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Funding and School Accountability: The Importance of Private and Decentralised Public Funding for Pupil Attainment

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Abstract

We discuss the issue of how schools should be financed, concentrating on the role of private funding and public funding via sub-national governments as accountability mechanisms in the provision of educational services. The historical evolution of school regulation in Italy and Spain has created differences in the percentage of pupils who attend private schools, the percentage of private school funding coming from public and private sources, and the percentage of public school funding that comes from central or local government sources. 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 an important interplay between them.

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

JEL Codes: H75, I22

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Policy points

- We discuss the issue of how schools should be financed exploiting the institutional diversity created by the historical evolution of school regulation in Italy and Spain

- We find that decentralised public funding is consistently associated with a better schools' performance with respect to centralised funding.

- Second, 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.

I. Introduction

Historical accounts of the evolution of school regulation all around the world suggest that this is a policy issue subject to much discussion. Two questions emerge as important in the debate: first, what is the role that *private schools* should play in the provision of education. Despite the presence of different types of private schools, in countries where the Catholic Church is still an important actor in social life, such as Italy and Spain, this question is basically centred on the role, if any, private faith-based schools should play in education, and whether these schools should be financed with *public funds*. A second question is on the role *sub-national governments* should play in the provision of education. Opponents of decentralisation argue that only public free-for-all education *centrally* managed can guarantee equal opportunity to all citizens, and a device to build a shared national identity, emphasizing the political and ideological nature of the debate (e.g., Fiske, 1996).

From an economic point of view, these two issues can be thought of as two different "accountability mechanisms" based on the sources of schools funding that have been somewhat overlooked in the recent debates on competition among schools.[1] The first mechanism – i.e., the private market incentive – is as old as economics. The comparison between private and public schools suggests that the former should be more effective than the latter type of schools in delivering higher student attainment, 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 should 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

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[1] For instance, Dearden and Vignoles (2011), presenting the special issue of Fiscal Studies on Schools, Markets and League Tables, suggest that school funding should be related, at a minimum, to the number of students a school can attract, but the problem of whether the *source* of this funding matters for educational outcomes is sidestepped.

"fiscal-accountability" incentives exerted by decentralized revenues. The policy suggestion would be to finance schools with sub-national governments' funds.

Indirect evidence supporting the role played by these two mechanisms in the case of schooling has been recently provided, for instance, by West and Woessmann (2010), Falch and Fischer (2012), Galiani et al. (2008), and Barankay and Lockwood (2007). Using PISA 2003 data, West and Woessmann (2010) show that fiercer competition from private schools (here measured by their market share) lead to better student achievement in mathematics, science and reading, and to lower cumulative (public and private) educational expenditure per student up to age 15, indirectly supporting the role of the "market-accountability" mechanism. The result on achievements is obtained controlling for the average share of funding that private schools receive from the government and the current share of the population who are Catholic. The authors also account for the likely endogeneity of the contemporary private schools 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.

Meanwhile, Falch and Fischer (2012), Galiani *et al*. (2008) and Barankay and Lockwood (2007) all find indirect evidence supporting the "fiscal-accountability" mechanism. Falch and Fischer (2012) show that *spending* decentralization positively impacts on students test scores (including PISA 2000) considering a sample of OECD countries. Galiani *et al*. (2008) demonstrate 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. Finally, 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 attainment.

While the literature has considered independently the two issues of private schools and (fiscal) decentralisation so far, they can hardly be separated when evaluating

schools outcomes, both within and across countries. The historical evolution of school regulation in Italy and Spain provides a clear example. These are two countries where Catholicism is still considered an important trait of the national culture (e.g., West and Woessmann, 2010), and where ideological disputes around school funding have been (and still are) frequent. They are, however, characterized by different historical paths, both with respect to the funding of private schools, and the role of regional governments, which translates into different combinations of private and public funds.

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), the goal of the paper is to explore how the two "accountability mechanisms" identified by the previous literature really impact on educational outcomes. To this end, we exploit historical institutional diversities between and within Italy and Spain in our identification strategy below 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" at the school level 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. This evidence holds controlling also for important dimensions of schools' characteristics and for parental background, two dimensions that might affect the selection of students into different types of schools.

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 a brief policy discussion. Section 4 collects the final remarks.

II. Italy and Spain: historical and institutional differences

While sharing a number of cultural traits characterising Mediterranean countries, including a large favour still granted to Catholicism, 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.

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

After the unification of the country in 1861, the Italian schooling system followed two basic principles: first, free-of-charge *public* elementary schooling for all citizens; second, *compulsory* education for all, with sanctions and fines for all 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 secular view of schooling (that also excluded religion from curricula in public schools), and sent their children to private institutions run by the Catholic Church.

These institutions were accepted by the government under the condition (established in the 1948 Republican Constitution) that they were run "without any financial burden for the State". This view has largely continued to the present day and means that the role of private schools in Italy is fairly limited: at the national level, more than 90% of students are enrolled in public primary and secondary schools, and public subsidies to private institutions account for less than 1% of the total public expenditure for education. These subsidies follow historical spending and – as for transfers to public schools – are totally unrelated to schools' performance measured by students' attainments.

By contrast, the situation in Spain stems largely from laws introduced during the dictatorship of Franco. In 1952, Catholic religious instruction became mandatory in all schools, even in the public ones; moreover, the Catholic Church was given the

right to establish its own universities. With the introduction of the democratic regime following Franco's death in 1975, the government has implemented various reforms of the educational system trying to account for the increasing level of decentralization of powers toward regions, some of which have had competencies to legislate on education from the early Eighties. However, the government continues to subsidize private church-affiliated schools today. Like in Italy, the funding of private (but also public) schools in Spain is not related at all to their performance and simply follows historical spending; but it is much larger, reaching 11,4% of total spending for education. Moreover, the role of private schools is more important than in Italy, with 32% of students enrolled in private institutions.[2]

2 Decentralization patterns: the rationales for regional autonomy

Italy and Spain have also followed different patterns for fiscal decentralisation (e.g., Davies *et al.*, 2002), and the share of funding coming from regional governments to finance schools is remarkably different. In Italy, the centralisation of funding (and management) of schools emphasised by the Republican Constitution has been threatened only in 2005 by a 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 Region Valle d'Aosta are financed by own regional funds, while schools in the other regions are almost totally financed by the central government, which – as already observed – 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 municipal governments (see, e.g., MIUR, 2007).

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[2] The figure corresponds to the sum of both "private-independent" and "private-government dependent" schools (*escuelas concertadas*). See SEIE (2014).

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.[3] This autonomy has been used to design different educational systems with respect to the national one. For instance, the Province of Trento assigns 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. Moreover, 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. However, differences in the level of spending do not influence the role of private schools, which is substantially similar to the one played at the national level: available data show that 95.3% of students in the Province of Trento were enrolled in a public school in 1999, compared to about 93% in the rest of the country; the large majority of private schools were faith-based schools run by the Catholic Church (Gasperoni and Peri, 1999).

Regional autonomy in Spain is more recent, but also in this case the reason for decentralisation of powers is totally unrelated 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). In terms of 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

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[3] 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.

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 municipal governments.

III. Empirical analysis

1. *The identification strategy*

The historical patterns described above provide a sort of "quasi-natural" experiment for testing the impact of institutional differences with respect to both private schooling and decentralised funding of educational services. In particular, 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 Valle d'Aosta); and *between* Italy and Spain. The degree of fiscal decentralisation is important because the higher the share of resources generated by sub-national (regional) governments to finance the services to citizens, the lower the Vertical Fiscal Imbalance (VFI), i.e., the share of central government transfers to fund decentralized spending. In other words, a lower VFI means that citizens contribute more with taxes raised in their local community to finance the public services they consume. The modern fiscal federalism theory suggests that a lower VFI – by providing a better match between spending and funding – will increase the electoral accountability of local politicians; hence, arguably, it will generate a greater efficiency of public spending.[4] 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 the schooling system, which is different between Spain and Italy, both for the role assigned to

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[4] The theoretical arguments are surveyed in, e.g., Oates (2005) and Weingast (2009). See Eyraud and Lusinyan (2013) for recent empirical evidence on the role of VFI.

private providers of education and, more importantly, for the share of public funding granted to private schools. In particular, private schools in Spain 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. If market incentives work, we should expect that a higher degree of private funding will be associated with improved educational outcomes.

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 attainment 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.[5] 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 (as well as in Sicily and Sardinia) 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.

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[5] On the use of external standardised exams and – more generally – 'quantitative performance measures' to improve educational outcomes, see, e.g., Muriel and Smith (2011).

iii. In between, we have Spanish public and private schools and Italian public schools in regions enjoying autonomy in funding schools. 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 *funding* education, and the variable PUB_FUND, which measures the percentage of *total* funding for each school in a given year coming from public sources (including municipal, regional and central governments). The interaction of the two variables, $DECENTR{\times}PUB\_FUND$, allows us to differentiate schools according to the incidence of regional funding, hence investigating the "fiscal-accountability" effect[6]. 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[7], which can be important in itself, especially in the presence of a nationally

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[6] A more direct way to test the impact of regional funding would have been to consider the share of regional funding out of total public funding. Unfortunately, PISA data do not have this information.
[7] Ideally, one would like to distinguish private schools between faith-based schools and secular schools, but PISA data do not allow such classification. However, we indirectly checked the prevalence of religious institutions by considering the question "How much consideration is given to the parents' endorsement of the instructional or religious philosophy of the school when students are admitted to your school?" in the school questionnaire. See below for further details.

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. Notice that, in most of the literature on schooling, accountability is defined according to the role played exactly by standardised external exams and other monitoring devices, but the role of fiscal decentralisation is hardly mentioned (e.g., Hanushek and Raymond, 2005; Muriel and Smith, 2011). 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 average test score at the school level (*SCORE*), and the controls can be grouped in regional, school, and student-related variables (e.g., Hanushek and Woessmann, 2011). The general model to be estimated can be written as follows:

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

where subscript *i* identifies the schools, X_k's are two country dummies interacted with *PUBLIC* to identify the institutional differences between Spanish and Italian schools, X_h's are a set of controls usually deemed to be other important determinants of school outcomes (including average pupil characteristics, school characteristics, and other autonomy measures; see below for details), ϕ_c and γ_r are country and region fixed effects, respectively. According to our "accountability" story, we are

particularly interested in the coefficients on *DECENTR, PUB_FUND, PUBLIC*, and their interactions.

It is worth highlighting that the identification of the coefficient for *DECENTR* (net of country and region idiosyncratic effects) exploits the circumstance that in Italy – unlike Spain – there are both non-decentralized and decentralized regions (in particular, the two Autonomous Provinces of Trento and Bolzano). Therefore, the coefficient for *DECENTR* is identified by excluding the dummy for a decentralized Italian region (to avoid multicollinearity), whose idiosyncratic effect is absorbed by *DECENTR*. Our estimates discussed below are obtained by excluding the dummy for the Autonomous Province of Trento; however, our results – and, more specifically, the estimated coefficient for *DECENTR* – are virtually unaffected if we drop as an alternative the dummy for the Autonomous Province of Bolzano. Hence, regional specificities play a minor role compared to the impact on schools' performance of fiscal decentralisation.

Moreover, since we are using region fixed effects, it is crucial for the validity of our identification strategy to have random variation between schools *within* a region, in terms of the proportion of public funding, and – consequently – the degree of fiscal decentralization evaluated at school level. We can reasonably assume that this condition is basically satisfied in Spain and Italy, since – as remarked in section 2 – public funds from different tiers of government are unrelated to students' performance, because they basically reflect historical spending. Furthermore, the variation is large enough: the average coefficient of variation for *PUB_FUND* *within* regions is 0.29, with a minimum of 0.14 and a maximum of 0.47. However, to show that this is really the case, we consider – somewhat in the spirit of West and Woessman (2010) – an auxiliary regression model investigating the determinants of *PUB_FUND* for each school in the sample, represented in the following Equation [2]:

$$PUB\_FUND_i = a + b_1 ILLIT\_1930_i + b_2 ILLIT\_2000_i +$$
$$+ \sum b_k PUBLIC \times X_{ki} + \sum b_h X_{hi} + \varepsilon_i \qquad [2]$$

where the regressors include the share of illiterate back in 1930 at the regional level (*ILLIT_1930*), the share of illiterate in 2000 (*ILLIT_2000*), and the same variables reflecting average pupil characteristics, school characteristics and other autonomy measures, which we also insert in our main Equation [1] on students' test scores.

2. Data and variable definitions

The analysis is based on 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 613 schools for which we have complete data from 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 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 schools located in Spanish regions and for those located in 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×PUB_FUND*.

a. Educational attainments.

PISA surveys report students' performance through *plausible values*. These need to be thought of as five 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. Moreover, to account also for the hierarchical structure of PISA data (i.e., the fact that we are observing students' performance for different schools in different regions within a country) and the consequent potential heteroskedasticity in the residuals of the regression models, we consider cluster-robust standard errors at the school level in all our estimates.[8]

Average 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 613 schools considered in the following empirical analysis are in table 1, distinguishing also the schools by country. On average, Spanish schools appear to perform better than Italian schools along all the four domains; moreover, estimated standard errors for Spanish schools' performance are significantly lower than those for Italian schools.[9]

[Table 1 about here]

b. Controls.

As already discussed, our main regressors are *DECENTR*, *PUB_FUND*, *DECENTR×PUB_FUND*, and *PUBLIC*, together with a whole set of country and

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[8] In particular, we apply the BRR (Balanced Repeated Replication) option of Stata. For additional details on this issue, see OECD (2005a)

[9] To better position the two countries, notice that in all PISA surveys the average score among OECD countries is 500 points, while the standard deviation is 100 points.

region fixed effects as a control for the unobserved heterogeneity in schools' performance across countries and regions.[10]

Besides the main variables, our covariates include a number of variables at the school level (X_h) that the previous literature deems to be important in affecting students' performance (e.g., Hanushek and Woessmann, 2011), and thus can be confounding factors for the accountability effects which we aim at identifying. Average pupil characteristics are summarized considering both the percentage of students with highly educated mothers, holding a college degree or a PhD (*MOTHER_HIGH*),[11] and the share of female students out of the total number of students (*SHARE_FEM*).[12] We expect the parental background to have both an indirect effect on the outcome via school choice (hence, eventually, also via funding), but also a more direct effect (e.g., Hanushek and Woessmann, 2011; Woessmann *et al.*, 2009).

As for school characteristics, we consider: the number of students per (full time equivalent) teacher (*PUP_TEACH_RATIO*); the total number of students enrolled in each institution (*TOT_ENROLL*); the shortages of teachers that can hinder the ability of schools to provide adequate education (*SHORTAGE_MATH*); and dummies for school location according to city size (*D_SMALL, D_LARGE*).

Finally, we also consider variables measuring schools' autonomy in different dimensions (e.g., Hanushek and Raymond, 2005; Muriel and Smith, 2011), which

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[10] Country and regional dummies pick up, for instance, unobserved differences in terms of per capita spending, per capita income, social and cultural traits, and/or structural differences with respect to private markets. Notice that, in order to avoid multicollinearity between country and region fixed effects, the two dummies for "Other Regions" (for both Italy and Spain) have been excluded from the set of regressors.

[11] Alternative measures in this respect are the highly educated fathers, or a sum of fathers and mothers. However, results are robust to the choice of the parental background variable.

[12] In a preliminary set of regressions we have also taken into account 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. Thus we have included the dummy *LANGUAGE*, which 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. However, since this variable is missing for Catalan schools – and Catalonia is one of the most important regions in the history of Spanish autonomy – and the estimated coefficient is never statistically significant, we decided to drop this variable from the analysis.

can also impact on the (potentially) *non-random selection* of pupils into different regions and types of schools. For instance, schools relying more on private funding (or located in decentralized contexts, with a higher share of regional funding and a higher degree of autonomy) can attract better students (those from wealthier and more educated families) and thus perform better. First, we include two variables that are also thought to (indirectly) increase 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*).[13] Both dimensions of autonomy can indirectly influence parental choice. Second, as a further control for selection policies by schools, we define three dummies for identifying schools that do *not* select students according to residence in a particular area (*D_RESIDENCE*), students' record or attendance of other family members (also in the past) to school (*D_SELECTIVITY*), and parents' endorsement of the instructional or religious philosophy of the school (*D_ENDORSEMENT*). Descriptive statistics for all the variables used in the empirical analysis are shown in table 2.

[Table 2 about here]

3. The results

Before discussing our main results, let us focus on the issue of exogeneity of *PUB_FUND*. Estimates of Equation [2] in table 3 are strongly supportive of this view. The coefficient for the share of illiterate back in 1930 is positive, constant in magnitude, and statistically significant at the usual confidence levels across all the specifications but one (col. 2), where it is only marginally insignificant. In addition, notice that the share of illiterate in 2000 is never statistically significant, suggesting that public funds given to each school are sticky and insensitive to school

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[13] For recent evidence about the effects of school autonomy on pupil performance based on PISA data see Verscheldel *et al.* (2015).

performance. Public funds were historically thought to help poorer communities (i.e., those with a larger share of illiterate) to finance educational services, and they basically remained there, so that variation amongst schools within regions today can be seen mostly as random.[14]

[Table 3 about here]

Table 4 shows the estimates of the education production function [Eq. 1] using *PV_PROB* (the most general assessment of students' ability) as an example for the dependent variable *SCORE*. However, results obtained with alternative definitions of *SCORE* largely mirror those described here and are reported in Appendix (tables A1-A3).

[Table 4 about here]

We discuss four specifications of Equation [1], starting from a simple specification including only variables aimed at capturing the main dimensions of accountability (col. 1): the size of public funding to schools, in order to consider accountability effects generated by *private markets* (*PUB_FUND*); the incidence of regional funding, so as to catch the accountability mechanism driven by *fiscal decentralisation* (*DECENTR* and, in particular, the interaction of *DECENTR* with *PUB_FUND*); the public/private nature of schools, considering also the institutional differences between Spain and Italy (*PUBLICxD_ITA*, *PUBLICxD_ESP*). We then augment this baseline model with variables aimed at capturing average pupil characteristics (col. 2), school characteristics (col. 3), and further measures of school autonomy (col. 4). The four specifications provide a consistent picture for the two accountability mechanisms.

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[14] Notice also that most of the coefficients for the other controls, not reported here for brevity, are insignificant. In particular, among the variables proxying for autonomy and selection policies, only coefficient for *D_ENDORSEMENT* is positive and statistically significant at the 10 per cent level, meaning that the share of public funds is higher, in general, for non-Catholic schools.

First, coefficient for *DECENTR* is positive and significant, implying that where regional governments enjoy a higher autonomy in managing and funding schools, we observe better performances. The magnitude of this effect ranges from about 117% to 208% of the estimated standard error for *PV_PROB* (39-69% of global standard deviation in PISA data).[15]

Second, coefficient for the share of public funding is negative and statistically significant: *ceteris paribus*, an increase of ten percentage points in *PUB_FUND* reduces the *PV_PROB* score by about 30-43% of the computed standard error (10-14% of global standard deviation in PISA data) depending on the specific model. This result is in contrast with the evidence 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, negatively affecting students' performance. Our results seem to point toward a different explanation, suggesting the existence of a likely interplay between decentralisation, public funding, and the role and funding of private schools.

These interrelationships are captured by the interaction *DECENTR×PUB_FUND*. The coefficient for this variable is positive and statistically significant at the usual confidence levels: an increase of ten percentage points in the share of public funding, where these funds are more likely to come from regional governments, implies an additional positive impact of about 25-34% of the estimated standard error compared to schools located in regions that do not enjoy fiscal autonomy (8-11% of standard deviation in PISA data). The magnitude and significance of this effect is similar also for alternative definitions of *SCORE* (see tables A1-A3). There are two ways to read this result. On the one hand, considering the negative sign of the first-order coefficient for *PUB_FUND*, it means that the incentives from *private market*

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[15] The estimated standard error for *PV_PROB* on the whole sample is 33.12 (see table 1). Recall, from footnote 10, that standard deviation in PISA data considering all countries is 100. Moreover, notice that the estimate of *DECENTR* changes only marginally if we drop the dummy for the Autonomous Province of Bolzano instead of Trento.

pricing are *less* strong if regional governments have to finance autonomously their schools: looking for instance at the most complete model (col. 4) and summing up coefficients, the negative impact on performance of an increase of ten percentage points in *PUB_FUND* reduces from 37% to 3% of the computed standard error (from 12.2% to 1% of standard deviation in PISA data) in regions where governments enjoy some degree of autonomy. On the other hand, considering 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.

Finally, looking at the public/private nature of schools, only the coefficient for the interaction *PUBLIC×D_ITA* is positive and statistically significant in all models: *ceteris paribus*, students at Italian public schools score from 219% to 261% of standard error (73-87% of global standard deviation in PISA data) more than students at private institutions, whereas no difference between public and private schools can be identified in Spain in the more complete specifications (col. 3 and col. 4). In the light of discussion above concerning the institutional differences between Spanish and Italian schools (section 3.1), one possible interpretation for this result is related to the disciplining role played by standardised national tests, which are currently lacking in Italy, while being compulsory in Spain.[16]

4. Discussion and policy implications

The results discussed in the previous section, which appear robust to different model perturbations, provide support to both accountability drivers – the decentralised funding incentives, on the one hand, and the market incentives, on the other hand – and suggest a number of thoughts on important educational policy issues.

First, decentralised school funding is consistently associated with higher educational attainments with respect to centralised funding. This is emphasised by coefficients for *DECENTR* and the interaction *DECENTR×PUB_FUND*. Computing predicted

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[16] On the positive effects exerted by external exams on students' performance, see, e.g., Woessmann *et al.*, (2009).

scores for different types of schools from the estimates of the most complete model (col. 4), those operating in regions where funding is decentralised perform better (see figure 1). The clear ranking is mostly 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 (statistically indistinguishable, since the coefficient on $PUBLIC{\times}D\_ESP$ 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 complements the 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): fiscal decentralisation increases the electoral accountability of sub-national governments, and this – in turn – improves the efficiency of public spending (here measured in terms of better student attainment). In order to reduce the Vertical Fiscal Imbalance and increase sub-national government accountability, the implied policy suggestion would then be to finance public schools with own regional funds beyond any ideology.

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, again beyond any ideological reason to like (or dislike) private schools, especially faith-based ones. 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 the estimates of the most complete specification (col. 4), if we take a school completely financed with private funds operating in a region where schooling is centralised, and we allow to decentralise education ($DECENTR = 1$) by switching to a total public funding based on regional resources ($PUB\_FUND = 100$, $DECENTR{\times}PUB\_FUND$

= 100), the final effect on students' attainments would be a net increase of about 86% of the computed standard error in the average performance (28% of global standard deviation in PISA data). Hence, the "fiscal-accountability" mechanism seems even more powerful than the "market-accountability" mechanism.

[Figure 1 about here]

Finally, the importance of country and region-specific dummies,[17] together with the controls for the nature of the schools ($PUBLIC{\times}D\_ITA$ and $PUBLIC{\times}D\_ESP$), 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.

IV. 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

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[17] Most of the estimated fixed effects – not reported in table 4 for sake of parsimony – are statistically significant in all the models.

and public schools, suggests that 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. 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 1

Descriptive statistics for schools' performance

	Nr. obs.	Mean	SE	t-stat
PV_PROB				
All sample	613	450.24	33.12	13.60
Spain	613	482.97	5.19	92.98
Italy	613	427.00	57.70	7.40
PV_MATH				
All sample	613	454.21	26.87	16.91
Spain	613	486.45	4.65	104.69
Italy	613	431.31	47.75	9.03
PV_READ				
All sample	613	455.55	30.64	14.87
Spain	613	480.94	5.82	82.57
Italy	613	437.52	51.76	8.45
PV_SCIE				
All sample	613	457.70	39.12	11.70
Spain	613	486.46	8.02	60.69
Italy	613	437.28	64.47	6.78

TABLE 2

Descriptive statistics for the determinants of schools' performance

	Obs.	Mean	Std. Dev.	Min	Max
Main variables					
DECENTR	613	0.55	0.50	0	1
PUB_FUND	613	77.44	23.95	0	100
DECENTR×PUB_FUND	613	46.14	44.05	0	100
PUBLIC×D_ITA	613	0.53	0.50	0	1
PUBLIC×D_ESP	613	0.23	0.42	0	1
Control variables					
MOTHER_HIGH	613	0.29	0.18	0	1
SHARE_FEM	613	49.58	20.93	0	98.4
PUP_TEACH_RATIO	613	10.96	5.59	1.38	70
TOT_ENROLLMENT	613	643.08	402.57	26	2,819
SHORTAGE_MATH	613	0.16	0.37	0	1
SHORTAGE_SCIENCE	613	0.13	0.34	0	1
SHORTAGE_READ	613	0.13	0.34	0	1
D_SMALL	613	0.25	0.43	0	1
D_LARGE	613	0.32	0.47	0	1
AUTCURR	613	3.47	0.75	1	4
AUTRES	613	2.14	1.45	0	6
D_RESIDENCE	613	0.51	0.50	0	1
D_SELECTIVITY	613	0.63	0.48	0	1
D_ENDORSEMENT	613	0.67	0.47	0	1
D_ITA	613	0.56	0.50	0	1
D_VENETO	613	0.07	0.26	0	1
D_TOSCANA	613	0.07	0.26	0	1
D_PIEMONTE	613	0.09	0.28	0	1
D_LOMBARDIA	613	0.08	0.27	0	1
D_BOLZANO	613	0.06	0.24	0	1
D_TRENTO	613	0.05	0.21	0	1
D_ESP	613	0.44	0.50	0	1
D_CASTILLA	613	0.07	0.26	0	1
D_CATALUNYA	613	0.07	0.25	0	1
D_BASQUE	613	0.16	0.37	0	1
ILLIT_1930	613	0.21	0.14	0.02	0.43
ILLIT_2000	613	0.01	0.01	0	0.02

TABLE 3

Estimates of public funding determinants [Eq. 2]

	(1)	(2)	(3)	(4)	(5)
ILLIT_1930	39.29**	43.72	46.78*	40.36*	41.98*
	[13.43]	[27.30]	[25.03]	[21.66]	[20.83]
ILLIT_2000	no	-88.13	-150.84	-378.50	-427.99
		[359.87]	[347.27]	[370.28]	[386.96]
pupil characteristics	no	no	yes	yes	yes
school characteristics	no	no	no	yes	yes
other autonomy measures	no	no	no	no	yes
Observations	613	613	613	613	613
R^2	0.0506	0.0508	0.1339	0.2469	0.2578

Note: cluster-robust standard errors at the region level in brackets; pupil characteristics include *MOTHER_HIGH* and *SHARE_FEM*; school characteristics include *PUP_TEACH_RATIO*, *TOT_ENROLLMENT*, *SHORTAGE_MATH*, *D_SMALL*, *D_LARGE*, *PUBLIC×D_ITA* and *PUBLIC×D_ESP*; other autonomy measures include *AUTCURR*, *AUTRES*, *D_RESIDENCE*, *D_SELECTIVITY* and *D_ENDORSEMENT*; ** $p<0.05$, * $p<0.1$.
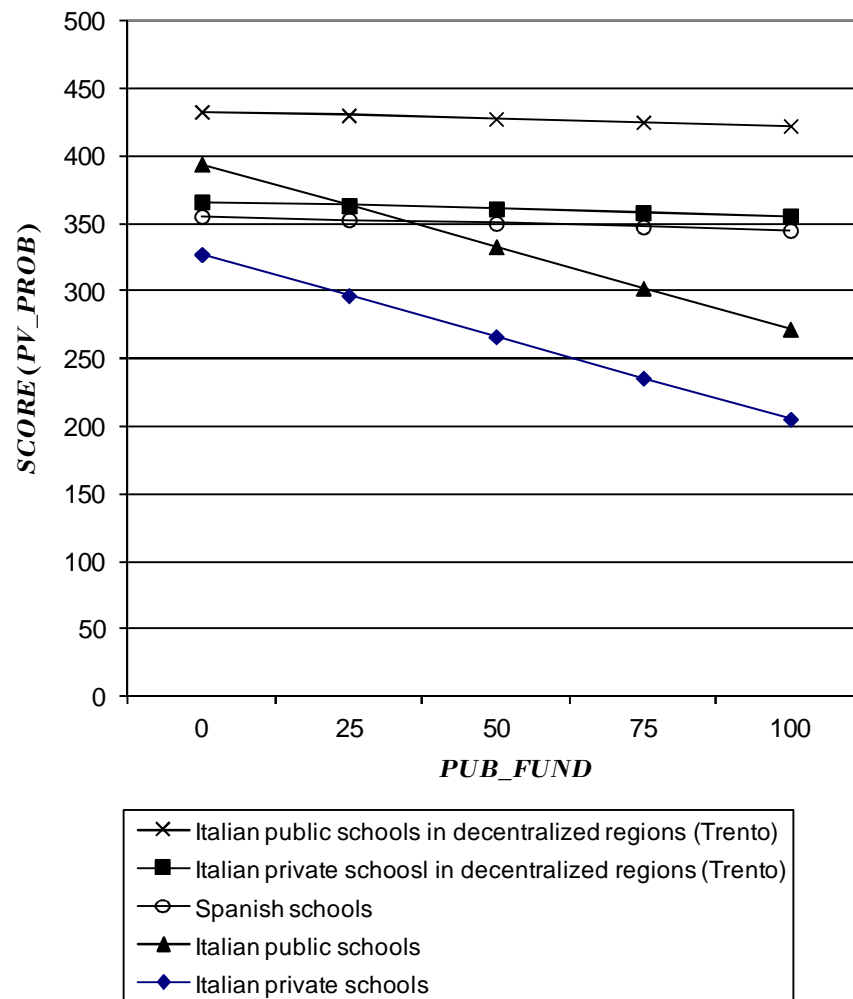
TABLE 4

Estimates of the education production function [Eq. 1]($SCORE = PV\_PROB$)

Main variables	(1)	(2)	(3)	(4)
DECENTR	51.37**	48.90**	68.83**	38.82*
	[25.89]	[23.60]	[30.35]	[23.18]
PUB_FUND	-1.44**	-1.15*	-1.01*	-1.22*
	[0.56]	[0.64]	[0.54]	[0.70]
DECENTR×PUB_FUND	1.02**	1.00***	0.83***	1.12**
	[0.45]	[0.33]	[0.31]	[0.49]
PUBLIC×D_ITA	83.29**	80.12**	72.64***	86.59***
	[36.27]	[35.60]	[23.07]	[23.47]
PUBLIC×D_ESP	-22.11**	-23.32***	14.05	-9.42
	[9.48]	[6.81]	[24.83]	[19.34]
Control variables				
pupil characteristics	no	yes	yes	yes
school characteristics	no	no	yes	yes
other autonomy measures	no	no	no	yes
Observations	613	613	613	613
R^2	0.9758	0.9774	0.9802	0.9834

Note: Cluster-robust standard errors at the school level in brackets; country and region fixed effects included in all models; pupil characteristics include *MOTHER_HIGH* and *SHARE_FEM*; school characteristics include *PUP_TEACH_RATIO*, *TOT_ENROLLMENT*, *SHORTAGE_MATH*, *D_SMALL*, *D_LARGE*; other autonomy measures include *AUTCURR*, *AUTRES*, *D_RESIDENCE*, *D_SELECTIVITY* and *D_ENDORSEMENT*; *** $p<0.01$, ** $p<0.05$, * $p<0.1$

FIGURE 1

Predicted scores for different types of schools

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

Appendix

Table A1. Estimates of the education production function [Eq. 1]
($SCORE = PV\_MATH$)

Main variables	(1)	(2)	(3)	(4)
DECENTR	80.30**	76.66**	94.92**	68.49***
	[31.19]	[33.00]	[39.84]	[22.46]
PUB_FUND	-1.04***	-0.78**	-0.64**	-0.86**
	[0.33]	[0.36]	[0.28]	[0.41]
DECENTR×PUB_FUND	0.66*	0.67**	0.50**	0.77**
	[0.33]	[0.32]	[0.25]	[0.32]
PUBLIC×D_ITA	67.07	64.21	54.47*	64.92***
	[41.06]	[44.23]	[32.38]	[20.23]
PUBLIC×D_ESP	-20.39**	-20.43***	13.21	-13.06
	[9.07]	[6.32]	[20.21]	[14.20]
Control variables				
pupil characteristics	no	yes	yes	yes
school characteristics	no	no	yes	yes
other autonomy measures	no	no	no	yes
Observations	613	613	613	613
R^2	0.9717	0.9731	0.9851	0.9873

Note: Cluster-robust standard errors at the school level in brackets; country and region fixed effects included in all models; pupil characteristics include *MOTHER_HIGH* and *SHARE_FEM*; school characteristics include *PUP_TEACH_RATIO*, *TOT_ENROLLMENT*, *SHORTAGE_MATH*, *D_SMALL*, *D_LARGE*; other autonomy measures include *AUTCURR*, *AUTRES*, *D_RESIDENCE*, *D_SELECTIVITY* and *D_ENDORSEMENT*; *** p<0.01, ** p<0.05, * p<0.1

Table A2. Estimates of the education production function [Eq. 1]
($SCORE = PV\_SCIENCE$)

Main variables	(1)	(2)	(3)	(4)
DECENTR	75.78**	73.10*	76.03**	45.25
	[35.92]	[38.97]	[31.60]	[28.24]
PUB_FUND	-1.41***	-1.14**	-0.97**	-1.24*
	[0.46]	[0.55]	[0.43]	[0.64]
DECENTR×PUB_FUND	0.96**	0.94**	0.80**	1.18**
	[0.43]	[0.35]	[0.36]	[0.57]
PUBLIC×D_ITA	69.54	66.52	67.27**	79.02***
	[51.13]	[53.49]	[31.56]	[26.19]
PUBLIC×D_ESP	-19.36**	-20.28**	21.64	-6.42
	[8.60]	[8.34]	[25.46]	[19.24]
Control variables				
pupil characteristics	no	yes	yes	yes
school characteristics	no	no	yes	yes
other autonomy measures	no	no	no	yes
Observations	613	613	613	613
R^2	0.9755	0.9770	0.9820	0.9871

Note: Cluster-robust standard errors at the school level in brackets; country and region fixed effects included in all models; pupil characteristics include *MOTHER_HIGH* and *SHARE_FEM*; school characteristics include *PUP_TEACH_RATIO*, *TOT_ENROLLMENT*, *SHORTAGE_SCIENCE*, *D_SMALL*, *D_LARGE*; other autonomy measures include *AUTCURR*, *AUTRES*, *D_RESIDENCE*, *D_SELECTIVITY* and *D_ENDORSEMENT*; *** $p<0.01$, ** $p<0.05$, * $p<0.1$

Table A3. Estimates of the education production function [Eq. 1]
($SCORE = PV\_READ$)

Main variables	(1)	(2)	(3)	(4)
DECENTR	45.37*	44.36	52.47**	31.48
	[27.81]	[27.71]	[25.88]	[24.77]
PUB_FUND	-1.28***	-0.96**	-0.84**	-1.04**
	[0.36]	[0.39]	[0.35]	[0.47]
DECENTR×PUB_FUND	0.85***	0.79***	0.69**	0.92***
	[0.31]	[0.27]	[0.27]	[0.35]
PUBLIC×D_ITA	71.49*	67.86*	55.48*	61.06***
	[36.87]	[38.68]	[30.39]	[19.33]
PUBLIC×D_ESP	-22.30**	-25.04***	8.74	-14.79
	[9.94]	[7.58]	[19.59]	[17.55]
Control variables				
pupil characteristics	no	yes	yes	yes
school characteristics	no	no	yes	yes
other autonomy measures	no	no	no	yes
Observations	613	613	613	613
R^2	0.9799	0.9823	0.9848	0.9867

Note: Cluster-robust standard errors at the school level in brackets; country and region fixed effects included in all models; pupil characteristics include *MOTHER_HIGH* and *SHARE_FEM*; school characteristics include *PUP_TEACH_RATIO*, *TOT_ENROLLMENT*, *SHORTAGE_READ*, *D_SMALL*, *D_LARGE*; other autonomy measures include *AUTCURR*, *AUTRES*, *D_RESIDENCE*, *D_SELECTIVITY* and *D_ENDORSEMENT*; *** $p<0.01$, ** $p<0.05$, * $p<0.1$