
	[26.90]	[27.11]	[36.79]	[31.72]
PUB_FUND×DECENTR			0.403	0.727*
			[0.407]	[0.418]
PUBLIC	45.87***		43.38**	
	[17.69]		[17.45]	
PUBLIC×D_ESP		40.35*		27.55
		[24.30]		[24.77]
PUBLIC×D_ITA		57.20*		69.73**
		[31.59]		[29.80]
Regional fixed effects	yes	yes	yes	yes
Country fixed effects	yes	yes	yes	yes
Observations	619	619	619	619
R^2	0.9805	0.9806	0.9807	0.9809

Note: Standard errors in brackets *** p<0.01, ** p<0.05, * p<0.1

Table A.10. The role of school autonomy (PV_SCIE)

VARIABLES	(1)	(2)	(3)	(4)
PUP_TEACH_RATIO	4.827**	4.631*	4.847**	4.448*
	[2.455]	[2.639]	[2.440]	[2.456]
TOT_ENROLL	0.0180	0.0130	0.0214	0.0142
	[0.0311]	[0.0310]	[0.0270]	[0.0284]
SHARE_FEM	0.237	0.249	0.219	0.226
	[0.227]	[0.229]	[0.210]	[0.205]
SHORTAGE_SCIE	-74.31	-74.13	-74.67	-74.64
	[53.02]	[52.79]	[53.45]	[53.16]
D_SMALL	-6.308	-7.588	-4.888	-6.217
	[23.16]	[22.52]	[21.77]	[21.01]
D_LARGE	2.210	3.649	1.848	4.566
	[18.55]	[17.77]	[18.74]	[15.99]
AUTCURR	-4.916	-6.551	-4.274	-7.134
	[9.502]	[8.918]	[9.047]	[9.665]
AUTRES	-1.128	-1.294	-1.270	-1.765
	[5.660]	[5.678]	[5.500]	[5.118]
PUB_FUND	-0.900***	-0.967***	-0.998***	-1.236***
	[0.271]	[0.281]	[0.358]	[0.465]
DECENTR	143.3***	144.1***	101.8***	84.78***
	[26.29]	[26.75]	[34.96]	[29.54]
PUB_FUND×DECENTR			0.377	0.752*
			[0.398]	[0.448]
PUBLIC	42.33*		39.99*	
	[24.33]		[23.36]	
PUBLIC×D_ESP		33.76		19.33
		[28.43]		[25.08]
PUBLIC×D_ITA		57.39*		69.89**
		[31.81]		[30.70]
Regional fixed effects	yes	yes	yes	yes
Country fixed effects	yes	yes	yes	yes
Observations	617	617	617	617
R^2	0.9806	0.9807	0.9807	0.9810

Note: Standard errors in brackets *** p<0.01, ** p<0.05, * p<0.1.

Table A.11. The role of parental background (PV_SCIE)

VARIABLES	(1)	(2)	(3)	(4)
PUP_TEACH_RATIO	4.356	4.216	4.381	4.015
	[2.762]	[3.083]	[2.728]	[2.891]
TOT_ENROLL	0.0179	0.0147	0.0220	0.0161
	[0.0273]	[0.0248]	[0.0229]	[0.0221]
SHARE_FEM	0.217	0.226	0.196	0.205
	[0.227]	[0.222]	[0.208]	[0.200]
SHORTAGE_SCIE	-78.92	-78.85	-79.34	-79.46
	[59.07]	[58.87]	[59.58]	[59.27]
D_SMALL	-2.021	-2.869	-0.346	-1.448
	[19.68]	[18.46]	[18.30]	[17.14]
D_LARGE	-1.201	-0.237	-1.663	0.641
	[14.48]	[14.27]	[14.57]	[12.41]
MOTHER_HIGH	82.99	82.70	83.55	83.17
	[78.49]	[79.46]	[78.39]	[81.09]
PUB_FUND	-0.662**	-0.704**	-0.769*	-0.962**
	[0.327]	[0.300]	[0.407]	[0.425]
DECENTR	138.2***	139.0***	103.5***	80.21**
	[23.82]	[23.93]	[34.60]	[33.24]
PUB_FUND×DECENTR			0.431	0.744**
			[0.363]	[0.365]
PUBLIC	43.22***		40.53***	
	[15.24]		[15.36]	
PUBLIC×D_ESP		38.33		25.22
		[23.92]		[26.49]
PUBLIC×D_ITA		53.26		66.06**
		[33.13]		[32.35]
Regional fixed effects	yes	yes	yes	yes
Country fixed effects	yes	yes	yes	yes
Observations	617	617	617	617
R^2	0.9810	0.9817	0.9818	0.9818

Note: Standard errors in brackets *** p<0.01, ** p<0.05, * p<0.1.