Public and Private school management systems: a comparative analysis

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Abstract: The purpose of this paper is to contribute to the investigation of the relative performance of private versus public schools. We take advantage of the co-existence in Portugal of strictly private, strictly public and state funded private schools to isolate the impact of different property and management schemes on the performance of students, resorting to cross-section data on the scores obtained on national exams by 9th grade students in 2010. The results corroborate the well-established result on the relevance of the family socio-economic background for students’ performance, but do also sustain the existence of a positive impact of private ownership on the scores of students. We also compare the number of years required to finish mandatory schooling in these three types of schools and conclude that the benefits of state funded versus strictly public schools are unclear: the probability of a student being retained at last once is slightly higher in state funded public schools but the probability of relapsing situations, failing twice the same grade, is lower.

Keywords: State-funded private schools, ownership and management schemes, Portugal, Education
1. INTRODUCTION

Until recently, education in most western countries has been almost fully administered and paid by central governments. The economic rationale for this intervention was developed by Friedman (1962) on two main grounds. First of all, the recognition that the education of each individual in a society carries benefits for all its members that go beyond the individual gain. Secondly, the widespread idea that governments have a responsibility over its citizens, of guaranteeing their access to the recognized benefits of education. In spite of this crucial role of governments on the provision of education, in most countries the private sector also plays a role, of various dimensions.

The recognition of such a role of governments in education, and of the role of education as an engine for the development of societies, motivated an intense expansion of research, often fostered by governments themselves, on attempts to identify new paths to further develop highly evolved educational systems both in public and private schools, and possible channels for improvement of current status. One of the most controversial channels is the impact of private school management and property schemes on educational performance. Several instruments have been used in recent years, in various countries, to analyze the relative performance of these two ownership schemes. Still many of these instruments have been accused of ignoring, or not fully controlling, the fact that the students in private and public schools tend to be very different, both in terms of family background and socio-economic condition.

The goal of this paper is to contribute to identify the role of public and private schools management and property schemes for the performance of students, in the case of the Portuguese educational system. We take advantage of the simultaneous existence in Portugal of strictly private schools, strictly public schools, and state-funded privately owned and managed schools. As in the last two groups of schools students are selected by the government on a geographic basis and do not pay (significant) fees, by analyzing the comparative performance of public and state-funded private schools, we are only considering schools with student with the same background, that differ in the management and property schemes adopted. Through this comparison this study aims thus at identifying the true contribution of property schemes for the performance of students, in the Portuguese educational system. In turn, the comparison of the performance of students in private schools with students in state-funded private schools isolates the impact of the property and management factor on the outcome of the system, thereby allowing the identification of the effect of the socioeconomic background.

The paper is divided in 6 sections. Section two presents a summary of the literature on the impact of property and management systems on the performance of students. In section three the Portuguese educational system is briefly described. Section four contains a description of the data and of the methodology used in the empirical analysis. The results obtained are presented and discussed in section five. Section six concludes.

1 Of course there are also several political and ideological considerations behind this fact.
2. LITERATURE REVIEW

Public/Private schools

The importance of ownership and property mechanisms to the performance of students is one of the most controversial topics on the education literature. At the center of the debate is the fact that attending a private school is not a random event, but rather the consequence of a decision taken by students and families, conditioned by their financial wealth. According to Hoxby (2004), students apply to private schools either because they are performing badly in their current public school, or because of the poor quality of public schools, or due to the exceptional quality of students who need specific resources to develop or even due to having highly motivated parents that want to search for the best options available. Still, the requirement to pay tuitions in most private schools puts strong constraints on the access to those schools. For all these reasons, students who apply to private schools are self-selected into them and thus the student body of public and private schools tends to be very different. Coleman et al (1982) observe that private school students come from wealthier families, with more educated parents, who invest more on their education. In this context identifying which schools are performing better is not a consensual task, and the first empirical results certainly suffer from self-selection bias.

In their comparative studies of several countries Coleman et al (1982), Neal (1997), Mizala et al (2002), Jiménez et al (1991) concluded that private schools outperform public schools, even after controlling for differences in the background of students, not only in terms of scores, but also in terms of higher high-school and college graduation rates and even in terms of higher future wages. Nevertheless, Mancebón et al (2012), Fertig (2003) and Kirjavainen et al (1998) argue that the apparent superiority of private schools fades way after controlling for differences in the background of students and in their peer composition.

Some authors even argue that the direction of the selection bias, introduced by differences in the background of students, is not necessarily favoring the results of private schools. Neal (1997), Neal (2002) and Coleman et al (1987) assert from their analyses of data that it is erroneous to assume that students are positively selected into private schools. These authors present evidence that with respect to personality and ability traits, students are negatively selected into some private schools, namely catholic schools and try to identify reasonable causes for this phenomena. They state that often middle and upper class families, when choosing a place to live, take into account the quality of public schools in the area. Consequently students from upper and middle class families tend to go into top public schools, and not to private ones. According to these authors only the least able children from upper class families, those with more stringent educational needs, go to private schools.

There are mainly two types of arguments often presented in favor of the larger efficiency of private schools when compared to their public counterparts, even after controlling for differences in the background of their students: the labor market flexibility in the private sector and the financial competition among private schools. Hanushek et al (2002) and Rivkin et al (2005) argue that one of the core characteristics of a school is the capacity to locate,
attract, retain and motivate talented teachers. As Hanushek et al. (2002) point out, there are significant differences among teachers in their ability to foster learning and achievement among students. Still, according to Hanushek et al. (2002), this capacity is not easily identified as it is poorly explained by characteristics of teachers directly observable in a resume or in a school database. These kinds of skills are only accessed by direct contact with the teachers and principals are, in general capable of detecting the presence of such skills.

As private school’s principals are free to choose which teacher they hire and what salary they wish to pay, they are, according to Rivkin et al. (2005), capable of attracting the professionals who gather the most desirable skills. According to Hoxby (2002) private schools do deviate from public schools wage settings to create incentive mechanisms. Ballou et al. (1995) present evidence that private schools present a much more flexible wage schedule than their public peers and that even when salaries in the private sector have wage schedule resembling the public one, deviations from settings are very frequent even when salaries in private schools are lower, on average. On the other hand, Ballou et al. (1995) and Neal (2002) point that wage mechanisms that settle pay and promotion in the public sector are very rigid and bureaucratic and persistently fail to compensate for individual differences in the performance of teachers, even when those differences are observable by principals.

This labor market rigidity, according to Ballou, results in public schools giving relatively lower weight to the quality of applicants when making hiring decisions. Consequently, as Hoxby et al. (2002) indicate, private sector salaries vary more with teacher scores and quality, and are more prone to create incentives to attract and maintain better teachers.

One other argument often invoked to justify a larger efficiency of private schools is the one popularized by Milton Friedman (1962) that, as private schools must be financially viable, they must attract a considerable amount of students to sustain their functioning, in this sense private schools are integrated in a competitive market for students. This competition is reinforced by the fact that, as Mancebón et al. (2012) point out, students enrolled in a private school may leave in search for better options at almost any moment, both for public or other private institution, without increasing, or even decreasing, the financial burden of their education. This competition between private providers of education makes them more receptive to customer’s demands and obliges these schools to use resources in the most efficient way possible, to achieve a high level of quality and satisfaction on the educational process, at the lowest possible cost Those competitive pressures are not active in the public sector: public schools are local monopolies, not obliged to magnetize students, as these are secured by regional assignment. Even if private schools do operate better than the public ones in one area, they are still not capable of exerting competitive pressure over public institutions given the financial barrier to mobility between these schools, imposed by tuitions in private schools. Consequently, parents will only change their child from a public to a private school if the perceived value of attending a private school is much higher than the public one and only if their financial situation permits such a decision. This barrier weakens the competition in the educational market and reduces the need for efficiency by public providers.

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2 This seems to be the case for Portugal as salaries in private schools are similar to the public ones, but inferior on average. Still privates report deviations from this schedule more often.
Despite these arguments, several authors stand that the apparent superiority of private schools can be severely questioned. The main stream of arguments is developed around the idea that the competitive pressure, introduced by the necessity of private schools to capture funds, does not produce the expected effects. According to Shepard (1991) the existing measures of school performance, namely school rankings, introduce incentives for private schools to demonstrate good results that do not reflect their effective quality. Shepard (1991) argues that the competitive pressure leads private schools to practice cream-skimming that is to retain, encourage transfer or even drop-out low performing students. Consequently, traditional schools evaluation mechanisms are biased, in the case of private schools, towards their high performing students, even after accounting for background differences. Mancebón et al (2012) question the capacity of parents to evaluate the effective quality of schools, arguing that parents decide mainly based on superficial evidence that does not reflect the quality of schools. Hence, if families and users are not capable of measuring school quality, there is little room for competition to improve the quality of schools.

In order to correct some of the enumerated deficiencies of public schools, some governments have tried to find solutions that combine the advantages of private education agents, both their flexibility in labor markets and their vulnerability to financial markets, without abnegating the fundamental duty of the state of ensuring universal access to education. From this effort several experiences have been born, like charter schools, school vouchers, publicly-subsidized private schools and many other hybrid systems. The debate around the advantages of these choice mechanisms has been very intense since the proliferation of Milton Friedman’s argument, in 1962, that competition, under school choice, would improve the quality of schools and its cost efficiency, especially by introducing financially unrestricted competition within the public education system. Still the empirical evidence on this issue has been far from conclusive. Andersen 2008 using data for Denmark found no significant average effect of private schooling on final examination scores. Mancebón et al (2012) concluded that Spanish publicly subsidized private schools were ultimately worse than regular public schools after controlling for student characteristics. Hanushek (2007) concluded that charter schools were not significantly better than regular public schools but were better at satisfying family preferences, regarding several aspects of the educational environment, and that charter school parents are more responsive to variations in the quality of schools, advocating thus the idea that the existence of school choice develops an education market that is more responsive to quality. Neal (2002) also found that large scale school choice mechanisms that result in an active competition for teachers among independent schools, could improve the quality of the teaching profession.

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3 Charter Schools are public schools funded on per-person basis for each student they attract. These schools are exempted from some of the public schools regulations, but are also constrained by public admission rules.
4 School vouchers are transfers from central governments to parents that can only be applied to pay for the educational expenditures of their children.
5 Publicly-subsidized private schools are privately owned and managed but their student’s tuitions are supported by central governments. These schools are constrained to accept students under the same rules as public schools.
6 According to Hanushek et al (2006) charter schools are better in satisfying family preferences in terms of educational approaches and social and religious focus.
3. THE PORTUGUESE EDUCATIONAL SYSTEM

The co-existence of public and private schools has been frequent in the Portuguese educational system over the last century. Still, in the late seventies and eighties the expansion of mandatory education up to the 9th grade generated a shortage of supply in the public education system. As the state was not financially capable of providing the funds required for the construction of new schools in areas of shortage, a new solution had to be designed. The establishment of contracts between the central government and private schools seems to have solved the problem by creating the so called “Escolas com contrato de associação” which are state-funded private schools, that is, schools that are privately owned and managed, whose student’s tuitions are supported by the central government. In order to enroll a child in a private school parents are required to pay fees in order to compensate the financial cost incurred by the school. On the contrary, in public and state-funded private schools these costs are supported by the state, without any significant additional payment from the families. Disadvantaged students in these schools are also eligible to receive financing to cover their expenditure in materials, food and accommodation. According to the Portuguese law publicly funded private schools are, alike regular public schools, obliged to accept all interested students conditional on the geographic and family criteria.

The ministry of education controls teaching contents and learning methods, in all types of schools up to the 12th grade. The ministry is also responsible for regulating the allocation of expenditures among public schools and state funded private schools. Private schools, both regular and state-funded, are responsible for selecting their teachers, whereas in public schools teachers are allocated to each school by ministry matching.

The educational track of students starts with optional pre-primary education for children between 3 and 5 years old. Afterwards there are four cycles of mandatory education with durations of 4, 2, 3 and 3 years, respectively. The last cycle corresponds to secondary education, either general or technological, and became mandatory in 2009. Students have to take national exams to finish secondary school since 1988, and in 2005 national exams at the end of the 9th grade were introduced. In 2007 national exams started to be applied to all students at the end of the 4th and 6th grade, too. In order to evaluate the relative performance of the two types of property regimes, we looked at the performance of students at the end of the third cycle (9th grade).

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7 In some of these schools there coexist a small number of students whose tuitions are not supported by the government but by the families.
8 According to the Portuguese law 85/2009 mandatory schooling was extended either until the conclusion of secondary education or up to the moment where the student completes 18 years of age. Still this reform applies only to students that were at the 7th grade, or lower, in the school year 2009/2010. Consequently the students that are currently (in the school year 2014/2015) studying at the 12th grade of mandatory schooling are the first ones to be covered by this law.
4. DATA AND METHODOLOGY

Data

Since 2005, the Portuguese ministry of education discloses yearly information regarding 9th grade national exams scores. The data provided regards the exam and school scores of students (on an anonymous base) along with a set of variables on student characteristics and a bundle of school descriptive variables.

In this research data from 2010 was used, regarding 171 611 Portuguese and Mathematics exams, administered to 9th grade students in all schools, located only in Portuguese mainland. In 2010, there were 1348 schools teaching third cycle students in mainland Portugal, from which 1130 (84%) were public schools, 139 (10%) were private schools and 79 (6%) were state-funded private schools. This sample includes only the students that took the exams and were subject to a continuous evaluation process at a school along that academic year. Thus, this analysis excludes those that registered themselves at a specific school only to take national exams.

Besides scores, students individual characteristics are age and gender. At the school level, the information available is the total number of exams and the ownership/management scheme of the institutions. As no information is available regarding the socio-economic background of students and their families, these variables were proxied by the average municipality levels of the area where the school is located, taken from CENSUS.

Methodology

Despite all the theoretical arguments advocating the relative superiority of public or private schools, the difficulty in controlling for self-selection of students into private schools and isolating the true impact of schools from differences in the motivations and background of students has not yet found a consensual solution among researchers. Still, the Portuguese educational system offers a privileged opportunity to disentangle the impact of student selection and background from the impact of public and private school management systems, on the performance of students. Public and private schools diverge both on the background of their students and on their property and management schemes adopted. Consequently any direct comparison of these two types of institutions faces severe problems in measuring the separate impact of these two effects. In this context the existence of state-funded private

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9 The extension of mandatory schooling to the end of secondary education had not taken place yet so these students were at their final year of mandatory schooling.
10 Madeira and Azores were excluded, given the scarcity of data on these regions and the fact that their political autonomy is reflected in different rules for mandatory schooling.
11 The Portuguese educational system allows students to sign up at a school only for an exam, independently of their academic progress along the year, by discarding their yearlong evaluation. These students are named self-applying students (in Portuguese “auto-propostos”) in opposition to school internal students (“internos” in Portuguese).
12 CENSUS is a nationwide official count of the Portuguese population. This headcount is performed every 10 years. At the time this research was concluded the last available data was from CENSUS 2001.
13 One possible solution would be to use value-added measures. This methodology, described in Hanushek et al (2006), uses student’s past academic information to control for selection and identify the true contribution of schools. Given the scarcity of data on the Portuguese System, this methodology cannot be replicated here.
schools can be of crucial importance. These schools, as mentioned previously, accept students under the same criteria and conditions (tuition fee free) as public schools, hence it is reasonable to assume that public school students are very similar to their counterparts in publicly funded private schools. Consequently any direct comparison between the performances of students in these two sorts of institutions gives us a measure of the impact of different management and property schemes on the educational outcomes of pupils. The dimension of this impact will be mentioned, from now on, as “management and property” effect.

Similarly regular private schools diverge from state-funded private ones on the composition of their student body even though they share the same management and property scheme. Consequently any direct parallel between the performances of students in these two types of organizations is particularly suitable to measure the impact of differences in student background on education outcomes. This impact will be, from now on, referred to as “background” effect.

Summarily, the particular features of the Portuguese educational system accommodate the detachment of “background” effects from “management and property” effects, by comparing separately private with state funded private schools and comparing state funded private schools with regular public schools. Of course this detachment is only feasible if there is no distortion imposed by self-selection of students into state-funded private schools, which seems to be the case, as stated above: students are assigned between public and publicly subsidized private schools according to geographic and family criteria that leave few room for selection distortions.

To analyze the impact of “management and property” mechanisms, including an astringent control for “background effects” three main models were estimated:

(1) \[ \text{StudentOutcome} = \alpha_1 \text{Female} + \alpha_2 \text{Age} + \alpha_3 \text{Priv vs Pub} + \alpha_4 \text{SchoolSize} + \alpha_5 \text{Socioeconomic} + \alpha_6 \text{District} \]

(2) \[ \text{StudentOutcome} = \alpha_1 \text{Female} + \alpha_2 \text{Age} + \alpha_3 \text{Priv vs Charter} + \alpha_4 \text{SchoolSize} + \alpha_5 \text{Socioeconomic} + \alpha_6 \text{District} \]

(3) \[ \text{StudentOutcome} = \alpha_1 \text{Female} + \alpha_2 \text{Age} + \alpha_3 \text{Charter vs Pub} + \alpha_4 \text{SchoolSize} + \alpha_5 \text{Socioeconomic} + \alpha_6 \text{District} \]

The variable \text{StudentOutcome} stands for the performance of each student. Seven main measures of outcome were used: student scores in Portuguese and Mathematics national exams\footnote{State-funded private schools operate like regular private schools, except on access student admission rules and on the tighter financial and administrative control they are subject to, from the ministry of education. But they have discretion upon the choice of their teachers another staff, a factor that is recognized as a major factor of increased source of productivity.}, whether a student passed or failed the exam, for both subjects, the number of times a student was retained before 9th grade and finally two joint measures of performance, that combine student scores on national exams with the time required to complete mandatory schooling. These output measures are represented by dummy variables. The first one, called

\footnote{The separation between the results on the two subjects is understandable, given the different determinants of achievement of these two subjects, as reported in OECD (2006) for the impact of gender on different skills.}
passontime, takes the value 1 if the student has never failed before 9th grade and passes the national exam, and 0 otherwise. The second dummy, failrepeater, looks at the opposite top of the distribution, and assumes the value 1 if the student has already failed at least one school grade and fails the national exam and 0 otherwise.

The models estimated using the first two outputs considered, exam scores and passing or failing the exam, provide a detailed view of the determinants of success on the national exam, and in particular the contribution of “background” and “management and property schemes” to the performance of students on nationwide tests. By using the number of times a student was retained before 9th grade as a dependent variable, we manage to analyze the determinants of the performance of students during the first eight years of mandatory schooling. By using the efficiency measures as outputs, we analyze separately the impact of school management systems on the exam performance of students that have had high and low performances in previous years.

The variable SchoolSize indicates the dimension of a school, measured by the number of 9th grade exams taken in that school in 2010. The item SocioEconomic represents a set of municipal indicators that proxy socio-economic and cultural status of families, such as the municipality level of unemployment (% Unemp), the rate of female participation in the labor force (% Female Activity) and the average educational performance within a municipality, as measured by the share of the population that completed at least mandatory education (% MandatorSschool), the school dropout rate (% Dropout), the share of illiterates (% Illiteracy) and the share of the population that completed tertiary education (%Higher Education). DistrictDummy represents a set of eighteen dummies, one for each district in Portuguese mainland, that account for persistent regional disparities.

The variable PrivsPub, in model (1) is a dummy that takes the value 1 if the school is private and the value 0 if the school is public. This first model aims at providing a crude comparison between public and private schools students’ performance. The second model aims at estimating the “background” effect by comparing students attending regular private schools with their state-funded private schools counterparts, that is, students from schools with the same management and ownership schemes, only with different backgrounds. This impact is measured through the inclusion in (2) of the variable ChartervsPriv, 16 a dummy variable that takes the value 1 if the student is enrolled in a state-funded private school and 0 if he attends a strictly private institution.

The purpose of the third model is to estimate the real impact of attending privately managed and owned schools on the achievement of students; the variable ChartervsPub takes the value 1 if the student attends a publicly subsidized private school and 0 if he attends a public one. The impact of this variable on student performance provides thus a measure of the “management and property” effect.

16 We are completely aware of the differences between a state-funded private school and a charter school. The variable included in models (2) and (3) is called charter only for a matter of simplicity.
In order to take into account the discrete nature of the dependent variables exam scores\(^\text{17}\) and years retained in mandatory schooling before 9th grade, a probit model was estimated. Using a standard normal distribution this model predicts the impact of each explanatory variable on the probability of achieving each of the ranked outcomes.

Given that passing of failing the exam, passing without having ever been retained and failing having already been retained are three events of binary nature, the models estimated for these outputs require the use of probit specifications. This model measures the impact of each explanatory variable on the probability of dependent variable taking the value one.

5. DISCUSSION OF RESULTS

Passing or failing

The results of the estimation for the dependent variable passing or failing the exam\(^\text{18}\) of models (1), (2) and (3) are reported in table \(^\text{19}\). In all these specifications variables Female, Age, %Dropout and %Higher Education present the expected signs. Girls outperform boys in Portuguese but fall behind on Mathematics. Older students, and thus students that have already been retained have a higher probability of failing again than their peers that have never failed before. The level of unemployment influences negatively student performance in Mathematics. In this subject students that live in municipalities with higher unemployment, and consequently were parents have lower economic stability, perform significantly worse.

The educational background of adults, which is the average level of attainment of families within a municipality, is significant to explain the educational performance of students. Students born in areas were school abandonment is lower tend to perform better.\(^\text{20}\) The percentage of the population with at least mandatory schooling pronounces a very interesting behavior in explaining student performance, in models (1) and (3). The share of the population with at least mandatory schooling seems to affect negatively the performance of students. On the contrary, the share of the population with higher education has a positive impact on the attainment of students. These results suggest that given the increasingly high education levels of adults, only living in an area with a large number of people with college education is capable of impacting positively the results of children.

When explaining the differences among private school and state-funded students, in model (2), results are much more linear, as they show that living in a municipality with a large number of adults with at least mandatory education and even with higher education levels increases the likelihood of achieving better results. This difference to the previous two models is

\(^{17}\) Exams are scored on a 1 to 5 scale.

\(^{18}\) The estimation of the three models for the dependent variables exam scores and being approved or retained at the exam yielded very similar results. Consequently we report and discuss only the results for the exam approval rates given that this specification reports a higher explanatory power.

\(^{19}\) In this table only the marginal effects of each variable on the dependent variable pass are reported and not the regression coefficients.

\(^{20}\) As the data for school dropout is from 2001, there should be no concern for endogenous relations between this variable and the performance of students in 2010.
probably due to the higher differences in the education levels of adults, between students from private and state-funded schools, that is, between students with very different backgrounds.

Table 1: Marginal effects of the determinants of passing or failing

<table>
<thead>
<tr>
<th>Pass</th>
<th>(1) Math PRIV vs PUB</th>
<th>(1) Port PRIV vs PUB</th>
<th>(2) Math PRIV vs CA</th>
<th>(2) Port PRIV vs CA</th>
<th>(3) Math CA vs PUB</th>
<th>(3) Port CA vs PUB</th>
</tr>
</thead>
<tbody>
<tr>
<td>Female</td>
<td>-6.87%*** (-17.85)</td>
<td>11.10%*** (33.45)</td>
<td>-4.43%*** (-4.96)</td>
<td>8.72%*** (12.54)</td>
<td>-6.99%*** (-18.43)</td>
<td>10.79%*** (33.89)</td>
</tr>
<tr>
<td>Age</td>
<td>-26.86%*** (-85.03)</td>
<td>-17.45%*** (-76.21)</td>
<td>-21.55%*** (-27.40)</td>
<td>-13.97%*** (-26.77)</td>
<td>-26.50%*** (-86.39)</td>
<td>-17.87%*** (-81.30)</td>
</tr>
<tr>
<td>Number of Exams</td>
<td>0.03%*** (12.45)</td>
<td>0.02%*** (10.44)</td>
<td>-0.004% (-1.00)</td>
<td>-0.003% (-1.01)</td>
<td>0.02%*** (8.51)</td>
<td>0.01%*** (5.82)</td>
</tr>
<tr>
<td>Private vs Public</td>
<td>31.79%*** (33.51)</td>
<td>17.01%*** (19.59)</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Private vs Charter</td>
<td>-</td>
<td>-</td>
<td>15.20%*** (8.28)</td>
<td>4.55%*** (3.22)</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Charter vs Public</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>2.06%*** (2.67)</td>
<td>2.16%*** (3.17)</td>
</tr>
<tr>
<td>% Unemp.</td>
<td>-0.82%*** (-4.99)</td>
<td>0.01% (0.10)</td>
<td>-2.38%*** (-3.76)</td>
<td>-0.52% (-1.08)</td>
<td>-1.01%*** (-6.32)</td>
<td>-0.09% (-0.68)</td>
</tr>
<tr>
<td>% Mandatory School</td>
<td>-0.48%*** (-5.43)</td>
<td>-0.29%*** (-3.88)</td>
<td>0.77%*** (3.26)</td>
<td>0.35%* (1.91)</td>
<td>0.37%*** (-4.28)</td>
<td>0.24%*** (-3.28)</td>
</tr>
<tr>
<td>% Dropout</td>
<td>-2.83%*** (-11.41)</td>
<td>-2.02%*** (-9.61)</td>
<td>-2.75%*** (-3.45)</td>
<td>-2.54%*** (-4.20)</td>
<td>-2.84%*** (-11.92)</td>
<td>-1.98%*** (-9.90)</td>
</tr>
<tr>
<td>% Female activity</td>
<td>-0.002% (-0.25)</td>
<td>0.10% (1.60)</td>
<td>0.11% (0.44)</td>
<td>0.47%** (2.45)</td>
<td>-0.01% (-0.19)</td>
<td>0.10%* (1.64)</td>
</tr>
<tr>
<td>% Illiteracy</td>
<td>0.003% (0.22)</td>
<td>-0.21%* (-1.63)</td>
<td>1.51%*** (3.01)</td>
<td>1.53%*** (4.01)</td>
<td>0.16% (1.13)</td>
<td>-0.08% (-0.66)</td>
</tr>
<tr>
<td>% Higher Education</td>
<td>1.38%*** (12.42)</td>
<td>0.82%*** (8.50)</td>
<td>0.16% (0.55)</td>
<td>0.2% (1.00)</td>
<td>1.24%*** (10.87)</td>
<td>0.94%*** (10.02)</td>
</tr>
<tr>
<td>N</td>
<td>75 709</td>
<td>75 041</td>
<td>10 947</td>
<td>10 943</td>
<td>76 800</td>
<td>80816</td>
</tr>
<tr>
<td>R2</td>
<td>12.07%</td>
<td>10.85%</td>
<td>13.68%</td>
<td>14.90%</td>
<td>10.21%</td>
<td>10.38%</td>
</tr>
</tbody>
</table>

Z-statistics are in brackets
* Statistically significant at 10% ** Statistically significant at 5% ***Statistically significant at 1%

Regarding the discussion on the literature on the consequences of school size on student performance, the results show that when comparing students from private and state-funded...
private schools with their public school counterparts, larger schools perform significantly better.

**Total effect**

The crude comparison between regular private school and public school students (model (1)) is presented in columns 1 and 2 of table 1, for Mathematics and Portuguese respectively. In these two regressions the coefficients of the dummy *Private vs Public* are positive, indicating that attending a private school improves the performance of students. In the case of Mathematics, students attending regular private schools have 31.79% higher probability of passing than their public school counterparts. On the Portuguese exam, private school students are 17.01% more likely to be approved on the national exam. Summing up, private schooling seems to impact positively student performance, when compared with public schooling.

The results on these two specifications evidence some disparities across disciplines: the advantage of private schooling on exam approval is much higher for Mathematics than for Portuguese. This disparity has two main possible explanations, either the educational inputs used in private schools, such as teacher quality, student tutorials and homework frequency, provide students with much better basis to face mathematical problems or private school students are supported by more educated parents in their “at home” study. To test the validity of these explanations we have to check in models (2) and (3) if these differences are still present.

**“Background” Effect**

The results of the estimation of model (2) are shown in columns 3 and 4 of table 1, for Mathematics and Portuguese respectively. We can see that attending regular private schools instead of publicly subsidized ones has a positive impact on the probability of passing both exams. In particular, attending an independent private school increases by 15.19% the probability of being approved in Mathematics and by 4.55% in Portuguese.

By looking at these results it becomes clear that there are significant differences in the performance of students that attend schools with similar property and management mechanisms but have very different socioeconomic background. Nevertheless, the impact of background on exam scores is much larger for Mathematics than for Portuguese. This result is in line with the one obtained in the comparison between private and public schools in model (1). The only difference is that the dimension of this differential is much larger in model (1) than in (2). This result most likely indicates that part of the differential in the advantage of private schooling, in Portuguese and Mathematics results, is explained by differences in the background of students, that is children born in more educated environments have better mathematical preparation than those born in less educated ones.
“Management and Property” effects

The differences between private and public school management systems were estimated using model (3) and the results are summarized in columns 5 and 6 of table 1, for Portuguese and Mathematics respectively. By looking at the coefficients for the dummy variable Charter vs Public, we can see that changing from a public to a state-funded private school increases by 2.06% the probability of passing the Mathematics exam and increases by 2.34% the probability of passing the Portuguese one.

In this model there is not a large difference between the Portuguese and Mathematics results. In reality the gap observed in the two previous models has not only vanished but also slightly inverted its direction, meaning that attending state funded private schools instead of public ones increases more the probability of success in the Portuguese exam than it does in Mathematics. Consequently we can conclude that the large disparity in magnitude of the impact of private schooling on the probability of passing in Portuguese and Mathematics, observed in the comparison between public and private schools is not due to differences in the management systems that would make private schools prepare their students better.

6. RETENTIONS BEFORE 9TH GRADE

The determinants of the number of school years repeated before 9th grade were estimated using models (1), (2) and (3), and their marginal effects are reported in table 2. The variable Repetition takes the value 1 if the student enters 9th grade without having ever been retained, 2 if the student has been retained once or twice and 3 if he failed more than twice.21

The estimates of all the three models indicate that girls are less likely to be retained before 9th grade. The impact of Number of Exams on the probability of being retained before 9th grade suggests that attending larger schools decreases the probability of ever being retained.

Regarding the socioeconomic indicators that proxy socio-economic background of families, we can see that having high levels of unemployment and low levels of female activity, in a municipality, increase the probability of ever being retained, possibly due to the fact that unemployed parents have fewer income sources and are less capable of investing in their children education.

The variables representing the educational background of families exhibit the same impact on the number of repetitions before 9th grade, as they did on the likelihood of passing. For example, living in a municipality with a large share of individuals with at least mandatory education is not sufficient to increase the probability of arriving on 9th grade “on time”. Only having a population with tertiary education can decrease the probability of ever being retained

21 The ages of students are reported, in the dataset, at the beginning of the civil year. Consequently students that have never repeated a school grade before should be 13 or 14 years old, those who repeated once or twice should be 15 or 16 years old and those who repeated more than twice should be older than 16.
during mandatory school. Similarly high levels of school dropout, at a municipality level, decrease the probability of never being retained before 9th grade.\(^{22}\)

### Table 2: Marginal effects of the determinants of number of repetitions prior to 9th grade

<table>
<thead>
<tr>
<th>Repetition</th>
<th>Arrive on time</th>
<th>Repeat once twice</th>
<th>Repeat more than twice</th>
</tr>
</thead>
<tbody>
<tr>
<td>PRIV vs PUB CA vs PUB</td>
<td>PRIV vs PUB CA vs PUB</td>
<td>PRIV vs PUB CA vs PUB</td>
<td></td>
</tr>
<tr>
<td><strong>Female</strong></td>
<td><strong>-0.04%</strong>* (-2.50)</td>
<td><strong>0.01%</strong>* (-2.50)</td>
<td><strong>0.02%</strong>* (-2.50)</td>
</tr>
<tr>
<td><strong>Number of Exams</strong></td>
<td><strong>0.08%</strong>* (2.62)</td>
<td><strong>0.08%</strong>* (2.62)</td>
<td><strong>0.08%</strong>* (2.62)</td>
</tr>
<tr>
<td><strong>Private vs Public</strong></td>
<td><strong>-0.08%</strong>* (-2.50)</td>
<td><strong>0.08%</strong>* (2.62)</td>
<td><strong>0.08%</strong>* (2.62)</td>
</tr>
<tr>
<td><strong>Charter vs Public</strong></td>
<td><strong>-0.08%</strong>* (-2.50)</td>
<td><strong>0.08%</strong>* (2.62)</td>
<td><strong>0.08%</strong>* (2.62)</td>
</tr>
<tr>
<td><strong>% Unemployed</strong></td>
<td><strong>-0.08%</strong>* (-2.50)</td>
<td><strong>0.08%</strong>* (2.62)</td>
<td><strong>0.08%</strong>* (2.62)</td>
</tr>
<tr>
<td><strong>% Mandatory School</strong></td>
<td><strong>0.08%</strong>* (2.62)</td>
<td><strong>0.08%</strong>* (2.62)</td>
<td><strong>0.08%</strong>* (2.62)</td>
</tr>
<tr>
<td><strong>% Dropout</strong></td>
<td><strong>0.08%</strong>* (2.62)</td>
<td><strong>0.08%</strong>* (2.62)</td>
<td><strong>0.08%</strong>* (2.62)</td>
</tr>
<tr>
<td><strong>% Female activity</strong></td>
<td><strong>0.08%</strong>* (2.62)</td>
<td><strong>0.08%</strong>* (2.62)</td>
<td><strong>0.08%</strong>* (2.62)</td>
</tr>
<tr>
<td><strong>% Literacy</strong></td>
<td><strong>-0.08%</strong>* (-2.50)</td>
<td><strong>0.08%</strong>* (2.62)</td>
<td><strong>0.08%</strong>* (2.62)</td>
</tr>
<tr>
<td><strong>% Higher Education</strong></td>
<td><strong>0.08%</strong>* (2.62)</td>
<td><strong>0.08%</strong>* (2.62)</td>
<td><strong>0.08%</strong>* (2.62)</td>
</tr>
</tbody>
</table>

Z-statistics are in brackets

* Statistically significant at 10% ** Statistically significant at 5% *** Statistically significant at 1%

### 7. TOTAL EFFECT

The estimation of the marginal effects of the total impact of attending private schools instead of public ones, on the age of completion of mandatory school, is presented in columns 1, 4 and 7 of table 2 for each of the possible events of the variable repetition. Here we can see that private school students are less likely to be retained before 9th grade than their public school counterparts. The marginal effects of changing from a public to a private school on the variable Repetition indicate that attending a private school increases the likelihood of never repeating a

\(^{22}\) As the data for school dropout is from 2001, there no should be no concern for endogenous relations between this variable and the performance of students in 2010.
school grade before 9th grade by 20.08%, decreases the probability of being retained once or twice by 18.30% and decreases the probability of repeating more than twice by 1.78%.

“Background” Effect

The comparison of the determinants of the number of repetitions before 9th grade for students that attend private and state-funded private schools is presented in columns 2, 5, and 8 of table 2, for each of the values taken by the variable repetition. The coefficient on the variable Private vs Charter indicates that students that attend regular private schools have a higher probability of completing mandatory schooling “on time”. In particular, students from regular private schools, when compared to their publicly subsidized private schools counterparts, are 16.62% more likely to arrive at 9th grade “on time”, are 15.08% less likely to be retained once or twice and are 1.55% less likely to be retained more than twice during mandatory schooling.

“Management and Property” effects

The impact of management and property mechanisms on the number of retentions before 9th grade is reported in columns 3, 6, and 9 of table 2. The coefficient on the variable Charter vs Public indicates that attending state-funded private schools instead of public schools decreases the probability of arriving at 9th grade “on time”. In particular, public schools students are 0.79% more likely to arrive at 9th grade without ever being retained than publicly subsidized private school ones. In fact public school students are 0.68% less likely to have already repeated once or twice before 9th grade and 0.11% less likely to have repeated more than twice. Summing up there is evidence that private school management and ownership systems slightly increase the probability of being retained before 9th grade.

“Efficiency”

The results obtained so far regarding the impact of private management and ownership schemes of schools on educational achievement point on two different directions. On the one hand, attending schools with private management systems improves the performance of students on 9th grade national exams, on the other hand increases the probability that students fail, at least once, before 9th grade.

In order to bring some light on this issue we now analyze the impact of an “efficiency” measure, that is, a joint measure of impact that captures the interaction between the performances of a student on the 9th grade national exams and whether or not he has already been retained before. In the interaction between these two variables it is particularly interesting to analyze two situations: what is the performance on national exams of students that have never been retained and, on the other top, what is the performance of students that have already been retained in previous years of mandatory education.

To measure the capacity of a school to generate good results on national exams, without submitting their students to a period of mandatory schooling longer than necessary, models
(1), (2) and (3) were re-estimated using the variables passontime and failrepeater as dependent variables. The marginal effects are summarized in table 3 below.

Table 3: Marginal effects of the determinants of passontime and failrepeater

<table>
<thead>
<tr>
<th></th>
<th>PRI vs PUB</th>
<th></th>
<th>PRI vs CA</th>
<th></th>
<th>CA vs PUB</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>passontime</td>
<td>failrepeater</td>
<td>passontime</td>
<td>failrepeater</td>
<td>passontime</td>
</tr>
<tr>
<td>Port</td>
<td>13.36%***</td>
<td>-6.57%***</td>
<td>8.93%***</td>
<td>-2.95%***</td>
<td>13.55%***</td>
</tr>
<tr>
<td></td>
<td>(51.03)</td>
<td>(-34.68)</td>
<td>(14.16)</td>
<td>(-8.25)</td>
<td>(52.41)</td>
</tr>
<tr>
<td>Female</td>
<td>5.30%***</td>
<td>-3.88%***</td>
<td>6.13%***</td>
<td>-2.47%***</td>
<td>5.20%***</td>
</tr>
<tr>
<td></td>
<td>(20.20)</td>
<td>(-20.53)</td>
<td>(9.69)</td>
<td>(-6.86)</td>
<td>(20.10)</td>
</tr>
<tr>
<td>Number of Exams</td>
<td>0.05%***</td>
<td>-0.03%***</td>
<td>0.02%***</td>
<td>-0.01%***</td>
<td>0.04%***</td>
</tr>
<tr>
<td></td>
<td>(30.06)</td>
<td>(-23.96)</td>
<td>(5.09)</td>
<td>(-4.69)</td>
<td>(25.25)</td>
</tr>
<tr>
<td>Private vs Public</td>
<td>36.85%***</td>
<td>-21.52%***</td>
<td>-9.74%***</td>
<td>-13.08%***</td>
<td></td>
</tr>
<tr>
<td></td>
<td>(57.69)</td>
<td>(-16.64)</td>
<td>(-13.08)</td>
<td>(1.45)</td>
<td></td>
</tr>
<tr>
<td>Private vs Charter</td>
<td></td>
<td></td>
<td>21.52%***</td>
<td>-9.74%***</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>(16.64)</td>
<td>(-13.08)</td>
<td></td>
</tr>
<tr>
<td>Charter vs Public</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>0.76%***</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>(1.45)</td>
</tr>
<tr>
<td>% Unemp.</td>
<td>-0.61%***</td>
<td>0.42%***</td>
<td>-1.52%***</td>
<td>0.77%***</td>
<td>-0.83%***</td>
</tr>
<tr>
<td></td>
<td>(-5.39)</td>
<td>(5.34)</td>
<td>(-3.35)</td>
<td>(3.13)</td>
<td>(-7.59)</td>
</tr>
<tr>
<td>% Mandatory School</td>
<td>-0.41%***</td>
<td>0.22%***</td>
<td>0.58%***</td>
<td>-0.31%***</td>
<td>-0.30%***</td>
</tr>
<tr>
<td></td>
<td>(-6.91)</td>
<td>(5.08)</td>
<td>(3.47)</td>
<td>(-3.29)</td>
<td>(-5.13)</td>
</tr>
<tr>
<td>% Dropout</td>
<td>-2.44%***</td>
<td>1.22%***</td>
<td>-2.58%***</td>
<td>1.58%***</td>
<td>-2.33%***</td>
</tr>
<tr>
<td></td>
<td>(-14.36)</td>
<td>(10.22)</td>
<td>(-4.57)</td>
<td>(5.32)</td>
<td>(-14.31)</td>
</tr>
<tr>
<td>% Female activity</td>
<td>0.08%*</td>
<td>-0.08%**</td>
<td>-0.07%</td>
<td>-0.09%</td>
<td>0.10%***</td>
</tr>
<tr>
<td></td>
<td>(1.72)</td>
<td>(-2.35)</td>
<td>(-0.38)</td>
<td>(-0.98)</td>
<td>(2.02)</td>
</tr>
<tr>
<td>% Illiteracy</td>
<td>-0.17%*</td>
<td>0.04%</td>
<td>-0.27%</td>
<td>-0.51%**</td>
<td>-0.10%</td>
</tr>
<tr>
<td></td>
<td>(-1.67)</td>
<td>(0.58)</td>
<td>(0.76)</td>
<td>(-2.71)</td>
<td>(-0.47)</td>
</tr>
<tr>
<td>% Higher Education</td>
<td>1.08%***</td>
<td>-0.52%***</td>
<td>0.06%</td>
<td>0.14%</td>
<td>0.97%***</td>
</tr>
<tr>
<td></td>
<td>(14.27)</td>
<td>(-9.51)</td>
<td>(0.32)</td>
<td>(1.14)</td>
<td>(12.56)</td>
</tr>
<tr>
<td>N</td>
<td>150 750</td>
<td>150 750</td>
<td>21 890</td>
<td>21 890</td>
<td>152 932</td>
</tr>
<tr>
<td>R2</td>
<td>4.64%</td>
<td>3.76%</td>
<td>7.50%</td>
<td>6.44%</td>
<td>2.97%</td>
</tr>
</tbody>
</table>

Z-statistics are in brackets
* Statistically significant at 10% ** Statistically significant at 5% ***Statistically significant at 1%

As the different determinants of educational outcomes for Portuguese and mathematics were already analyzed and yielded very similar results, except for gender, we did not perform the regressions separately for Portuguese and mathematics. Still a dummy variable for Portuguese (value 1) and mathematics (value 0) was included in all three models, to take into account differences between these two disciplines.
The results, for all three models, indicate that large schools increase the performance of students, as they increase the probability of completing mandatory schooling without having ever failed, and reduce the probably relapsing retention situations. The variables representing the educational capital of families exhibit a behavior very similar to the previous specifications. Being in an environment with highly educated adults and low levels of school dropout increases the probability of passing the 9th grade exams without having ever been retained and reduces the probability for previously retained students to be retained again. Also, the results for the impact of unemployment on these outcomes are very similar to the previous ones: high levels of unemployment worsen education outcomes.

**Total effect**

The direct comparison between public and private schools is reported in columns 1 and 2 of table 3. By looking at the coefficients on the variable Private vs Public, we can see that changing from a public into a private school increases the probability of completing mandatory schooling on time by 36.85% and decreases the probability, ceteribus paribus, of failing the exams for students that have already been retained in previous grade courses by 21.37%.

**“Background” Effect**

The impact of background on the probability of academic success, for students that have never been retained before and for those who have been retained at least once, are reported in columns 3 and 4 of table 3. The results indicate that private school students are 21.51% more likely, than their publicly subsidized school colleagues, to pass national exams when they have never been retained before and are 9.74% less likely to relapse in failure situations when they have already been retained.

**“Management and property” effects**

The coefficients on the variable Charter vs Public in columns 5 and 6 of table 3 indicate that attending a state-funded private school instead of a public one reduces by 0.76% the probability of failing the exams for students that have already been retained in previous grades. It is also noticeable that being enrolled in a state-funded private school instead of a strictly public does not have a significant impact on the probability of successfully completing mandatory schooling without having ever been retained.

### 8. CONCLUSIONS

We attempt to identify the contribution of the private versus public nature of schools to students’ performance by comparing the scores obtained in 9th grade national exams by three groups of students: those attending strictly private schools, those in strictly public schools and the group of students enrolled in state-funded private schools. The rationale behind this exercise is the presumption that students in these two last types of schools share the same
socioeconomic background, given that they are allocated to either of these schools by the government, on the basis of geographic criteria.

Resorting to cross-section data on the scores obtained on national exams by 9th grade students in 2010, this study corroborates the well-established result on the relevance of the family socio-economic background for students’ performance, but does also sustain the existence of a positive impact of private ownership and management schemes on the scores of students. Still, results also suggest that students in state-funded private schools are slightly more prone to be retained at least once before 9th grade. However, the probability of relapsing, for these students, is lower than for their counterparts on the public system. Thus, whether the overall duration of mandatory schooling is larger or smaller in state-funded private schools remains unclear.

9. REFERENCES

Andersen, “Private schools and the Parents that choose them Empirical evidence” from the Danish Voucher System, 2008, Scandinavian Political studies, 31, (1): 44-68


Hanushek, Eric et al., 2007 “Charter School quality and parental decision making with school choice” Journal of Public Economics, 91(5-6).


24 With micro data this hypothesis could be tested. However there is no data about the socioeconomic characteristics of private school students, so more sophisticated techniques to match the groups could not be used.


