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Are Basic Schools more Effective than Secondary Schools?

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Abstract

The present essay focuses on the effectiveness of Portuguese public schools' provision of 7th, 8th and 9th grades, using data from the Portuguese Ministry of Education and Science for 2009/10, 2010/11 and 2011/12. At least two school types offer these grades: Basic and Secondary. Based on previous findings, a production function is estimated for 9th grade students in the regular academic track, including a variable that indicates the specific school type attended by each student. After concluding that Basic Schools add more value, some explanations are presented as well as recommendations and possible further research.

Key words: Effectiveness, Public Schools, Economics of Education

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I. Introduction

Education is an investment which has positive externalities for societies, as it is a key factor for countries' welfare and individuals' productivity. It constitutes a valid factor in explaining the behavior of wages[1], labor market situation and GDP growth rate (Hanushek and Kimko 2000), since it leads to the production and accumulation of human capital (Becker 1993).

In an effort to provide a deeper knowledge of the effect of certain inputs in educational outcomes, and consequently what works best, the educational production process has been extensively researched, nevertheless results are not always consistent. At the heart of the educational debate lies one aspect of great interest, focused by major international organizations such as UNESCO and OECD: effectiveness.

Within the Portuguese education system, as in several others worldwide, a non-deeply explored event takes place, which can be evaluated from the point of view of its effectiveness: the dual provision of 7th, 8th and 9th grades. Since 1986, Portuguese Basic Schooling includes 9 years, from 1st to 9th grades divided into three cycles: the first with four years, the second with two and the last with three years. In 2012, compulsory education changed to 12 years, including Basic and Secondary Schooling. Primary Schools are responsible for teaching the first four years, Basic Schools the two, and Secondary Schools the last three. However, the 7th, 8th and 9th grades are offered by both Basic and Secondary Schools. Thus, a student can either attend this cycle in a school that also offers 5th and 6th grades or in a school that provides high school as well. Consequently, one is in the presence of two school types that offer these three: Basic Schools, with classes from the 5th to the 9th grade and Secondary Schools, which provide

[1]There is empirical evidence that more years of education are associated with higher expected income.

from the 7th to the 12th. Both school types teach exactly the same subjects and contents to pupils from the common grades, preparing them for the 9th grade national exams[2]. Moreover, when looking at the characteristics of these two school types one can infer that Secondary Schools have teachers with higher education and experience, as well as students with better prior achievement. However, in these schools students may be more exposed to risky-behavior and school staff control over class attendance may be lower. Hence, first of all, differences between Basic and Secondary Schools will be evaluated by their significance; afterwards one has to assess if school type plays a role in explaining better results. If it does, possible explanations should be suggested.

The question under analysis is: should the Portuguese system re-define the allocation of the 3rd cycle to one of these school types or are there no systematic differences in school outcomes between Basic and Secondary Schools in the 7th, 8th and 9th grades?

In the next two sections some context is provided through a brief description of the evolution of the Portuguese Educational System as well as a revision of the literature on school effectiveness. Section IV exposes the econometric framework, followed by dataset description. Section VI discusses results on the educational production function, which can be compared to the results reached in section VII. Finally some conclusions and limitations are presented, along with further research topics.

II. Evolution of the Portuguese Educational System[3]

In the second half of the 20th century, three phases can be distinguished concerning the Portuguese educational system: in the first decade, there is a process of accommodation of the system in place since the 1930's to the socio-economic reality of the post-war

[2] In Portugal, course contents taught in public schools during compulsory schooling are set nationally and national exams are standardized.

[3] Based on reports from the Portuguese Ministry of Education and Science and Eurydice as well as Alice Mendonça studies. See References section for more details.

period; the second, from 1960 to 1974, when the government understood the educational delay of the country; and the last, until 1997, in which qualitative and quantitative transformations took place.

In the 1960's, under the dictatorship regime of Salazar, compulsory schooling increased from 4 (3 for girls) to 6 years, corresponding to primary education. In January of 1970 the Ministry of Education, Veiga Simão, tried to launch the foundations of a system that truly implemented compulsory and democratic schooling. He defended that education should be made available to all Portuguese in a meritocratic basis, in order to allow the more capable to integrate society's elite, independently of social-economic determinants. In 1973, a modern and democratic policy regarding the educational system is approved and *Instituto da Acção Social Escolar* (IASE) was created to give social support to those who had intellectual capacities and wanted to pursue their studies. However, this reform was never totally implemented due to limitations, such as the opposition of more conservative sectors in the political system, human and material resources, along with the beginning of the revolution in 1974 and the financial crisis of 77/78. After the 25th of April of 1974, a democratic state is implemented and the first measure taken was the standardization of compulsory schooling for all students, which comprised the first six years.

In 1975, the 1st cycle of *Curso Geral do Unificado* is created to unify high school and technical school. It included three mandatory grades (nowadays 7th, 8th, and 9th), being the first two years common to all, while the last one offered some electives. Three years later, two more grades were "added", which intended to continue vocational education started in 9th grade. High school was created in 1980, comprised of three grades, and only set as mandatory in 2012.

Basic Schooling as we know it today starts only in 1986. It is universal, compulsory and free, comprising 9 years and 3 sequential cycles. In this way, 7th, 8th and 9th grades are now part of the 3rd and last cycle of Basic education. During this adjustment Secondary Schools were already offering the three grades under study. When they become part of mandatory and Basic education Basic Schools start providing them as well, while Secondary Schools start offering high school. Therefore, this situation arose according to school needs and nowadays at least two types of schools offer 7th, 8th and 9th grades: Basic Schools, which offered from the 5th to the 9th, and Secondary Schools, from the 7th to the 12th grade. Additionally, many other combinations were possible and exist until today, but with smaller representation in "schools population", as one can see from the table1 below.

Table 1: School Types in MISI dataset

School Type (grades)	2006/07	2007/08	2008/08	2009/10	2010/11	2011/12	Total
Basic (5th-9th)	574	542	516	508	474	465	3079
Secondary (7th-12th)	287	262	253	259	248	248	1557
Integrated (1st-12th)	4	7	15	6	16	15	63
Partially Integrated (1st-9th)	92	104	116	125	129	142	708
Basic with high school (5th-12th)	80	106	112	128	132	143	701
Total	1037	1021	1012	1026	999	1014	6109

Independently of the school type, every student in the regular academic track needs to pass a Mathematics and a Portuguese national standardized exam in order to finish 9th grade and Basic School. Each exam has two calls, so a student failing in the first has the chance to retake it.

In 1991, in an experimental setting – that turned out to be permanent –, a new model of management of educational system appears: geographical sets of schools. In more recent years, these organizational sets – called *agrupamentos* – start combining grades within

schools of the set according to its needs, number of students and size of infrastructures for instance, leading to cases in which the primary school of a set offers classes until the 5th grade and the Basic School from the 6th to the 9th for example. Moreover, it is possible that the grades offered by each school change between academic years. All these events and possibilities must be taken into account when building the econometric framework.

III. School Effectiveness: a review of the Literature

As exposed in the previous sections, the present essay focuses on a question of effectiveness related to the provision of 7th, 8th and 9th grades by public schools. Effectiveness and efficiency of the education system are closely related. In an abstract sense, efficiency explains the relation between inputs and outputs in a production process. In contexts like the education setting, characterized by multiple inputs and outputs, a situation can be characterized as efficient when it is not possible to produce more of some output without reducing another. Hence, this concept is about the optimal use of resources, and an improvement in it leads to an improvement of society's welfare. Its indicators are thus economic in nature; public expenditure, expenditure by pupil or the level of education can be considered as such.

On the other hand, effectiveness has to do with the ability of school systems to achieve its institutional goals (F. Cornali 2012) as: "teaching general and abstract knowledge" and transmit "cognitive methods and thought patterns". Therefore, its indicators refer to observable outputs of the system and to achieved outcomes, such as the number of graduates in a given school year and students' test scores, respectively. Note that improving efficiency of the system and/or effectiveness of schools may yield high returns, since either a best allocation of inputs or better learning outcomes generates more human capital, which is a relevant factor for the success of modern societies. Contrarily,

inefficiency can be due to the lack of knowledge, in the sense that policy makers do not know what works best.

Many studies on school effectiveness focus on school size, school structure and autonomy. Although size is not a direct causal factor affecting school quality, it is indirectly related to academic outcomes through its relation with other variables. For instance, J. R. Slate and C. H. Jones (2005) revise several papers on the effects of this variable and point out the curvilinear relation between effectiveness and size[4], arguing that initially increasing school size may have positive effects in educational outcomes, but as size continues to rise the point of diminishing returns will be reached. The authors document the lack of consensus on the effect of school size on students' achievement, however when using grade level as a mediating variable Friedkin and Necochea (1988) found that large schools in California were associated with higher achievement for 12th grade students and smaller schools with better achievement for students in 3rd, 6th and 8th grades. Finally, larger schools seem to have teachers with higher qualifications, more special-education teachers and fewer teachers teaching out of their certified fields; while smaller schools have, on average, lower dropout rates and fewer disciplinary problems, higher attendance and graduation rates.

School size is also linked to accountability through parental involvement, since it is greater in smaller schools (Meier 1996; Walberg 1992). This increases monitoring of teaching staff performance by parents, making school accountable. Accountability may provide sufficient incentives for schools to improve performance, raise staff motivation and parental involvement through information dissemination and "name-and-shame" mechanisms. Actually, there is evidence of a positive correlation between parental-

[4] The authors also study the curvilinear relation between size and efficiency, exploiting the possibility of economies of scale in larger schools.

teacher relations and students' attainment (Thomas 1987). Another way to make schools accountable is through standardized tests, whose results are public, since in this way parents and police makers are able to identify over and underperforming schools.

Both Basic and Secondary Schools subject their 9th grade students to the same national standardized exams thus, if one type of school is in fact better than the other in preparing students for exams – e.g. uses a more effective teaching-to-the-test method –, accountability would be part of the driving mechanism, assuming parents' can choose schools. In what concerns school choice, according to Portuguese Law, students are allocated to the public school that is closest to their home or parents' workplace. Parents can only choose the school if the closest Basic and Secondary schools are equally near. Additionally, parents have developed mechanisms to go over this law when the latter situation does not occur.

Another intensely analyzed topic in school effectiveness literature is school structure, as mentioned before. School administrative structure, autonomy and accountability are usually accessed together in comparative studies, as different types of schools have different combinations of the three. S. Machin and O. Silva (2012) assess the effect of different school structures within the English education system – namely voluntary-controlled, voluntary-aided, foundation and community schools – on pupils' performance. These four structures differ in the composition of their school governing body, autonomy of students' admission and employment decision-making. There are similar studies for American charter schools and Swedish free-schools. The argument behind the positive impact of autonomy in educational attainment is the following: if schools are allowed to differentiate their curricula, students can choose the one that better satisfies their needs, and if parents can choose the school in which to enroll their children,

good schools will attract more students and expand, while the opposite will happen to underperforming schools. One should keep in mind that in public Portuguese schools there is virtually no autonomy of teacher allocation and rewarding; it only applies to private schools, which are out of the scope of this essay. Additionally, public schools follow a national program for each mandatory course; the only possibility to differentiate is in extra-curricular activities.

IV. Econometric Framework

The most used measure to compare school performance and assess the effects of school structure, size or even public *versus* private nature in the literature are test scores in standardized tests. Taking the latter into account, and given the data available, the more suitable measure to evaluate the effectiveness of each school type regarding the provision of 7^{th}, 8^{th} and 9^{th} grades is student performance in standardized national tests of Mathematics and Portuguese, which take place in the last year and evaluate all learning contents defined for the three grades. This measure is strongly influenced by contextual factors and students' prior level of achievement. For this reason, controls for family background, pupil's characteristics as gender, 1^{st} language and a measure of previous attainment should be included when using test scores as dependent variable. Moreover, between-school comparisons may be restricted to schools that operate in similar context, for example serving similar student populations. Then, district dummies corresponding to student residency area need to be introduced[5].

School specific characteristics will also be introduced, since there is evidence that they may have a significant impact on students' achievement. Hence, variables related to

[5] Portugal is divided into districts, which include municipalities, which in turn are constituted by parishes. It may be the case that at least one school of each type exists in the same municipality; but dummies for municipalities are not statistically significant, potentially due to the low variability and number of observations in each one. For this reason district dummies were used instead.

school size, proportion of girls, average teachers' education and experience in the school are included in the regression. Furthermore, a measure of peer effects will also be incorporated.

To account for the type of school providing educational services a dummy, *T*, that takes value 1 for Basic Schools and 0 for Secondary Schools was created. The value of the dummy can vary for the same school between academic years due to allocation decisions made by the geographic set to which each school belongs.

Ergo a first approach is to regress the following by OLS:

$$9^{th}score_{ihst} = \beta_0 + \beta_1 X_{ist} + \beta_2 6^{th}score_{ihst} + \beta_3 W_{st} + \beta_4 T_{st} + \delta t + u_{ihst},$$

where the dependent variable is student *i*'s score in exam *h* (either the Mathematics or Portuguese) at school *s* and academic year *t*; *X* is a set of student controls; 6^{th} *score* corresponds to the test score in either Mathematics or Portuguese 6th grade exam; *W* to a vector of school *s* characteristics at academic year *t*; *T* is the variable of interest that accounts for school type and *t* corresponds to academic year fixed effects. This last variable was included to account for the fact that exam questions, evaluation criteria and even contents[6] change between academic years as well as their difficulty[7].

The presented framework reveals how effective each school type was in preparing students for each exam, given pupils' observed features and allocation of available resources.

V. MISI Database and Descriptive Results

The more complete dataset available for the Portuguese educational system in what concerns students' and schools' characteristics is MISI – a micro database from *Direcção Geral de Estatística da Educação e Ciência* (DGEEC), made available by the Portuguese

[6] Mathematics contents taught in Basic education changed in the sample period, particularly in 2011/12.
[7] Between calls in the same academic year the only factor plausible to vary is difficulty.

Ministry of Education and Science. This dataset has information regarding public schools located in the mainland of Portugal for six academic years, from 2006/07 to 2011/2012. Regarding students' characteristics that may be used as controls, MISI provides six files, one for each academic year with students from all grades. As this essay focuses on the provision of three specific years, with the last corresponding to the end of Basic education, when students take their Mathematics and Portuguese national exams, the emphasis will be on 9th grade pupils. Moreover, students in both alternative and special-education tracks were excluded for comparability reasons, leaving only students in the regular academic track.

From each of the six files, variables regarding individual student features were built, namely: gender (1=male), if he has access to a computer and internet at home[8], if the student failed, abandoned or dropped out the 9th grade[8], if his mother tongue is Portuguese[8], his immigrant status[9], the number of times he failed grades before showing up in the dataset in 9th grade[10], the level of school subsidy received by the student[11] and the degree of family allowance, his parents' education[12], job market situation[13] and occupation[14]. Still for each academic year, variables as the proportion of girls in the school, school size, joint size of 7th, 8th and 9th grades along with its proportion in the whole school and size of 9th grade alone were computed for each school. Lastly, since

[8] 1=yes.

[9] Takes value 0 if the pupil and at least one of his parents are Portuguese, 1 or 2 if he is a 2nd or 1st generation immigrant, respectively.

[10] This variable was built by first calculating the student's age at the time he is on the 9th grade for the first time in the database (subtracting from the corresponding academic year the year in which he was born) and, after, subtracting 14 from its age. According to Portuguese Law governing compulsory schooling, a student who never repeated and was 6 years old by 15 September is 14 when reaches 9th grade; those who became 6 after 31 December have 15 when they get to 9th grade; and those who turn 6 in-between are either 14 or 15 in 9th grade, depending on their parents' decision. These possibilities were taken into account in the computation of grade repetition of each student given the month in which the student was born.

[11] 0=none, 1=low, 2=high. School subsidy level is intimately related to family allowance degree, which goes from 1 to 6 and the higher the degree, the bigger the allowance.

[12] 0=up to 9th grade, 1= high school or bachelor degree of 3 years, 2=undergraduate of 5 years or post-graduate of 1 or 2 years usually, 3= master degree or PhD.

[13] 0=unemployed, 1=stay at home parent, 2=student, 3=retired, 4=employee, 5=self-employed, 6=employer.

[14] 0=unknown or missing, 1=blue collar/low skilled, 2=blue collar/high skilled, 3=army, 4=white collar/low skilled, 5=white collar/high skilled.

there was no indication of school type already defined in the dataset, two variables indicating the highest and lowest grades offered by each school were created. Based on them it was possible to define which schools were (truly[15]) Basic and Secondary in each academic year. In this way, the situations created by schools' geographical sets do not interfere; newer, less representative grade combinations were excluded.

The next step was to append all six student treated files and match each observation to its test scores, which were provided by *Júri Nacional de Exames* (JNE). The latter database had information on Mathematics and Portuguese tests scores[16] from national exams conducted in 9th and 6th grades. The first pair of test scores, regarding 9th grade, was used as dependent variable to measure effectiveness of each school type and the second pair to control for past achievement, since education is a cumulative process. Furthermore, note that, even though 6th grade exam was implemented in 2001, data on that is only available after 2006. As a result only students from the last three academic years – 2009/10, 2010/11 and 2011/12 – have these test scores available in JNE database.[17]

At this point only school characteristics are missing. MISI provides teachers' characteristics in a separate file, such as teacher's gender, education[18], seniority in days, weekly load of teaching and study support[19] (in some cases, divided by cycles[20]) and, of course, the school to which they were allocated. Ergo, averages were taken across teachers of the same school, with the condition that they had a lecture schedule assigned.

[15]In the sense that only offered from the 5th to the 7th grades or from the 7th to the 12th.
[16] For the 9th grade the score goes from 0 to 100; for 6th grade from 1 to 5.
[17] The data is then restricted to students who took the 6th grade exam and for who the score is available. The proportion of repeaters in the two types of schools under analysis, before and after imposing this restriction, are very similar hence not only students that failed in past years are erased, preserving sample constitution.
[18]Initially this variable had 23 categories that were summarized into 5: 0=none, 1=up to 9th grade, 2=up to high school, 3=bachelor degree of three years, 4=undergraduate of five years or post-graduate of one or two years, 5=master degree or PhD. Only the highest and more recent education was included for each teacher.
[19]Notice that students' weekly load of classes of each course is centrally determined, so that all students have the same weekly load of each course in all schools. However, teachers' load is defined inside a range according to school needs, varying between teachers.
[20] Cycle 0 corresponds to pre-school, 1st cycle to primary school, 2nd cycle to 5th and 6th grades, 3rd cycle to 7th, 8th and 9th grades and finally high school to 10th, 11th and 12th grades.

This procedure allowed the creation of aggregate measures by school that could be matched to each school in the already built students' dataset. Other variables were created as relative study support to the 3rd cycle[21]; the proportion of teachers with bachelor, undergraduate or master degree in the school as well as average years of experience of teachers by school.

Finally, the students' database was matched with school characteristics. Thus, the sample is constituted by 9th grade students, who attended school in the mainland of Portugal, in the regular academic track between 2009 and 2012 and took the 6th grade national tests in 2006 or after. The sample size is 289.139 students: 105.826 in Secondary Schools and 183.313 in Basic Schools.

At this stage it becomes possible to compare Basic and Secondary Schools in terms of size, students' and average teachers' characteristics, among others[22]. Starting with the dependent variable of the model, the average score of the 9th grade national exam is higher in Secondary Schools comparatively to Basic for both Mathematics and Portuguese, by 2 points; however standard deviations are lower for Basic Schools. Tests for difference in means were performed and the null of equality of average scores between the two school types was rejected for all usual significance levels.

The control used for prior achievement – standardized 6th grade test score – has a higher average for students in Secondary Schools and, even significant at usual levels, the difference between the two school types is marginal.

In what concerns family background, average parents' education is higher for students in Secondary Schools and less students seem to have unemployed parents. Accordingly, the

[21]This variable was calculated by dividing "total weekly hours of support provided by the school" by "the number of students in 7th, 8th and 9th grades". Total hours of study support in each school is the sum of each teacher's weekly contribute.

[22] Descriptive statistics in appendix I.

average of school subsidy, which is related to family income, is higher in Basic Schools and this difference is statistically different from zero at usual significance levels. From the previous analysis one can infer that Secondary Schools have students with "better endowments", who also have higher scores in national exams.

Gender distribution, and consequently proportion of girls, is very similar between the two school types. Secondary Schools have more students in the 3rd cycle and 9th grade than Basic. As mentioned before, smaller schools tend to favor parental involvement. Teachers' average education and experience is higher in Secondary Schools, namely the proportion of teachers with a master or PhD degree is bigger.

VI. Production Function

When looking at the available literature one realizes that there is little consensus regarding the effect of some inputs on students' performance. Therefore, in order to provide some guidelines towards the expected signs of different inputs used in the model and exposed in the previous section, a production function estimated by Pereira (2010) using 2006 PISA data for Portugal is presented. The choice of this paper instead of another relates to its timeliness, the use of data for Portugal and the similarity between the dependent variables used, as well as the possible independent variables.

Pereira (2010) concludes on some of the most important determinants of attainment in Portugal, namely students' characteristics, as female gender, which has a negative impact for Mathematics and positive for reading tests. Relatively to family background, Pereira settles the positive effect of a home environment propitious to learning, the significant role of parents' occupations, especially for white collar/high skilled workers and the negative impact of being an immigrant.

Regarding school characteristics, he emphasizes the positive effect of school size – suggesting the existence of economies of scale – and proportion of girls on outcomes and the negative impact of repeaters. The usual employed variables to measure school resources, as average class size and student/teacher ratio do not appear to be significant inputs in the Portuguese education production function, as in most studies.

Finally in the mentioned study, grade amplitude – calculated as the difference between the maximum and the minimum grades offered by the school – has a positive and significant impact at 10% significance level for Portuguese students taking PISA's reading test; though no impact was observed for Mathematics tests.

VII. Results

Based on the general regression presented in Section IV and on the exposed in the previous section, several combinations of variables were tried, namely interchanging: 3rd cycle size with 9th grade size; parents' job situation and occupation; immigrant status and if Portuguese was the pupil's mother tongue; level of school subsidy and degree of family allowance. Additionally, variables that had no explanatory power, such as the proportion of girls in the 9th grade, were excluded from the regression. In the end, two very similar specifications proved to work best, one for each dependent variable – Mathematics and Portuguese scores. A summarized regression table is presented below[23] and the subsequent analysis should be understood in *ceteris paribus*. Regressions 1 and 3 have no school specific characteristics; these were only added in regressions 2 and 4 for Portuguese and Mathematics test scores, respectively.

[23]A complete table is presented in appendix II.

Table 2: Main Results

Test Scores:	Portuguese		Mathematics	
Variable	(1)	(2)	(3)	(4)
gender (0=female)	-3.779**	-3.756***	-0.688***	-0.724***
computer (0=no access)	0.806***	0.746***	-	-
internet (0=no access)	-	-	1.572***	1.531***
school subsidy (0=none)				
low	-1.036***	-0.818***	-1.516***	-1.486***
high	-1.763***	-1.438***	-2.71***	-2.388***
immigrant (0=native)				
2nd gen.	-1.547***	-1.486**	-2.149***	-2.795***
1st gen.	-0.818**	-1.037**	-0.704	-0.888
father job situation (0=unemployed)				
stay-at-home	0.387	-0.081	-2.331	-2.518
student	-0.107	0.607	-4.699*	-5.282*
retired	0.580	0.644	1.236***	1.116*
employed	0.503**	0.536**	1.213***	1.133***
self-employed	0.808***	0.79***	1.827***	1.689***
employer	0.573*	0.646**	2.11***	2.042***
father education (0=up to 9th grade)				
up to high school or bachelor	1.595***	1.492***	1.864***	1.952***
undergraduate or post-graduate	4.324***	4.103***	5.819***	5.94***
master degree or PhD	5.455***	5.046***	6.885***	6.887***
mother job situation (0=unemployed)				
stay-at-home	0.44**	0.57***	1.273***	1.294***
student	0.091	0.463	1.266	1.696
retired	0.359	0.048	-1.200	-1.234
employed	0.54***	0.576***	1.199***	1.272***
self-employed	0.376	0.487*	1.787***	1.897***
employer	0.736**	0.865**	2.021***	2.133***
mother education (0=up to 9th grade)				
up to high school or bachelor	1.92***	1.807***	1.773***	1.728***
undergraduate or post-graduate	5.422***	5.264***	6.452***	6.481***
master degree or PhD	5.92***	5.593***	7.254***	7.258***
grade repetition	-3.711***	-3.726***	-3.494***	-3.407***
6th grade Portuguese score	12.148***	12.113***	-	-
6th grade Math score	-	-	15.728***	15.751***
average teacher experience	-	0.017	-	0.612***
average teacher experience squared	-	-	-	-0.019***
average teacher education	-	1.212***	-	2.533***
average school subsidy	-	-2.98***	-	-1.752***
9th grade size	-	-0.004***	-	-0.006***
T (1=Basic, 0=Secondary)	0.382***	0.555***	1.058***	1.437***

reference groups in parenthesis

District and academic years dummies used
using heteroskedasticity robust standard errors
*p-value<=0,1 **p-value<=0,05 ***p-value<=0,01

1. Students' characteristics

When analyzing the results one can see that, on average, boys have worse grades than girls for both subjects, though for Portuguese the difference is more pronounced.

Specific district effects also play a role, since almost all their coefficients are statistically significant for both 9th grade exams. The district chosen as baseline was the one with median test score closer to the population median, Lisbon.

An interesting result is related to pupil's immigrant status. A 2nd generation immigrant has, on average, a lower score in Mathematics exam compared to a native student; however, a 1st generation immigrant has a Mathematics proficiency level similar to a native, as the coefficient is not significantly different from zero at usual levels. In the Portuguese exam the reverse occurs, the coefficient is only statistically significant and negative for a 1st generation immigrant, while 2nd generation immigrant students seem to have, on average, a fairly equal score to a native student. The last situations suggests that the negative effect of the status attenuates, for Portuguese test scores, as students and their families have lived longer in the country.

Grade repetition, which stands for the number of times the students failed grades in past academic life, has a negative (and significant for all usual levels) coefficient with a magnitude of over 3.4 values out of 100 for each failed year. Another variable with a strong effect is the test score of the 6th grade Mathematics (Portuguese) exam, 15.75 (12.1) values. Bear in mind that 6th grade scores go from 1 to 5, thus an increase of 1 in this exam implies a considerable improvement.

2. Family background

Parents' education constitutes one of the most relevant variables in what concerns family background. It is positively correlated to the dependent variable and statistically different from zero for all usual significance levels. The latter control is related to parents' job occupation, with a correlation of about 0.2794 and 0.0749 for mother's and father's education, respectively. Being a stay-at-home father, comparatively to being unemployed, has no effect in pupil's attainment; contrarily, a stay-at-home mother has a positive effect. Going up in the scale, a more pronounced effect emerges for both parents' job situations.

Following Pereira (2010), parents' job situation was, in an alternative model[24], substituted by parents' occupation, with a Spearman correlation coefficient with parents' qualifications of approximately 0.5. As one moves up in the breakdown of parental occupation a positive effect on pupil's test scores emerges, particularly for white-collar/high skilled[25] parents.

School subsidy is related to family income and, as expected, the higher the degree of subsidy, the lower the grade of the student, on average, *cp.* and the coefficient is even lower for the Mathematics exam.

3. School Characteristics

Average teachers' education and 9th grade size are significant for both Mathematics and Portuguese scores, the first with a positive influence and the second with a negative and marginal effect. Average teachers' experience, as well as squared experience, have a significant and positive effect for Mathematics, but no effect for Portuguese. The reason

[24]The table for this regression is in appendix II. All coefficients are similar and only parents' job situation was substituted.
[25]For the Portuguese exam a dummy for white-collar was used instead of the usual categorical variable for parental occupation, as no difference appeared to exist between high and low skilled inside each collar category. Results are consistent with the exposed.

behind this result may be related to the higher difficulty associated with the first course, on average – national Mathematics averages are lower than Portuguese ones. Hence, a teacher with more years of experience has, in principle, developed teaching skills that enhance students' comprehension of the contents, namely skills that translate into a higher value added in the study of Mathematics comparatively to Portuguese.

In addition, the average school subsidy received by students in 9th grade at each school was included to control for peer effects. Its sign suggests that the larger the number of students receiving it and the higher the degree of the subsidy, the lower the score achieved. A higher average of this variable is related to poorer 9th grade population and, even, poorer neighborhoods in which the school may be located.

Finally, the coefficient of interest has a positive sign, which is almost the triple for Mathematics relatively to Portuguese scores and significant at all usual levels. Therefore, one can conclude that, even though Basic Schools have students with worst backgrounds and prior achievement, as showed in Section V, this type of school has a bigger added value to their students than Secondary Schools. When comparing its coefficient between the regressions with and without school characteristics is clear that the impact increases. The last result suggests that, although Secondary Schools have teachers with higher qualifications and experience – which have a positive effect in the pupil's test score – their value added to students is smaller, hence the effect of attending a Secondary School decreases relatively to frequent a Basic School. The same is to say that the effect of going to a Basic School increases.

Nonetheless, the coefficient of interest remains significant, thus non-measurable factors are still in place. They may be related to the way teachers and school staff interact with students, as well as the fact that in Basic Schools 3rd cycle pupils are mixed with younger

colleagues from 5th and 6th grades, while in Secondary Schools they interact with older students. The latter fact is associated with exposure to risky behavior and more autonomy granted to students. For instances, Basic Schools have a stricter "entrance and exiting the school" policy during class time along with a bigger absenteeism control and report to pupil's parents his missing days. As a result parental involvement may on average tend to be greater, straightening parent-teacher relations, bonding their educational goals, which has a positive effect on students' attainment as argued by Berlin and Cienkus (1989). Moreover, 9th grade in a Basic School constitutes the end of a student's life in that institution, while in Secondary Schools the 9th grade is no more than a transition to a more relevant cycle – high school. To finish, students face a transitional environment when switching from Basic to Secondary Schools in 7th grade, while the environment and staff is the same when they do not change schools between cycles, making the transition smoother. This may suggest why Basic Schools are more effective than Secondary ones. Furthermore, in order to investigate if Basic School effectiveness affects all students in the same way, especially the ones in the tails, a Quantile regression was performed in each quartile. A table with the coefficient of interest is presented below.[26]

Table 3: Quantile Regression Results

	Whole Sample	Q1	Median	Q3
		Math Test Scores		
T	1.437	1.530	1.613	1.286
$CI^{95\%}$	[1.087301;1.786391]	[1.074727;1.985285]	[1.174427;2.051537]	[0.7995818;1.771806]
		Portuguese Test Scores		
T	0.555	0.836	0.429	0.447
$CI^{95\%}$	[0.2945939;0.8150754]	[0.4793755;1.192531]	[0.0960622;0.7624965]	[0.0807577;0.8131696]

[26] The whole regression is in appendix III. Results for remaining variables are very similar to the ones in the main regression.

All coefficients are statistically significant at usual levels and there is evidence that, for the Portuguese exam, the students' quartile that benefits the most from being in a Basic School, comparatively to a Secondary, is the lowest. Therefore, students with worst prior conditions, as parents with lower education, with inferior grades in the 6th grade exam and so forth seem to be the ones that gain the most from attending a Basic School. On the other hand, for Mathematics, the pupils that apparently benefit the most are the ones around the second quartile. Nevertheless, students in the first quartile are also associated with a higher point estimate than the one for the whole sample. Given the 95% Confidence Interval, it is not possible to argue that the population's effect varies for each quartile.

VIII. Limitations and Further Research

The data was cleaned[27] and organized, however coding errors are natural in data of this kind, as its construction behaves as the one in the survey data. Fortunately, given the large sample size, one may agree that in most cases there are no recording problems and that possible implications are negligible.

In addition to the work presented in this essay, effectiveness of other school types that also provide 7th, 8th and 9th grades may be evaluated in comparison to Basic Schools, as fully integrated schools (offer from the 1st to the 12th grade), partially integrated (teach from the 1st to the 9th) and Basic Schools with high school (provide from the 5th to the 12th grade). The last type combines Basic and Secondary Schools and, hence, it may be interesting to analyze if this school type takes advantage of the best features of each type analyzed previously. Note that other grade combinations are possible and exist due to decisions made by geographic school sets, as mentioned before, but those combinations tend to be very volatile, making its evaluation difficult.

[27] Some elementary checks, as descriptive and summary statistics, were analyzed in order to ensure that variables were defined in proper intervals and scale. Some listwise deletion has to be performed as well.

Another possible extension to the analysis performed is to follow each student up to the end of Secondary School and see if there are systematic differences across 12th grade national test scores between students who attended a Basic School during 7th, 8th and 9th grades and the ones that did not go through this change and started already their 3rd cycle in a Secondary School. To push even further, one could trace these students after they enter the labor market and see if, in fact, their wages have significant differences.

As a final point, it is still necessary to understand which factors make Basic Schools indeed more effective. Some possibilities were pointed out, but a deeper analysis is necessary. This may be developed alongside with other fields that also study teacher-student-parent interaction, as Psychology and Sociology, since these two disciplines share some points of interest regarding education with Economics, such as measuring scholastic performance, analyzing the education production process and formulating educational policies.

IX. Conclusions

There are different types of schools providing lower secondary education in Portugal. Particularly in large cities students can make lower Secondary Schooling on Basic Schools or move to Secondary Schools with lower secondary level. This situation arose organically, as mandatory schooling increased in later decades of the 20th century.

The purpose of this essay was to analyse whether there are systematic and significant differences in the performance of the students of these two different schools, as a first look at this particular situation. In case they exist, two possible driving mechanisms may be in place: teachers' and students' characteristics. The first one comprises teachers' quality, their teaching-to-the-test approach, the degree of demanding requirements, among others. The second is related to pupil's family background, home environment,

innate ability, autonomy and responsibility and how they interacted with younger or older colleagues.

To study this question, standardized test scores of national exams performed by 9th grade Portuguese pupils were collected for three academic years, as the *ultimate criterion for assessing the effectiveness of any school reform is the extent to which it improves actual academic achievement* (Hanushek 1986). The analysis of the descriptive statistics led to the conclusion that Secondary Schools have better teachers as well as students, which are positively correlated to test scores. However, when test scores from standardized exams were regressed in a binary variable that accounted for school type, controlling for pupils' and schools' characteristics, going to a Basic School comparatively to attending a Secondary School was beneficial for students, enhancing his performance in both Portuguese and Mathematics exams. The main conclusion is, then, that systematic differences exist between Basic and secondary Schools. Some possible explanations were brought forward: the different way the two school types face students in 9th grade, the way teachers and school staff interact with them and the degree of students' autonomy may play an important role in explaining this differences. Further research is needed to conclude on the non-measured determinants of Basic School effectiveness, which may involve inside-school data collection.

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Appendix I: Descriptive Statistics

Table 4: Test Scores - Descriptive Statistics

Mathematics exam scores

School Classification	Obs.	Mean	Std. Dev.	Min	Max
Secondary Schools (SC)	33653	49.401	24.603	0	100
Basic Schools (BC)	60184	47.148	23.566	0	100

Portuguese exam scores

School Classification	Obs.	Mean	Std. Dev.	Min	Max
Secondary Schools (SC)	33781	55.717	16.782	0	100
Basic Schools (BC)	60231	54.046	16.473	1	100

Table 5: Schools summary statistics - Controls

	Secondary			Basic		
	Obs.	Mean	Std. Dev.	Obs.	Mean	Std. Dev.
size of 3rd cycle	105818	370.211	153.502	183313	345.937	129.235
size of 9th grade	105818	118.870	47.937	183313	103.388	42.163
proportion of girls in 9th grade	105818	0.507	0.059	183313	0.513	0.060
range*	105818	6	0	183313	5	0
% teachers that only lecture 3rd cycle	105818	0.169	0.074	183313	0.374	0.079
weekly hours of support to 3rd cycle	101362	0.022	0.029	162559	0.004	0.021
relative support to 3rd cycle**	39449	0.000076	0.000140	62440	0.000012	0.000062
average teacher education***	101362	3.027	0.058	162559	2.936	0.058
teachers with bachelor degree	101362	0.053	0.033	162559	0.093	0.042
% teachers with undergraduate degree	101362	0.846	0.050	162559	0.835	0.053
% teachers with masters or PhD	101362	0.090	0.038	162559	0.053	0.024
average teachers experience****	101362	17.855	2.694	162559	16.503	2.680
average teacher experience squared	101362	431.422	99.543	162559	385.047	99.650

*nº of grades taught in the school

**see foot note 20

***highest and latest degree reported by the teacher; see foot note 17

****in years

Table 6: Students summary statistics - Controls

	Secondary			Basic		
	Obs.	Mean	Std. Dev.	Obs.	Mean	Std. Dev.
Female Gender	105 818	0.483	0.500	183313	0.471	0.499
Immigrant	105818	0.048	0.281	183313	0.064	0.331
Portuguese 6th grade score	105818	3.469	0.665	183313	3.398	0.651
Math 6th grade score	105818	3.303	0.842	183311	3.209	0.820
% Failed 6th grade math exam	105818	0.125	0.330	183313	0.140	0.347

% Failed 6th grade portuguese exam	105818	0.013	0.111	183313	0.016	0.126
% Failed 9th grade	105818	0.083	0.276	183313	0.090	0.286
% Abandoned school	105818	1.89E-05	0.004	183313	3.27E-05	0.006
% Absenteeism	105818	1.89E-05	0.004	183313	0.000	0.000
Grade repetition*	105818	0.210	0.554	183313	0.216	0.555
Has access to computer at home	105818	0.781	0.414	183313	0.810	0.393
Has access to internet at home	105818	0.694	0.461	183313	0.657	0.475
Degree of family allowance**	105 818	0.674	1.045	183313	0.969	1.135
Degree of school subsidy**	105818	0.453	0.734	183313	0.604	0.795
Guardian's education***	87 695	0.930	0.784	165325	0.722	0.732
Father's education***	83650	0.794	0.770	157170	0.604	0.702
Mother's education***	87405	0.912	0.783	164194	0.700	0.730
Guardian's occupation#	105 448	2.413	2.077	183145	2.398	1.952
Father's occupation#	103 381	2.444	1.938	179217	2.448	1.747
Mother's occupation#	104 836	2.412	2.080	181871	2.344	1.966
Guardian's job situation##	86 777	3.434	1.476	168915	3.315	1.562
Father's job situation##	82 136	4.000	1.053	159266	3.983	1.114
Mother's job situation##	86 308	3.335	1.530	167119	3.201	1.611
Guardian is unemployed	105 448	0.160	0.367	183147	0.215	0.411
Father is unemployed	103 381	0.039	0.194	179217	0.049	0.217
Mother is unemployed	104 836	0.185	0.388	181871	0.245	0.430

*see foot note 9

**see foot note 10

***see foot note 11

#see foot note 14

##see foot note 12

Appendix II: Main Regressions

Table 7: Main Regression

Test Scores:	Portuguese		Mathematics	
	R-squared	0.442	R-squared	0.5093
Variable	coeff.	p-value	coeff.	p-value
gender (0=female)	-3.756	0.000	-0.724	0.000
computer (0=no access)	0.746	0.000		
internet (0=no access)			1.531	0.000
district (Lisbon)				
oversea	2.441	0.515	-5.309	0.282
Aveiro	1.848	0.000	3.461	0.000
Beja	-1.237	0.031	1.990	0.008
Braga	1.468	0.000	3.990	0.000
Bragança	0.623	0.283	1.993	0.013
Castelo Branco	1.938	0.000	2.282	0.001
Coimbra	2.430	0.000	4.122	0.000
Évora	-0.411	0.399	-2.542	0.000
Faro	-1.783	0.000	0.085	0.815
Guarda	0.358	0.389	3.443	0.000
Leiria	0.540	0.048	2.586	0.000
Portalegre	-1.447	0.001	-4.162	0.000
Porto	1.375	0.000	2.402	0.000
Santarém	-0.280	0.298	1.307	0.000
Setúbal	-1.737	0.000	-1.296	0.000
Viana do Castelo	1.936	0.000	6.197	0.000
Vila Real	-0.351	0.338	2.358	0.000
Viseu	2.146	0.000	3.685	0.000
school subsidy (0=none)				
low	-0.819	0.000	-1.486	0.000
high	-1.438	0.000	-2.388	0.000
immigrant (0=native)				
2nd gen.	-1.486	0.015	-2.795	0.000
1st gen.	-1.037	0.013	-0.888	0.105
father job situation (0=unemployed)				
stay-at-home	-0.081	0.975	-2.518	0.412
student	0.607	0.785	-5.282	0.058
retired	0.644	0.142	1.116	0.066
employed	0.536	0.024	1.133	0.000
self-employed	0.790	0.004	1.689	0.000
employer	0.646	0.047	2.042	0.000
father education (0=up to 9th grade)				
up to high school or bachelor	1.492	0.000	1.952	0.000
undergraduate or post-graduate	4.103	0.000	5.940	0.000
master degree or PhD	5.046	0.000	6.887	0.000
mother job situation (0=unemployed)				
stay-at-home	0.557	0.009	1.294	0.000
student	0.463	0.725	1.696	0.286
retired	0.048	0.939	-1.234	0.158
employed	0.576	0.002	1.272	0.000

self-employed	0.487	0.067	1.897	0.000
employer	0.865	0.025	2.133	0.000
mother education (0=up to 9th grade)				
up to high school or bachelor	1.807	0.000	1.728	0.000
undergraduate or post-graduate	5.264	0.000	6.481	0.000
master degree or PhD	5.593	0.000	7.258	0.000
grade repetition*	-3.726	0.000	-3.407	0.000
6th grade Portuguese score	12.113	0.000		
6th grade Math score			15.751	0.000
academic year (2009/10)				
2010/11	-10.028	0.000	-14.822	0.000
2011/12	16.679	0.000	12.472	0.000
average teacher experience	0.017	0.429	0.612	0.000
average teacher experience squared	-	-	-0.019	0.000
average teacher education	1.212	0.057	2.533	0.004
average school subsidy	-2.980	0.000	-1.752	0.000
9th grade size	-0.004	0.001	-0.006	0.001
T (1=Basic, 0=Secondary)	0.555	0.000	1.437	0.000
constant	24.515	0.000	-16.069	0.000

reference groups in parenthesis

using heteroskedasticity robust standard errors

*number of times a student failed

Table 8: Alternative Regression (to be continued)

Mathematics Test Scores (9th grade)			R-squared	0.5096
Variable	coeff.	sd.dev.	t-stat	p-value
gender (0=female)	-0.686	0.127	-5.400	0.000
internet (0=no access)	1.447	0.143	10.140	0.000
district (Lisbon)				
oversea	-6.361	4.271	-1.490	0.136
Aveiro	3.651	0.286	12.780	0.000
Beja	1.902	0.729	2.610	0.009
Braga	3.916	0.263	14.900	0.000
Bragança	1.426	0.774	1.840	0.065
Castelo Branco	2.548	0.637	4.000	0.000
Coimbra	4.227	0.378	11.180	0.000
Évora	-2.563	0.612	-4.190	0.000
Faro	0.003	0.351	0.010	0.994
Guarda	3.599	0.572	6.290	0.000
Leiria	2.729	0.362	7.540	0.000
Portalegre	-3.833	0.533	-7.200	0.000
Porto	2.348	0.229	10.270	0.000
Santarém	1.432	0.342	4.190	0.000
Setúbal	-1.313	0.278	-4.720	0.000
Viana do Castelo	6.171	0.528	11.700	0.000

Vila Real	2.610	0.472	5.530	0.000
Viseu	3.865	0.367	10.520	0.000
school subsidy (0=none)				
low	-1.406	0.182	-7.740	0.000
high	-2.476	0.197	-12.560	0.000
immigrant (0=native)				
2nd gen.	-2.689	0.734	-3.670	0.000
1st gen.	-0.505	0.509	-0.990	0.321
father occupation				
blue collar/low skilled	0.112	0.263	0.430	0.671
blue collar/high skilled	0.503	0.241	2.090	0.037
white collar/ low skilled	1.039	0.256	4.050	0.000
white collar/ high skilled	1.809	0.268	6.760	0.000
father education (0=up to 9th grade)				
up to high school or bachelor	1.609	0.175	9.200	0.000
undergraduate or post-graduate	4.901	0.293	16.700	0.000
master degree or PhD	5.575	0.579	9.630	0.000
mother occupation				
blue collar/low skilled	-0.216	0.239	-0.900	0.367
blue collar/high skilled	0.374	0.251	1.490	0.136
white collar/ low skilled	0.485	0.183	2.660	0.008
white collar/ high skilled	1.536	0.250	6.150	0.000
mother education (0=up to 9th grade)				
up to high school or bachelor	1.506	0.177	8.510	0.000
undergraduate or post-graduate	5.618	0.281	20.020	0.000
master degree or PhD	6.101	0.615	9.920	0.000
grade repetition*	-3.426	0.139	-24.600	0.000
6th grade Mathematics score	15.728	0.081	194.340	0.000
academic year (2009/10)				
2010/11	-14.897	0.132	-112.890	0.000
2011/12	12.334	0.616	20.020	0.000
average teacher experience	0.637	0.101	6.310	0.000
average teacher experience squared	-0.020	0.003	-7.100	0.000
average teacher education	2.064	0.838	2.460	0.014
average school subsidy	-1.613	0.393	-4.100	0.000
9th grade size	-0.006	0.002	-3.510	0.000
T (1=Basic, 0=Secondary)	1.453	0.172	8.470	0.000
constant	-12.140	4.360	-2.780	0.005

reference groups in parenthesis
using heteroskedasticity robust standard errors
*number of times a student failed

Table 8: Alternative Regression (continued)

Portuguese Test Scores (9th grade)				R-squared 0.5096
Variable	coeff.	sd.dev.	t-stat	p-value
gender (0=female)	-3.772	0.115	-32.750	0.000
computer (0=no access)	0.816	0.158	5.180	0.000
district (Lisbon)				
oversea	-1.361	4.201	-0.320	0.746
Aveiro	2.054	0.246	8.350	0.000
Beja	-1.527	0.649	-2.350	0.019
Braga	1.768	0.230	7.680	0.000
Bragança	1.228	0.691	1.780	0.076
Castelo Branco	1.886	0.551	3.420	0.001
Coimbra	3.098	0.322	9.620	0.000
Évora	-0.115	0.536	-0.220	0.830
Faro	-1.846	0.293	-6.300	0.000
Guarda	1.078	0.478	2.250	0.024
Leiria	0.783	0.308	2.540	0.011
Portalegre	-1.405	0.472	-2.970	0.003
Porto	1.541	0.203	7.590	0.000
Santarém	0.014	0.306	0.050	0.963
Setúbal	-1.607	0.240	-6.710	0.000
Viana do Castelo	2.585	0.463	5.580	0.000
Vila Real	-1.013	0.463	-2.190	0.029
Viseu	2.720	0.337	8.070	0.000
school subsidy (0=none)				
low	-0.771	0.162	-4.770	0.000
high	-1.597	0.199	-8.040	0.000
immigrant (0=native)				
2nd gen.	-1.176	0.738	-1.590	0.111
1st gen.	-1.071	0.485	-2.210	0.027
father education				
up to high school or bachelor	1.040	0.155	6.700	0.000
undergraduate or post-graduate	3.452	0.244	14.180	0.000
master degree or PhD	4.732	0.502	9.420	0.000
mother education (0=up to 9th grade)				
up to high school or bachelor	1.463	0.162	9.050	0.000
undergraduate or post-graduate	4.729	0.229	20.630	0.000
master degree or PhD	5.137	0.531	9.680	0.000
white collar mother	0.800	0.160	5.000	0.000
white collar father	1.060	0.144	7.340	0.000
grade repetition*	-3.710	0.138	-26.810	0.000
6th grade portuguese score	12.044	0.100	121.040	0.000

academic year (2009/10)				
2010/11	-10.073	0.118	-85.490	0.000
2011/12	16.394	0.557	29.430	0.000
average teacher experience	-0.022	0.026	-0.830	0.407
average teacher education	2.029	1.048	1.940	0.053
average school subsidy	-2.581	0.360	-7.170	0.000
9th grade size	-0.004	0.002	-2.240	0.025
T (1=Basic, 0=Secondary)	0.541	0.161	3.370	0.001
constant	25.354	3.364	7.540	0.000

reference groups in parenthesis

using heteroskedasticity robust standard errors

*number of times a student failed

Appendix III: Quantile Regressions

Table 9: Quantile Regression Results (to be continued)

Math Test Scores						
	Q1		Median		Q3	
Variable	coeff.	p-value	coeff.	p-value	coeff.	p-value
gender (0=female)	-0.676	0.000	-0.755	0.000	-0.667	0.000
internet (0=no access)	1.650	0.000	1.625	0.000	1.357	0.000
district (Lisbon)						
oversea	-2.141	0.871	-3.338	0.000	-1.539	0.941
Aveiro	3.459	0.000	3.526	0.000	3.629	0.000
Beja	3.806	0.000	1.341	0.168	2.707	0.005
Braga	4.338	0.000	3.870	0.000	3.775	0.000
Bragança	1.442	0.165	2.510	0.083	3.456	0.006
Castelo Branco	2.764	0.009	2.166	0.013	2.990	0.000
Coimbra	4.399	0.000	4.184	0.000	4.010	0.000
Évora	-3.158	0.002	-2.977	0.000	-2.935	0.001
Faro	0.265	0.603	-0.067	0.874	-0.181	0.703
Guarda	3.979	0.000	3.230	0.000	3.586	0.000
Leiria	2.921	0.000	2.315	0.000	2.266	0.000
Portalegre	-2.848	0.000	-4.966	0.000	-4.814	0.000
Porto	2.523	0.000	2.631	0.000	2.414	0.000
Santarém	1.759	0.000	1.096	0.016	1.122	0.027
Setúbal	-1.376	0.000	-1.677	0.000	-1.513	0.000
Viana do Castelo	7.297	0.000	6.767	0.000	6.050	0.000
Vila Real	2.749	0.000	1.717	0.003	2.357	0.000
Viseu	3.587	0.000	3.718	0.000	3.750	0.000
school subsidy (0=none)						
low	-1.717	0.000	-1.663	0.000	-1.090	0.000
high	-2.664	0.000	-2.572	0.000	-2.190	0.000
immigrant (0=native)						
2nd gen.	-1.413	0.000	-3.151	0.001	-3.674	0.002
1st gen.	-1.401	0.007	-0.667	0.395	0.048	0.933
father job situation (0=unemployed)						
stay-at-home	-1.371	0.623	-5.176	0.108	-3.400	0.005
student	-6.513	0.455	-4.839	0.473	-4.324	0.337
retired	0.900	0.197	1.049	0.148	1.085	0.179
employed	1.350	0.001	1.086	0.008	1.162	0.019
self-employed	1.858	0.000	1.758	0.000	1.668	0.002
employer	2.361	0.000	1.977	0.000	2.303	0.000
father education (0=up to 9th grade)						
up to high school or bachelor	2.000	0.000	1.808	0.000	2.051	0.000
undergraduate or post-graduate	6.873	0.000	5.678	0.000	5.335	0.000
master degree or PhD	7.730	0.000	6.420	0.000	6.660	0.000
mother job situation (0=unemployed)						
stay-at-home	1.228	0.000	1.807	0.000	1.287	0.005
student	2.559	0.490	1.966	0.399	1.660	0.478
retired	-1.381	0.067	-1.420	0.298	-1.511	0.319
employed	1.507	0.000	1.614	0.000	1.139	0.004
self-employed	1.896	0.000	2.108	0.000	2.046	0.000

employer	3.281	0.000	2.189	0.000	1.395	0.045
mother education (0=up to 9th grade)						
up to high school or bachelor	1.438	0.000	2.261	0.000	1.922	0.000
undergraduate or post-graduate	7.388	0.000	7.489	0.000	5.950	0.000
master degree or PhD	8.891	0.000	8.372	0.000	6.414	0.000
grade repetition*	-2.186	0.000	-3.370	0.000	-4.866	0.000
6th grade Math score	16.146	0.000	16.712	0.000	15.859	0.000
academic year (2009/10)						
2010/11	-15.915	0.000	-15.415	0.000	-14.242	0.000
2011/12	13.209	0.000	9.616	0.000	9.749	0.000
average teacher experience	0.576	0.000	0.709	0.000	0.586	0.000
average teacher experience squared	-0.017	0.000	-0.022	0.000	-0.020	0.000
average teacher education	1.824	0.114	2.910	0.008	2.294	0.052
average school subsidy	-1.746	0.001	-2.094	0.000	-2.003	0.000
9th grade size	-0.007	0.004	-0.009	0.000	-0.007	0.002
T (1=Basic, 0=Secondary)	1.530	0.000	1.613	0.000	1.286	0.000
constant	-25.917	0.000	-21.479	0.000	-2.269	0.714

reference groups in parenthesis

using heteroskedasticity robust standard errors

*number of times a student failed

Table 9: Quantile Regression Results (continued)

Portuguese Test Scores						
	Q1		Median		Q3	
Variable	coeff.	p-value	coeff.	p-value	coeff.	p-value
gender (0=female)	-4.154	0.000	-3.675	0.000	-3.591	0.000
computer (0=no access)	0.838	0.000	0.595	0.000	0.669	0.000
district (Lisbon)						
oversea	5.691	0.177	4.899	0.713	4.670	0.002
Aveiro	2.041	0.000	1.903	0.000	1.827	0.000
Beja	-2.232	0.005	-0.650	0.406	-1.408	0.034
Braga	1.265	0.000	1.541	0.000	1.815	0.000
Bragança	-0.334	0.614	1.266	0.094	0.820	0.363
Castelo Branco	1.996	0.007	1.994	0.000	1.765	0.028
Coimbra	2.025	0.000	2.381	0.000	2.786	0.000
Évora	-1.083	0.043	-0.489	0.235	-0.124	0.813
Faro	-1.592	0.000	-2.124	0.000	-2.030	0.000
Guarda	0.077	0.894	0.319	0.516	0.440	0.360
Leiria	0.722	0.059	0.352	0.306	0.093	0.809
Portalegre	-1.937	0.012	-0.721	0.199	-1.604	0.003
Porto	1.089	0.000	1.403	0.000	1.690	0.000
Santarém	-0.514	0.192	-0.285	0.421	0.137	0.750
Setúbal	-1.647	0.000	-2.149	0.000	-1.520	0.000
Viana do Castelo	2.071	0.000	1.800	0.000	1.585	0.022
Vila Real	-0.279	0.566	-0.653	0.146	-0.582	0.248
Viseu	2.272	0.000	2.408	0.000	2.267	0.000
school subsidy (0=none)						
low	-0.872	0.000	-0.815	0.000	-0.790	0.000
high	-1.595	0.000	-1.409	0.000	-1.392	0.000

immigrant (0=native)						
2nd gen.	-2.144	0.000	-1.499	0.018	-1.372	0.076
1st gen.	-1.583	0.001	-1.143	0.032	-1.428	0.025
father job situation (0=unemployed)						
stay-at-home	4.638	0.756	-0.863	0.063	2.062	0.771
student	2.319	0.171	-0.072	0.844	-1.849	0.555
retired	1.102	0.107	0.582	0.379	0.750	0.215
employed	0.890	0.003	0.546	0.052	-0.072	0.836
self-employed	0.957	0.008	0.776	0.017	0.270	0.497
employer	0.835	0.054	0.520	0.180	0.304	0.517
father education (0=up to 9th grade)						
up to high school or bachelor	1.476	0.000	1.789	0.000	1.624	0.000
undergraduate or post-graduate	3.951	0.000	4.486	0.000	4.427	0.000
master degree or PhD	4.956	0.000	5.748	0.000	5.715	0.000
mother job situation (0=unemployed)						
stay-at-home	0.497	0.122	0.429	0.079	0.517	0.073
student	-0.546	0.751	1.636	0.467	0.775	0.204
retired	0.017	0.985	0.543	0.527	0.320	0.667
employed	0.894	0.001	0.580	0.006	0.446	0.077
self-employed	0.484	0.186	0.708	0.019	0.561	0.114
employer	0.615	0.246	0.610	0.175	1.175	0.039
mother education (0=up to 9th grade)						
up to high school or bachelor	1.560	0.000	1.875	0.000	2.035	0.000
undergraduate or post-graduate	4.840	0.000	5.471	0.000	5.721	0.000
master degree or PhD	4.864	0.000	5.184	0.000	6.119	0.000
grade repetition*	-3.595	0.000	-3.407	0.000	-3.956	0.000
6th grade Portuguese score	11.894	0.000	1.250	0.000	12.630	0.000
academic year (2009/10)						
2010/11	-10.431	0.000	-10.412	0.000	-9.715	0.000
2011/12	16.691	0.000	16.071	0.000	14.614	0.000
average teacher experience	0.081	0.006	0.029	0.273	-0.046	0.130
average teacher education	1.257	0.156	2.194	0.006	0.941	0.295
average school subsidy	-3.385	0.000	-3.138	0.000	-2.585	0.000
9th grade size	-0.006	0.001	-0.005	0.008	-0.005	0.014
T (1=Basic, 0=Secondary)	0.836	0.000	0.429	0.012	0.447	0.017
constant	16.210	0.001	27.897	0.000	30.774	0.000

reference groups in parenthesis

using heteroskedasticity robust standard errors

*number of times a student failed