Teacher Characteristics and Educational Outcomes: Evidence from Public and Publicly Funded Schools in Spain

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Abstract

We use the Programme for International Student Assessment (PISA) 2018 database, which includes information on teacher characteristics, to examine the academic performance gap between public and publicly funded schools in Spain. In particular, we focus on the relationship between teachers' seniority and academic performance by school ownership: on average, teachers in publicly funded schools have nearly twice the amount of experience in their schools compared to teachers in public schools. Our results highlight the relevance of teacher seniority as a determinant of student performance, particularly in publicly funded schools. However, the performance gap by school ownership still appears to be largely explained by differences in the socioeconomic composition of their student bodies.

Keywords: Teacher's seniority; School ownership; Performance gap

Introduction

The Spanish education system has been designed as a dual system, with most private schools publicly funded and competing with public schools for students. These private schools, which we will hereafter refer to as publicly funded schools, tend to have higher student performance compared to public schools. In the seventh edition of Programme for International Student Assessment, PISA 2018, the average score in the reading competence assessed for publicly funded schools was 489 points, whereas public schools scored more than twenty points less, a total of 468 points. This gap has persisted across all editions, albeit with some variations; for example, the score difference exceeded 30 points in PISA 2006, PISA 2009, and PISA 2012. This gap has motivated numerous studies on the impact of school ownership on academic performance. Literature has primarily attributed this performance difference to the more favourable socioeconomic characteristics of students attending publicly funded schools, rather than to ownership itself.

The objective of this study is to examine an additional source of differences between public and publicly funded schools beyond student composition: teachers, specifically their professional experience. Previous research has identified teacher experience as a determinant of academic performance, generally finding that more years of experience are associated with higher student achievement (Wayne & Youngs, 2003; Coenen et al., 2018). However, analyses based solely on total years of experience have sometimes produced non-significant results (e.g. Muñoz & Chang, 2007; Huang & Moon, 2009) underscoring the need to consider specific types of experience. For instance, Huang & Moon (2009) reported that while total teaching experience was not a significant predictor of academic performance, years of experience at a given grade level were positively associated with student outcomes. Ost (2014) found that students taught by teachers with more grade-specific experience achieved greater learning gains than those whose teachers had similar general experience but less experience in that particular grade. Similarly, Blazar (2015) reported that teachers who frequently change grade levels tend to exhibit lower returns to experience.

This study examines the relationship between teachers' seniority, as measured by the number of years served in the same school, on academic performance. Using data from PISA 2018, we observe that the difference in general teaching experience (total number of years in the profession) between publicly funded schools and public schools

is minimal, whereas teachers in publicly funded schools have, on average, twice as many years served in their current school compared to their public counterparts. Our objective is to analyse teachers' seniority as a determinant of student academic performance in each type of school, and to examine whether the observed differences can help explain the higher performance of publicly funded schools.

The document is organized as follows. Section 2 outlines the context of publicly funded schools in Spain. Section 3 describes the data used in the analysis, while Section 4 presents the methodology. Section 5 reports the main results, which are then discussed in Section 6. The final section summarizes the key conclusions.

Context of the publicly funded schools in Spain

Following several legislative reforms, the Spanish education system has consolidated into a dual structure characterized by the predominance of public schools and the extensive subsidization of private schools.[1] The expansion of publicly funded schools took place after the 1985 Organic Law (Ley Orgánica 8/1985, Ley Orgánica reguladora del Derecho a la Educación, LODE), mainly as a result of the increased demand resulting from the extension of compulsory education to the age of 16 under the 1990 Organic Law (Ley Orgánica 1/1990, Ley Orgánica de Ordenación General del Sistema Educativo, LOGSE, 1990) and the demographic pressure of the baby boom generation reaching secondary school age. Public-private collaboration was therefore considered necessary to ensure an adequate supply of school places (Muñiz & Llera, 2012).

Initially, publicly funded schools appeared to play a subsidiary role; however, enrolment in these schools has remained stable over the past few decades, accounting for around 30% of students in compulsory education, which reflects a complementary role in which public schools form the backbone of the Spanish education system, while publicly funded schools maintain a significant and enduring presence (Echazarra de Gregorio, 2024). For instance, according to the latest data from the Ministry of Education and Vocational Training for the academic year 2023-2024, 67% of students are enrolled in public school, 29% in publicly funded school, and just 4% in private school.

[1] Since the General Education Law (Ley 14/1970, Ley General de Educación) was passed in 1970, until the latest educational reform published on 30 December 2020 (Ley Orgánica 3/2020, Ley Orgánica de modificación de la Ley Orgánica de Educación of 2006, LOMLOE, 2020), a total of eight education laws have been passed in Spain. Please see Appendix C for specific details.

The promotion of publicly funded education expanded the supply of state-funded schooling with the aim of equalising families' opportunities and ensuring the right to free school choice. Free enrolment and common admissions criteria between public and publicly funded schools should allow any family, regardless of their socio-economic level, to exercise their right to choose a school.2 However, not all parents can fully exercise this right; those living in rural areas or small municipalities often face limited educational options, and even among families with choice, opportunities are not equally accessible (Bernal & Vera, 2019).

Although tuition is free in publicly funded schools, other indirect costs may discourage families from lower socio-economic backgrounds. These can include expenses for uniforms, extracurricular activities, transportation, school materials, or even the costs associated with obtaining information about schools. Another relevant factor is the fees charged by publicly funded schools, which are theoretically voluntary but commonly applied in practice, averaging between 568€ to 684€ per year in secondary education (Gortazar et al., 2024).

Consequently, families from the higher socio-economic levels make the most use of school choice and are more likely to choose a publicly funded school (Salinas & Santín, 2012; Villaroya & Escardíbul, 2009; Mancebón & Ximénez de Embún, 2007). The concentration of students from higher socio-economic backgrounds in publicly funded schools, together with the existing residential segregation in Spain, are the main sources of segregation within the Spanish education system (Murillo & Guiral, 2025; Murillo et al., 2018). Spain is among the European countries with the highest school segregation by socio-economic level (Murillo & Martinez-Garrido, 2018) and this situation has remained largely unchanged, mirroring the trend observed in most OECD countries (Gutiérrez et al., 2020).

Another argument behind the promotion of publicly funded education is that it would improve the overall quality of schools. The underlying assumption is that allowing students to choose schools that best fit their needs and interests will create competition among schools, thereby improving their quality if parents base their decisions on

[2] The criteria for admission in the case of insufficient places, common to both public and publicly funded schools, have undergone a range of modifications over the years. The criteria of the last law to come into force (article 84.2, Ley Orgánica 3/2020, LOMLOE of 2020) give priority to the existence of brothers or sisters in the school, whether the parents work in the school, the proximity to the parent's residential location or work, and the per capita income of the family. The composition and situation of the family is also considered.

educational quality and have sufficient information to do so (Musset, 2012). As mentioned above, families do not always have the opportunity, information, or resources to make choices based on school quality. In fact, Vega-Bayo & Mariel (2018), using PISA 2012 data for Spain, point out that the characteristics that most influence school choice are ownership, location and reputation.

Regarding how attending a publicly funded private school has ultimately influenced students' academic performance, the evidence in the Spanish case is mixed. Calero & Escardíbul (2007), Mancebón & Muñiz (2008), Perelman & Santín (2011) and Choi & Calero (2012) conclude that the differences in the students' academic performance between publicly funded schools and public schools are not explained by school ownership but mainly by individual and family characteristics. However, Calero & Waisgrais (2009) find that attendance at publicly funded schools is related to lower performance, and Mancebón et al. (2012) show that, once differences in students' backgrounds, school resources and individual management inefficiencies are accounted for, Spanish public schools are more efficient than their publicly funded counterparts. Conversely, Crespo et al. (2013) conclude that publicly funded schools are more productive than public schools, while Cordero et al. (2016) found that funded schools are more efficient, but the difference narrows when controlling for student composition.

Data and descriptive analysis

This study draws on data from the Programme for International Student Assessment (PISA), which evaluates the academic performance of 15-years-old students. The assessment measures three core competencies, science, mathematics, and reading, every three years. The first edition took place in 2000 and since then both OECD members and other partner countries have participated. In the most recent edition, PISA 2022, a total of 81 countries and economies took part. The PISA project, in addition to collecting scores for the competences assessed, also administers questionnaires to students and school principals, which provide information about the personal characteristics of students and their families, as well as information about the schools themselves. In addition, since 2015, an optional questionnaire is also offered to teachers. The collection of these data allows for more comprehensive analyses from which future suggestions for improvement of the education systems of the participating countries can be derived.

The teacher questionnaire has been administered since 2015: however, Spain did not take part in the most recent edition, PISA 2022, as participation is voluntary.

Therefore, data are only available for PISA 2015 and PISA 2018. Due to the limited sample size of PISA 2015, this wave was excluded from the analysis: only 4,286 teachers responded to the voluntary questionnaire, compared to 21,621 who did so in PISA 2018. Another limitation of the dataset is the inability to link teachers to the specific students they teach. Consequently, our analysis relies on information referring to the average teacher within each school, which leads to a reduction in within-school variability.

The PISA 2018 database for Spain contains more than 5,000 variables, from which a selection was made based on their relevant to the analysis of academic performance. These variables are grouped into three main categories: those indicating the individual characteristics of students, their families, and their schools. The school-related variables include aspects that describe the school environment, such as school climate, student composition, and geographical location, as well as characteristics of the teaching staff, including their professional experience. The definition of each of the explanatory variables is shown in Table B1 in Appendix B.

The Spanish sample consists of around 1,000 schools and 35,000 students, of whom 22,265 attend public schools, 9,722 attend publicly funded schools (privately management and at least partly publicly funded) and 2,410 attend private schools. The study focuses on comparing the results of students attending public schools with those attending publicly funded schools, so we exclude observations corresponding to private schools.

The dependent variable in this study is students' academic performance, measured by reading competency scores. On average, students attending publicly funded schools score 20 points higher than those in public schools. The family background variables indicate that students in publicly funded schools come from more favourable socio-economic backgrounds, as noted in the previous section. The parents of students enrolled in publicly funded schools have a higher educational and professional level than those of students enrolled in public schools. Moreover, publicly funded schools have a lower proportion of immigrant students (8% compared with 14% in public schools) and a smaller percentage of students who have repeated a school year (18% and 31%, respectively).

Regarding school characteristics, the school climate is reported to be more favourable in publicly funded schools, which also have a lower percentage of socioeconomically disadvantaged students (15.3% compared to 10.5%). Concerning our variable of interest -seniority, measured as the number of years served in the same school-

the average is 7.4 years for teachers in public schools and 14.5 years for those in publicly funded schools. Thus, teachers in publicly funded schools have, on average, nearly twice as many years of experience in the same school compared to their public counterparts. Moreover, 75% of public-school teachers have nine or fewer years of experience, underscoring their comparatively shorter experience in the same school3.

Methodology

In the PISA sampling design, students are randomly selected from each school, which has in turn been randomly selected from the pool of schools making up the national total. Thus, the database has a hierarchical structure consisting of two levels, as students are nested at the higher level (schools). Since sampling is conducted in proportion to school size, larger schools are more likely to be selected, although students at larger schools are less likely to be chosen to complete the test. Moreover, students attending the same school often share similar characteristics, and variables related to students and schools are not independent. Due to these features of the data, we need to use a hierarchical econometric model that controls for the correlation between students' results within the same school (Hox, 1995). Specifically, we rely on a multilevel linear model so as to take into account the nested structure of the data and the continuous nature of our dependent variable:

$$Y_{ij} = \alpha_j + \beta X_{ij} + \varepsilon_{ij} \qquad \text{1st Level (students) (1)}$$

$$\alpha_j = \delta_{00} + \delta_{01} Z_j + \mu_j \qquad \text{2nd Level (schools) (2)}$$

$$\beta = \delta_{10} \qquad \text{2nd Level (schools) (3)}$$

where X_{ij} is a vector of variables representing the characteristics of individual i belonging to school j and Z_j is a vector of variables representing the characteristics of school j.

[3] Table A1 in the Appendix A presents descriptive statistics for the two sub-samples considered: public and publicly funded schools. The differences in means between public and publicly funded schools are statistically significant (except for the gender variable) as can be seen in the p-values of the t-test for equality of means in Table A2).

The multilevel model allows the slope of equation (1) to vary and, in this way, captures the possible variation of the effect of X_{ij} on Y_{ij} between schools.4 The regression to be estimated is obtained by combining the three previous equations:

$$Y_{ij} = \delta_{00} + \delta_{10}X_{ij} + \delta_{01}Z_j + \mu_j + \varepsilon_{ij} \quad (4)$$

Results

Table 1 presents the model estimates for the whole sample, considering personal characteristics first (Model 2) and then adding family (Model 3) and school characteristics (Model 4, 5 and 6). The first model shows a positive and significant correlation between attending a publicly funded school and academic performance. This correlation reduces in magnitude when we introduce personal characteristics in Model 2. A positive sign for the gender variable indicates that female students, on average, attain higher achievement than male students. Part of these results can be explained by the academic performance proxy chosen. In this study, we have opted to use reading scores, the core competency of PISA 2018, in which girls tend to outperform boys. Male students tend to score higher on average, in mathematical competence (Ministerio de Eduación y Formación Profesional, 2019). The personal characteristic with the greatest negative coefficient is grade repetition. The result is in line with the results of other studies (Choi et al., 2018; Valbuena et al., 2021) that point to grade repetition as an ineffective policy for improving academic performance.

When family characteristics are incorporated in Model 3, both the repetition and immigrant status variables decrease in magnitude, although they still have a negative coefficient. As for the family variables, the index of the socio-economic level of the family is of great importance for academic performance. Students who come from families with better socio-economic conditions have higher academic results. Regarding the characteristics of the parents, their educational level is more relevant than their professional status, although both are positively related to performance. Since the Coleman Study (1966), which presented as one of the main conclusions that the effect family characteristics were the most important influence on student achievement

[4] We account for the clustering of children within schools by making an appropriate adjustment to the estimated standard errors (using either the STATA 'repest' or 'pv' survey commands). Weights, which attempt to correct for bias induced by non-responses, while also scaling the sample up to the size of the national population, have been applied throughout the analysis.

(Hanushek, 2016), an extensive literature has corroborated the importance of these family characteristics. There is evidence that a higher parental education is related to more years of education for their children (Stella, 2013), a lower probability of repeating a grade (Oreopoulos et al., 2006), and higher academic performance (Magnuson, 2003; Chevalier, 2004).5

In the following models, we incorporate school characteristics. Model 4 includes variables that capture the school environment. The results indicate that schools located in rural areas have lower academic performance, that a higher percentage of socio-economically disadvantaged students within the school is associated with lower performance, and, conversely, that a positive disciplinary climate is linked to higher academic performance. Models 5 and 6 show seniority is related to higher academic performance, although the relationship displays decreasing returns. These findings are consistent with those reported by Huang and Moon (2009) and Kukla-Acevedo (2009), who used alternative measures of teaching experience.

Furthermore, once seniority is controlled for, the coefficient associated with publicly funded schools increases in magnitude and becomes statistically significant. This suggests that, after accounting for one of the main advantages of publicly funded schools, the higher average teaching experience of their teachers, these schools lose their performance advantage over public schools.

Heterogeneity of results by type of school

We now turn to the analysis of our results by school ownership. The main findings are presented in Table 2. In the subsample of public schools, gender differences are, on average, smaller than in the publicly funded schools, indicating a narrower performance gap between male and female students in public schools. The difference in the coefficient associated with immigrant status is also noteworthy. While in publicly funded schools the coefficient becomes non-significant once family characteristics are included, in public schools it remains significant and indicates a substantial reduction in academic

[5] The ways in which family characteristics influence students' academic performance are diverse. Parents with higher levels of education tend to spend more time reading with their children and do so at earlier ages and are more likely to promote their children's creativity and use a larger and more complex vocabulary. This will facilitate the student's learning at school. The socio-economic status of the family also influences academic performance through the student's health; children from lower socio-economic levels tend to have more health problems, which increases absenteeism and undermines their ability to learn in the classroom. Finally, lack of economic security negatively affects students' confidence and behaviour and, therefore, their future school performance (Rothstein, 2010; Mcginnity et al., 2022).

Table 1: Results of the multilevel linear model for the total sample. Reading competence, PISA-2018.

	(1)	(2)	(3)	(4)	(5)	(6)
Publicly-funded schools	20.9763***	6.9255*	-0.4936	-1.1893	-7.2273**	-6.4783*
	(4.137)	(4.149)	(4.318)	(3.213)	(3.561)	(3.494)
Gender		17.3120***	17.2843***	16.4594***	16.4939***	16.4947***
		(1.784)	(1.873)	(1.866)	(1.847)	(1.850)
Immigration status		-11.1957***	-6.6653**	-6.0768**	-5.6260**	-5.5125**
		(2.622)	(2.777)	(2.714)	(2.725)	(2.723)
Grade Repetition		-91.3003***	-80.2711***	-79.3051***	-79.0892***	-78.9978***
		(1.883)	(2.019)	(2.104)	(2.108)	(2.100)
ESCS			4.3859**	2.5089	2.3812	2.4383
			(1.887)	(1.588)	(1.586)	(1.585)
Educational level mother			3.7070***	3.3584***	3.3789***	3.4110***
			(0.952)	(0.936)	(0.936)	(0.939)
Educational level father			2.7985***	2.9040***	2.9438***	2.9818***
			(0.868)	(0.887)	(0.891)	(0.888)
Parental occupational			0.2979***	0.3338***	0.3358***	0.3342***
			(0.074)	(0.067)	(0.067)	(0.066)
Rural				-8.2112***	-7.5072***	-7.2657***
				(2.762)	(2.726)	(2.711)
Socio-eco disadvantaged students				-0.4411***	-0.4410***	-0.4230***
				(0.090)	(0.088)	(0.090)
Disciplinary climate				4.6279***	4.5485***	4.4703***
				(0.989)	(0.999)	(0.988)
Seniority					0.8697**	2.6091***
					(0.411)	(0.988)
Seniority^2						-0.0795*
						(0.041)
Constant	468.3144***	494.7281***	455.9372***	465.2875***	458.0783***	449.6342***
	(1.817)	(2.076)	(6.674)	(7.261)	(8.094)	(9.421)
Observations	31,987	30,968	28,545	25,722	25,596	25,596

Source: Elaborated by the author based on PISA 2018 data. Notes: *** statistically significant at 99%; ** 95%; * 90%).

performance. This result can be partly explained by the higher concentration of immigrant students in public schools (14%) compared with publicly funded schools (8%).

Family background variables appear to play a more important role among students in public schools, where they show a positive and significant coefficient. In contrast, although all family variables display positive coefficients in publicly funded schools, only parental occupational level is statistically significant. Regarding school variables, the percentage of socioeconomically disadvantaged students is negatively related to academic performance only in public schools. Schools located in rural areas tend to perform worse in both school types, while both benefit from a more favourable disciplinary climate. Finally, teachers' seniority is significantly and positively related to performance in publicly funded schools.

Table 2: Results of the multilevel linear model by ownership. Reading competence, PISA-2018.

	Publicly-funded schools	Public schools
Gender	19.4328***	15.4134***
	(2.711)	(2.197)
Immigration status	5.9849	-8.2174***
	(6.334)	(3.111)
Grade Repetition	-75.5094***	-79.8267***
	(4.537)	(2.361)
ESCS	2.5227	2.3007
	(3.227)	(1.673)
Educational level mother	2.3658	3.6611***
	(1.712)	(1.027)
Educational level father	2.1610	3.1962***
	(1.855)	(0.926)
Parental occupational	0.3363***	0.3494***
	(0.118)	(0.076)
Rural	-14.1311***	-5.6991*
	(5.417)	(3.046)
Socio-eco disadvantaged students	-0.1413	-0.4911***
	(0.169)	(0.097)
Disciplinary climate	7.8691***	3.4315***
	(2.003)	(1.042)
Seniority	2.6050*	2.5645
	(1.331)	(1.890)
Seniority^2	-0.0849*	-0.0767
	(0.045)	(0.105)
Constant	447.1770***	448.6606***
	(15.780)	(11.396)
Observations	7,364	18,232

Source: Elaborated by the author based on PISA 2018 data. Notes: *** statistically significant at 99%; ** 95%; * 90%).

Exploring interactions between school ownership and school characteristics

The preceding results have shown the relevance of teachers' seniority, particularly in publicly funded schools, where this variable exhibits a positive correlation with students' academic performance. Table 3 presents the results of the estimations aimed at examining whether differences in teachers' seniority between public and publicly funded schools help explain the performance gap observed by school ownership, as well as exploring the other school characteristics included in our analysis. The estimations replicate Model 6 from Table 1, incorporating interaction terms between school ownership and the school-level variables. The results reveal that seniority is not differentially associated with academic performance across public and publicly funded schools. However, the percentage of socioeconomically disadvantaged students and the disciplinary climate of the school are more positively associated with academic performance in publicly funded schools than in public schools. These findings suggest that the advantage of publicly funded schools cannot be attributed solely to teachers' seniority but also to school-level factors, particularly student composition and disciplinary climate.

Table 3. Summary of interaction coefficients between school ownership and school characteristics. Reading competence, PISA 2018

	(1)	(2)	(3)	(4)
Publicly-funded schools*Rural	-0.0535			
	(0.901)			
Publicly-funded schools*Socio-eco disadvantaged students		4.2045**		
		(2.136)		
Publicly-funded schools*Disciplinary climate			0.4667**	
			(0.193)	
Publicly-funded schools*Seniority				-9.2191
				(6.348)
Observations	25,596	25,596	25,596	25,596

Source: Elaborated by the author based on PISA 2018 data. Notes: *** statistically significant at 99%; ** 95%; * 90%). For the complete set of estimates, see Table A3 in Appendix A.

Discussion

According to our estimates, the relationship between attending publicly funded schools and achieving higher academic performance disappears one we consider the

personal and family characteristics of students. This finding is consistent with previous studies that identify students' socioeconomic background as the main source of performance differences between public and publicly funded schools.

Building on this, we extend the analysis to include the characteristics of teachers, focusing on particular on their seniority. This aspect is particularly interesting, as publicly funded schools have teachers with, on average, twice as many years of experience at their current school compared to teachers in public schools. In fact, once we control for the greater experience of teachers in publicly funded schools, being a student in a publicly funded school becomes associated with lower academic performance[6]. To interpret this result, it is necessary to understand how teachers are recruited and the nature of their employment conditions in each type of school.

There are clear differences in the recruitment model according to school ownership. In publicly funded schools, there is autonomy in recruitment. The criteria for teacher selection are established by the School Board, generally following the principles of merit and ability (Ley Orgánica 8/1985, Ley Orgánica reguladora del Derecho a la Educación, LODE).

In contrast, access to teaching positions in public schools takes place through a competitive examination process that includes both an examination phase and a merit-based evaluation phase, in which academic merit, training and previous experience are assessed (Ley Orgánica 1/1990, Ley Orgánica de Ordenación General del Sistema Educativo, LOGSE). It is also important to note the fact that there are different categories of public school teachers: civil servants who have permanent positions within the public administration, and interim civil servants, who temporally perform the duties of a civil servant in specific circumstances, such as vacancies that cannot be occupied by civil servants, temporary replacements, the implementation of temporary programmes and excess or accumulation of tasks (Real Decreto Legislativo 5/2015, de 30 de octubre, por el que se aprueba el texto refundido de la Ley del Estatuto Básico del Empleado Público).

According to the European Commission's Education and Training Monitor 2023 report, access to the civil service as a teacher was limited until 2021 due to the low number of published vacancies. To fill existing vacancies, education authorities opted to recruit teachers on a temporary basis. This practice has led to high teacher turnover which can

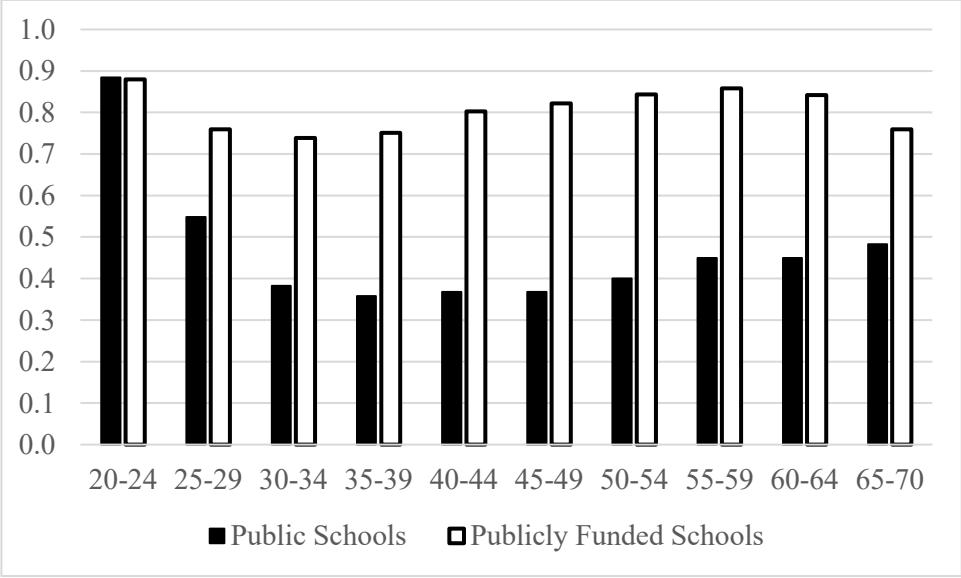
[6] The results are robust to using mathematics or science scores as alternative dependent variables and are qualitatively similar when regional fixed effects are included.

negatively affect job satisfaction, educational outcomes and the effectiveness of pedagogical projects.

These distinct entry processes into the teaching profession may help explain why teachers in public schools tend to have less experience within their schools, as there is a higher proportion of temporary staff. Teachers in publicly funded schools have, on average, 14.48 years of experience in their schools, compared with 7.39 years among teachers in public schools. However, the difference in total teaching experience is minimal (17.16 and 17.43 years, respectively). When looking at the ratio of school experience to total experience, teachers in publicly funded schools (0.80) have obtained most of their experience within the same school, whereas public school teachers (0.40) tend to change schools more frequently.

As shown in Figure 1, teachers in publicly funded schools enjoy greater stability reflected in their higher ratio of school experience to total experience from the early stages of their careers. This gap is persistent across all age groups, although teachers in both types of schools are becoming increasingly stable over time, the proportion in publicly funded schools is much higher across all age groups.

Figure 1: Ratio of school experience to total experience by age and school ownership



Source: Elaborated by the author based on PISA 2018 data.

While school experience appears to play an important role, particularly in publicly funded schools, the performance gap between public and publicly funded schools still seems largely explained by differences in the socioeconomic composition of their student bodies. When we include the interaction of school ownership with other variables at the

school level, such as the percentage of students with socio-economic disadvantages and the disciplinary climate, these factors appeared to benefit publicly funded schools more than public schools.

In line with these findings, we find that students attending schools with lower average socioeconomic status exhibit a stronger positive correlation between teacher seniority at their school and their academic performance (see Table A4 in Appendix A). Schools in socioeconomically disadvantaged environments tend to face greater challenges in attracting and retaining teachers; consequently, our results suggest that greater teacher seniority within a school *may be* particularly beneficial for the most disadvantaged schools.

Conclusions

This study examines the academic performance gap between public and publicly funded schools in Spain, using data from the PISA 2018 database, which includes information on teacher characteristics. Estimates were obtained by accounting for the hierarchical structure of the data and by separating the sample according to school type.

The results highlight the importance of considering teacher characteristics and working conditions when comparing public and publicly funded schools. We find that the correlation between student performance and attendance at a publicly funded school becomes negative and significant once teachers' seniority in these schools is taken into account. In contrast, teachers in public schools tend to have less experience within the same school, partly due to the widespread use of the interim contract.

In terms of the education policy agenda, our findings suggest that students in public schools could benefit from implementing alternative policies that provide more autonomy in teacher recruitment, specifically aimed at reducing teacher turnover, and especially for temporary civil servant teachers. Allowing schools to retain temporary staff for longer than a single academic year could improve job satisfaction, which in turn may enhance both school and student outcomes. However, it is important to interpret these results with caution due to the associative nature of the findings provided in this study.

On the other hand, this study faces two main limitations. First, it is not possible to directly link individual teachers with the students they teach; instead, we rely on average teacher characteristics at the school level, thereby losing within school variability. Second, data on teacher characteristics are available for only one PISA wave which make it impossible to evaluate our findings over time.

This research underscores the relevance of seniority as a potential determinant of student achievement. A previous study in the Spanish case, which examined total teaching experience, conducted by Izquierdo et al. (2018), concluded that teacher experience is only a relevant factor un primary education, but not in secondary education. These findings suggest the need for further research into the mechanisms through which greater experience within the same school benefits students. Future studies should aim to identify the specific skills teachers develop by remaining in the same institution over time, or whether it is the most capable teachers who tend to stay longer in the same school.

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Appendix A

Table A1: Summary statistics.

	Public schools				
	Obs.	Mean	Std. dev.	Min	Max
Reading scores	22,265	468.31	1.81	464.75	471.88
Gender	22,265	0.50	0.50	0	1
Immigration status	21,492	0.14	0.35	0	1
Grade Repetition	21,917	0.31	0.46	0	1
ESCS	21,822	-0.29	1.02	-6.0726	3.7171
Educational level mother	21,309	3.91	1.16	1	5
Educational level father	20,835	3.71	1.20	1	5
Parental occupation	21,120	44.87	22.31	11.56	88.96
Rural	22,003	0.37	0.48	0	1
Socio-eco disadvantaged students	20,809	15.26	15.62	0	100
Disciplinary climate	21,812	-0.25	1.03	-2.7124	2.0345
Seniority	22,153	7.39	3.00	1	27.5
	Publicly-funded schools				
	Obs.	Mean	Std. dev.	Min	Max
Reading scores	9,722	489.29	3.84	481.76	496.82
Gender	9,722	0.50	0.50	0	1
Immigration status	9,492	0.08	0.27	0	1
Grade Repetition	9,626	0.18	0.38	0	1
ESCS	9,578	0.24	0.90	-3.9659	3.6109
Educational level mother	9,351	4.38	0.92	1	5
Educational level father	9,247	4.20	1.01	1	5
Parental occupation	9,349	55.85	22.38	11.56	88.96
Rural	9,694	0.16	0.37	0	1
Socio-eco disadvantaged students	8,201	10.48	12.52	0	89
Disciplinary climate	9,601	-0.10	1.00	-2.7124	2.0345
Seniority	9,655	14.48	3.96	1	39

Source: Elaborated by the author based on PISA 2018 data.

Table A2: t-test for equality of means by school ownership

	T-test
Gender	0.5032
Immigration status	0.0000
Grade Repetition	0.0000
ESCS	0.0000
Educational level mother	0.0000
Educational level father	0.0000
Parental occupation	0.0000
Rural	0.0000
Socio-eco disadvantaged students	0.0000
Disciplinary climate	0.0000
Seniority	0.0000

Source: Elaborated by the author based on PISA 2018 data.

Table A3: Results of the multilevel linear model with interactions between school ownership and school characteristics. Reading competence, PISA-2018.

	(1)	(2)	(3)	(4)
Publicly-funded schools	-4.9344	-10.9245***	-6.0388*	-5.8833
	(3.970)	(3.729)	(3.462)	(9.602)
Gender	16.4384***	16.4903***	16.4913***	16.4958***
	(1.860)	(1.844)	(1.854)	(1.851)
Immigration status	-5.4330**	-5.6339**	-5.4809**	-5.5153**
	(2.724)	(2.702)	(2.725)	(2.715)
Grade Repetition	-78.9517***	-79.0652***	-78.9705***	-78.9940***
	(2.099)	(2.103)	(2.101)	(2.101)
ESCS	2.5184	2.4502	2.4514	2.4364
	(1.585)	(1.585)	(1.590)	(1.583)
Educational level mother	3.3845***	3.4141***	3.4024***	3.4129***
	(0.940)	(0.943)	(0.938)	(0.941)
Educational level father	2.9851***	2.9609***	2.9700***	2.9832***
	(0.888)	(0.884)	(0.888)	(0.882)
Parental occupational	0.3351***	0.3377***	0.3333***	0.3342***
	(0.066)	(0.066)	(0.066)	(0.066)
Rural	-5.8096*	-7.1514***	-7.2460***	-7.2592***
	(3.031)	(2.671)	(2.721)	(2.720)
Socio-eco disadvantaged students	-0.4253***	-0.5067***	-0.4240***	-0.4227***
	(0.090)	(0.097)	(0.090)	(0.090)
Disciplinary climate	4.4601***	4.4568***	3.4619***	4.4709***
	(0.986)	(0.986)	(1.041)	(0.991)
Seniority	2.6403***	2.7474***	2.5866***	2.5927***
	(0.987)	(0.985)	(0.979)	(0.927)
Seniority^2	-0.0808**	-0.0904**	-0.0785*	-0.0777*
	(0.041)	(0.041)	(0.041)	(0.043)
Publicly-funded schools*Rural	-9.2191			
	(6.348)			
Publicly-funded schools*Socio-eco disadvantaged students		0.4667**		
		(0.193)		
Publicly-funded schools*Disciplinary climate			4.2045**	
			(2.136)	
Publicly-funded schools*Seniority				-0.0535
				(0.901)
Constant	449.1074***	450.4215***	449.5813***	449.6219***
	(9.412)	(9.605)	(9.386)	(9.390)
Observations	25,596	25,596	25,596	25,596

Source: Elaborated by the author based on PISA 2018 data. Notes: *** statistically significant at 99%; ** 95%; * 90%).

Table A4: Results of the multilevel linear model with interactions between school ESCS and seniority. Reading competence, PISA-2018.

Publicly-funded schools	-6.2218*
	(3.640)
Gender	16.5136***
	(1.861)
Immigration status	-5.6875**
	(2.682)
Grade Repetition	-78.8423***
	(2.083)
ESCS	2.1737
	(1.591)
Educational level mother	3.3489***
	(0.947)
Educational level father	2.9231***
	(0.879)
Parental occupational	0.3307***
	(0.066)
Rural	-5.9799**
	(2.768)
Socio-eco disadvantaged students	-0.4031***
	(0.094)
Disciplinary climate	4.5241***
	(0.984)
Seniority	1.9175*
	(1.027)
Seniority^2	-0.0619
	(0.042)
q1 School ESCS	-14.1808**
	(7.060)
q1 School ESCS * Seniority	1.3185*
	(0.755)
Constant	455.3407***
	(9.361)
Observations	25,596.00

Source: Elaborated by the author based on PISA 2018 data. Notes: *** statistically significant at 99%; ** 95%; * 90%).

Appendix B

Table B1: Dependent variable and personal, family and school explanatory variables.

Environment	Variable	Description
	PVread	Plausible values of reading competence
Personal	Gender	Dichotomous (female=1)
	Grade repetition	Dichotomous: the student has repeated in primary or secondary school.
	Immigration status	Dichotomous: the student is a first-generation or second-generation immigrant
Family	ESCS	Index of economic, social and cultural status
	Educational level mother	Mother's educational level (1(not complete ISCED 1), 2(ISCED 1), 3(ISCED 2), 4(ISCED 3b, 3c), 5(ISCED 3a))
	Educational level father	Father's educational level (1(not complete ISCED 1), 2(ISCED 1), 3(ISCED 2), 4(ISCED 3b, 3c), 5(ISCED 3a))
	Parental occupation	Parents' highest occupational status
School	Public	Dichotomous: publicly owned school
	Publicly-funded	Dichotomous: privately owned, publicly funded school
	Socio-economically disadvantaged students	Percentage of students coming from socio-economically disadvantaged homes
	Rural	Dichotomous: schools located in areas with less than 15,000 inhabitants
	Disciplinary climate	Index of disciplinary climate
	Seniority	Mean number of years working as a teacher at this school of the school's teachers

Source: Elaborated by the author.

Appendix C

The General Education Law (Ley 14/1970, Ley General de Educación) of 1970 was the first to regulate the educational agreement in Spain. Article 5.1 established that both public and private organisations could promote and support educational centres, and therefore the centres could be state or non-state (Article 55). The benchmark of the economic agreement was created for non-state schools, thus ensuring free basic general education and first-degree vocational training (Article 94).

The next education law, approved in 1980, was the Organic Law regulating the Statute of School Centres (Ley Orgánica 5/1980, Ley Orgánica por la que se regula el Estatuto de Centros Escolares, LOECE). Its main modification with respect to the previous law in terms of publicly funded schooling is the recognition in Article 5 that parents have the right to choose the type of education they want for their children and to have it provided by the education system, so they can choose the school that best suits their preferences. Another of its most important contributions was the establishment that the government must ensure freedom of school choice at compulsory levels of education. This right was already implicitly recognised in Article 27.3 of the Spanish Constitution approved two years earlier, which states that the public authorities must ensure the right of parents to provide their children with the religious and moral education of their choice.

In 1985 the Organic Law regulating the right to education (Ley Orgánica 8/1985, Ley Orgánica reguladora del Derecho a la Educación, LODE) came into force, which established a dual education system composed of public and private schools. Publicly funded private schools would be renamed publicly funded schools (Article 10). Article 51 establishes the obligation to provide education free of cost and that school activities (teaching, complementary, and service activities) cannot be of a profit-making nature. In addition, the admission of students must be in accordance with the regime established for public schools (Article 53). Article 20 details the criteria to be followed for the admission of students when there are insufficient places. Mainly, the annual income of the family unit, together with their residential location and the existence of siblings enrolled in the school, are considered. In the same way, it is specified that in no case shall there be discrimination in admission on ideological, religious, moral, social, racial, or birth grounds.

The Organic Law on the General Organisation of the Education System (Ley Orgánica 1/1990, Ley Orgánica de Ordenación General del Sistema Educativo, LOGSE)

of 1990 extends compulsory and free schooling to age of sixteen (Article 5). The main effect of this law was, through the extension of schooling, an increase in the demand for education which boosted public-private collaboration.

A second additional provision of the Organic Law on the Participation, Evaluation and Governance of Educational Centres (Ley Orgánica 9/1995, Ley Orgánica de la Participación, la Evaluación y el Gobierno de los centros docentes, LOPEG) of 1995 ensured the schooling of students with special educational needs in publicly funded educational institutions while maintaining a balanced distribution between institutions.

In 2002, the Organic Law on the Quality of Education (Ley Orgánica 10/2002, Ley Orgánica de la Calidad de la Educación, LOCE) was drafted, which modified the criteria for the admission of students with respect to the LODE, considering the per capita income of the family unit instead of the annual income and including the concurrence of disability in the student or in one of his/her parents or siblings, and the legal condition of large family, as well as considering as a priority criterion the existence of chronic illnesses affecting the student (Additional Provision Five). The LOCE established the total subsidisation of Pre-school Education and ensured the existence of free school places in both public and publicly funded schools (Article 11).

Four years later, in 2006, with the approval of the Organic Law on Education (Ley Orgánica 2/2006, Ley Orgánica de Educación, LOE), the previous education law (LOCE, 2002), the LOPEG of 1995, the LOGSE of 1990 and the LOE of 1970 were revoked and the LODE of 1985 was modified. With respect to the modifications affecting publicly funded schools, the LODE made changes to the financing of educational agreements (Article 117.7)

The Organic Law for the Improvement of the Quality of Education (Ley Orgánica 8/2013, Ley Orgánica para la Mejora de la Calidad Educativa, LOMCE) of 2013 made changes with respect to the LOE of 2006, introducing modifications in the attributions of schools, adding final evaluations at the end of some educational stages, and changing aspects related to attention to diversity and students with special learning difficulties, among others. As for the admission of students, there are new criteria included such as the importance of parents or legal guardians working in the same school and the proximity to the place of work, in addition to that of the home address. Article 1.61 of the LOMCE allows families to choose a sex-differentiated education centre without this implying less favourable treatment for families, students, or centres when it comes to signing up to concerts or in any other aspect. Furthermore, schools are obliged to state in their

educational project the educational reasons for the choice of this system and the academic measures they develop to promote equality. Innovations on the autonomy of schools are incorporated by establishing in Article 1.73 that publicly funded schools shall be accountable for the results obtained and that the educational administrations shall publish the results obtained by the schools, considered in relation to the socio-economic and socio-cultural factors of the context in which they are located.

Finally, in December 2020, the Organic Law amending the Organic Education Law (Ley Orgánica 3/2020, Ley Orgánica por la que se modifica la Ley Orgánica de Educación, LOMLOE), which repeals the LOMCE of 2013. It modifies Article 84 of the LOE of 2006, which regulates the admission of students to public and publicly funded schools. It establishes that this admission process must ensure the right to education, equal conditions of access and freedom of choice of school. In addition, it develops the necessary measures to avoid segregation of students on socio-economic or other grounds. This is a significant change as it introduces the explicit objective of avoiding the socio-economic segregation of students in the admission process to public and publicly funded schools. Article 109.1 adds the pursuit of the objective of social cohesion and the consideration of the heterogeneity of the student body as an educational opportunity when programming the supply of places. Furthermore, Article 109.3 establishes that the educational offer will be programmed, ensuring the existence of sufficient public places and Article 109.5 that the progressive increase of school places in all public schools will be promoted.