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Does the Increase in Competitionbetween Schools Improve the Quality of the Service? :

The Role of the 80s Educational Reform in Chile

Abstract

This research analyses the effect of geographic competition between schools on their average academic performance in the context of the Chilean educational reform implemented in the 1980s. It is found that a larger number of public schools positively affects the quality of education of other schools located in a particular area, with the effect particularly observed amongst middle-class families and in middle-ranking schools. However the number of voucher schools decreases the performance of neighbouring schools. The results are confirmed whilst ruling out endogenouslocationof voucher schools in areas with bad quality public schools.

JEL codes: I20, I24, I28

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1.Introduction

What effect does providing more competition have on schools' performance? This paper aims to answer this question in the context of Chile, a country where a wide-ranging voucher school programme has been put in place in order to provide such competition. We use data on a large sample of Chilean schools to investigate this issue, distinguishing between competition from voucher schools and from other public schools. The analysis controls for a large number of school and municipality-level variables that could also influence school performance. A particularly useful aspect of the available data is that the same children are observed in the same school at two points in time, allowing us to control for the quality of pupils in each school.

Many initiatives have been suggested and implemented in order to build and re-build an educational system that increases the quality of the service provided andthat promotes opportunities for students, with the presumption that education will provide them with the necessary tools to have a good future in terms of earning and quality of life. In this way, inequality should be reduced and a healthy flux in society should provide hope and incentives for new generations.In Finland, for example, reforms have been focused on increasing the equity of the service via standardisation of education, teachers' quality and strict inspections of schools associated with rewards or punishment depending on their performance (Sahlberg, 2007). In South Korea, a country that together with Finland is always near the top in international academic assessments,educational initiatives wereinitially focused on a large proportion of educational funding to primary educationand has continuedover time with secondary and tertiary education (Kim, 2001). On the other hand, Zanzig (1997) shows that Scholastic Aptitude Tests (SAT) from 1967 to 1992 have declined by more than 50 points in the USA even though the spending on education has almost doubled, suggesting that more economic resources destined to education are not an infallible solution.

A new approach therefore became very popular, namely the implementation of reforms based on competition, decentralisation and privatisation of the educational market with the hope of generating the right incentives for an efficient educational system, where schools are more reactive to the needs and preferences of parents and pupils are opposed to a standardised and monopolistic pure public educational system (Friedman, 1962).Thus, denationalisation of schools would be more efficient in meeting the consumers' (parents') demands - the benefits of diversity and choice alone are worth it, as people enjoy their freedom to choose, and because of a better matching between student and school according to different preferences and needs (Lubienski, 2008). In

this way, parents can express their dissatisfaction directly by taking their children and enrolling them into another school in opposition to the nationalisation system where parents can only express their views using political channels (which are often not reachable). Therefore, a system that includes private and public schools would provide a health variety of schools and introduce flexibility into the system (Friedman, 1962).

However, this idea has always been controversial. One of the main points made by supporters of the nationalisation of schools is that it is not possible to build a stable and democratic society without a minimum level of education for the majority of individuals and without wide agreement about some common values. Education can contribute to both and is therefore essential for creating and maintaining a prosperous society. In addition, concerns about the increasing levels of social segregation could be raised as the number of private educational institutions increase, often with little control from the government. A lack of information available to parents can weaken the competition between schools, which can be even worse when the parents are poor or less educated. Competition could also potentially create more inequality among schools and children instead of increasing the standard of education, concentrating poorer or less supported children into fewer schools, reducing the overall quality of the service. It has therefore been claimed that the educational system could be one of the main institutions of social reproduction (Breen, 2001).

The relevant literature is quite scarce and also quite inconclusive with regard to measuring how competition can impact educational outcomes, and often the biggest limitation is the lack of appropriatedata. Thus, there is not a lot of evidence nor it is very conclusive. Due to the lack of data, most of the previous studies have been theoretical or focus on experiments in the USA and on the Chilean experience. For the latter, the studies have only attempted to answer the question of whether or not voucher schools provide better education than public schools, but have not really faced the question of competition effects on the academic performance of students. It is also possible to find some research conducted in Sweden and New Zealand (Böhlmark and Lindahl, 2008 and Ladd and Fiske, 2003 respectively) and some research that analyses the effect of competition in mainly public administered educational systems such as the UK (Gibbons, *et al.* (2006) and Bradley and Taylor (2002)). Additionally, it is also possible to find some examples in developing countries, as in Bangladesh where vouchers are supplied only to females attending grades 6-10 or in Guatemala where the vouchers are supplied only to selected low income girls between the ages of 7-14 (West, 1996).

Previous results regarding the effect on school performance due to competition seem to be diverse. Arum (1996) points out that in the US the proportion of private

subsidised schools has an important positive influence on the performance of public schools, as theory predicts. However, the improvement does not seem to be related to an increase of efficiency through competition, but because of an increase in the resources provided to public schools. In addition, Hoxby (2003) uses data from American school choice programmes and finds that student achievement improves when they attend voucher schools and that public schools respond positively to competition. On the other hand, Gibbons, *et al.* (2006) in the case of London's primary schools, analyse the effect of increasing school choice and increasing school competition separately, finding no certain evidence to suggest that geospatial competition affects performance positively.

Chile is a good source of empirical evidence, as a simultaneous voucher and privatisation system has been implemented nationwide for more than 30 years in the country. This was supposed to produce an increase in competition and therefore, an increase in educational quality in the municipalities that had a larger proportion of private institutions (Ladd and Fiske, 2003). It is considered that location and quality of school plays an important role in school choice in Chile (Gallego and Hernando, 2009). Patrinos and Sakellariou (2008) conclude that overall, privatisation reforms improve the efficiency of the educational system, but that benefits are cancelled out with the increase of inequality. Additionally, Hsieh and Urquiola (2003) find that in Chile, school choice does not seem to improve student performance and point out the importance of distinguishing between the effects of school productivity and school sorting.

Endogeneity of competition effects has been one of the main concerns in the competition-effect analysis, as more voucher schools would prefer to settle in areas where the performance of children is better (omitted variable issues) or that school location choice may be determined by the preference of voucher schools to be located in areas with bad public education (reverse causality). In trying to rule out these concerns, Hoxby (1994) analysed the effect of school choice in the USA on improving the quality of education provided using as an instrument for voucher school enrolment the percentage of Catholic people in the area, finding that voucher school competition improves the public school performance.

The research presented here is motivated by the desire to contribute with evidence to the study of the effect of competition and market oriented educational provision on the academic performance of schools, assuming the latter could be a sign of the quality of education that schools provide and that skills acquired by students will be a determinant in accessing higher levels of education and probably accessing better jobs

and better salaries in their futures. In particular, this research becomes interesting if one considersthat the Chilean educational system seems to be in crisis, which is reflected by a permanent underperforming in international educational tests (Medrano and Contreras, 2009) and considering that the arguments against voucher systems have always been more ideological than supported by empirical evidence (Arenas, 2004).

The next section outlines the Chilean Educational System, to be analysed in the empirical section. Section 3 then describes the methodology and data to be used, while Section 4 describes the results of the analysis. A final section concludes.

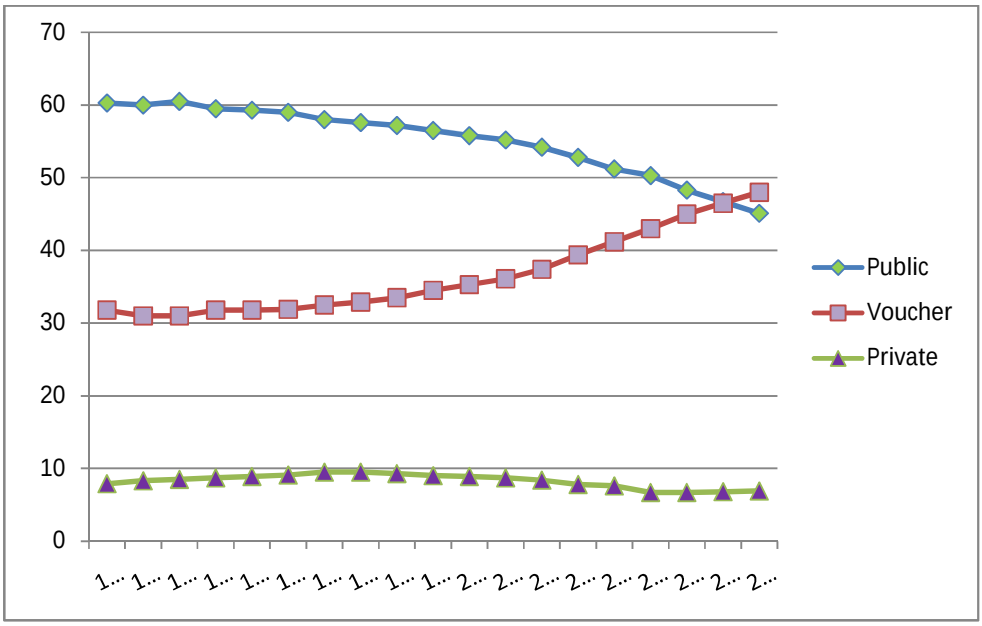
2.Chilean Educational System

In Chile, the need to increase the provision of education, increase efficiency of the public sector and increase the quality of the educational service provision was planned through reforms regarding school choice, in particular, by opening the supply side provision to non-governmental institutions and reducing the barriers to entry for organisations that can focus on students with different preferences and needs. Therefore, since 1981, a voucher system was implemented on a large scale nationwide, and in the context of a market-oriented transformation of the country, Chile's military non-democratic government decentralised public schools and started financing some private schools with a voucher system for each student.

In practical terms, the reform implied that public and voucher schools receive the same voucher amount which is unrestrictive so every student can participate. A voucher is a coupon that a student carries with them to the school which they choose (or their parent choose for them) to attend. When the students enrol the school gets the cash value of the voucher. Voucher schools only receive students that want to make use of it; they do not accept students where parents want to pay the full extent of their education (these parents will likely send their children to private, fee paying schools). Hence the main idea was that competition would create more quality for fewer resources, and that was all that was necessary in order to improve the service provided. Therefore, the spending on education fell in the decade following the reform(in 1990 spending on education was 23% lower than the value in 1982), with the deepest fall for secondary schools. Chile then became, "a virtual laboratory for a relatively unregulated, decentralised, competitive market in primary and secondary education" (Bravo, *et al.*, 2010, p. 2), where parents can choose between public school, voucher or fee-paying (private) schools.

One of the most immediate effectsof the reform mentioned abovewas that more than a thousand new voucher schools were opened within the first five years after the reform -in 1980 there were 1,627 voucher schools and in 1985, 2,643 schools of the same kind (Hsieh and Urquila, 2006). This provoked an enormous impact on the number of students receiving a formal education and an increase in demand for privately administered schools (see Graph 2.1). For example, in 2006, one in every three children between the age of 0 and 5 attended a nursery or similar in contrast to 1990 when only one in every five were attending. In addition, only 50% of the children of the relevant age were attending secondary school in 1990, but in 2006, 70% were attending.

Graph 2.1: % Enrolment by type of school (1990-2008)



Source: Ministry of Education (2008)

Even though these improvements in educational coverage were observed, it has been suggested that it was the decrease of public spending on education which created the incentive to open new voucher schools (Checchi and Jappelli, 2002). In particular, public schools would have fewer resources, generating a decline in the service provided (even though if competition is effective and increases efficiency, this effect should be cancelled out). A further decline in public school performance would be observed since voucher schools can select their students, leaving the students who have the most difficulties to the public schools ('sorting'). Even though parents have the freedom to choose the school that they want without restrictions of area of residence, the student selection process can be based upon academic tests, parental interviews, or religious affiliation, so they voucher schools can secure for themselves the best pupils. In

contrast, public schools have a first-come-first-served system to enrol students until their maximum school provision is reached, and they cannot use any selection criteria with the exception of schools with an over-demand, which normally select pupils using parental interviews and academic tests, using them as a proxy for the quality of the pupils.In addition, there are concerns related to the focus of voucher schools on status elements such as fancy names or luxury uniforms instead of quality of service and to the decline of working conditions for teachers including low salaries and overwork, which could also be a consequence of a fake “efficiency”.

Therefore it seemsthat the implications of the reform are diverse, and that a level of competition that works on paper may not work in reality, especially because the effective implementation of the reform assumes so many details that could in fact be very important in order to encourage schools to compete. The likely consequences of a privatised educational system and competition effects may be not as expected and in the worst case create even more social segregation instead of equalising children’s opportunities.

Given the criticismsof the implementation of the neoliberal educational reform mentioned above it was not surprisingly reverted by the government in the return to democracy in 1990, which was a political strategy to maintain the fragile equilibrium between the left and right in the country (OECD, 2004). However, successive changes have been implemented by the subsequent democratic governments. In 1991, a special labour code was established for public teachers, increasing their salaries by around 54.4% from 1990 and giving them more stability regarding salary, contract hours, holidays, benefits, etc., which in a way limited the efficiency of the system but helped get support from the teacher’s unions for the whole process of transition to democracy (Cox, 1997). In 1994, voucher schools were allowed to charge student tuition fees on top of the voucher obtained by the student[2], which is also a controversial initiative as it has been suggested that this decision increased the segregation by income levels because those who can pay fees are accumulated in certain institutions where the poorest cannot go (Narodowski and Nores, 2002). In 1995, with an already stable democracy established in the country, the government’s increase of spending on education became the priority in terms of social policy. From 1996 the Full Day School reform was implemented together with a curriculum reform, to support the poorest schools and a programme to increase quality and equity in the education provided. Finally, in 2008, an increase of 50% of the value of the voucher per students classified as vulnerable by the Ministry of Development and Planning was established.

[2] Public schools were also allowed to top up their public funding but only at the level of secondary education.

3. Data and Methodology

To study the consequences of school competition on academic performance, information on academic assessment of pupils will be used to measure the performance of schools. The SIMCE (System of Measurement of Quality of Education) data sets, provided by the Chilean Ministry of Education since 1990 until now, will be used. These data sets contain information on academic tests in mathematics, reading/writing (Spanish), natural sciences and history[3], which are taken every year in every urban school of the country independent of the school's type of funding.[4]Here we make use of each school's average score in the mathematics and Spanish academic assessments for each year.

Each year, SIMCE surveys a different year group within schools, alternating between fourth grade and eighth grade in primary schools and second grade in secondary schools.Two years of data were specifically chosen to be analysed, namely 2005 and 2009. In 2005, students were evaluated in their 4th primary grade, while the 2009 survey focused on 8th primary grade.Thus, the pupils surveyed within each school in these two years will be, with the exception of a small number of school-movers, the same children. Using these two years therefore allows us to look at changes over time in test scores (so-called 'value added' specifications), or equivalently to control for the starting test scores of the pupils, and so control for the quality of each school's intake.

The other key variable to define is the level of competition faced by each school. This is measured as the number of other schools in a fixed geographic radius around each school.We use information on geographical coordinates for each school in the country to measure distances between them, using the Universal Transverse Mercator (UTM) of two dimensional Cartesian coordinates to represent the surface of the Earth.

A range of other explanatory variables, from a variety of sources, are used in the estimated equation to control for other determinants of pupil performance. These include average characteristics of the pupils in each school, other school level characteristics including type of school, and characteristics of the municipalities in which

[3] In more recent years, English and physical education have also been added.

[4]For this research, private schools are dropped from the analysis, since they were never part of the voucher reform and tuition is fully paid by families, with almost no control from the government.

schools are located. These data were obtained from a range of sources, as described in Table A1 in Appendix A, with descriptive statistics provided in Table B1 in Appendix B.

The sample obtained,when combining the various data sources mentioned above, contains a similar proportion of public schools (55%, or 2,450 schools) relative to voucher schools (45%,or 2,007 schools), of which one-third are totally free voucher schools and two-thirds are voucher schools charging tuition fees. Out of a total number of 346 municipalities, 330 are included in the analysis, producing a total of 4,466 schools.Of the included municipalities, 238 have at least one voucher school.

The impact of competition between schools on school quality is estimated using the model below, as suggested by Gibbons *et al.* (2006):

$$y_{st} = \alpha y_{st-1} + \theta_P CI\_Public_{st} + \theta_V CI\_Voucher_{st} + \sigma X_{st} + \varepsilon_{st}$$

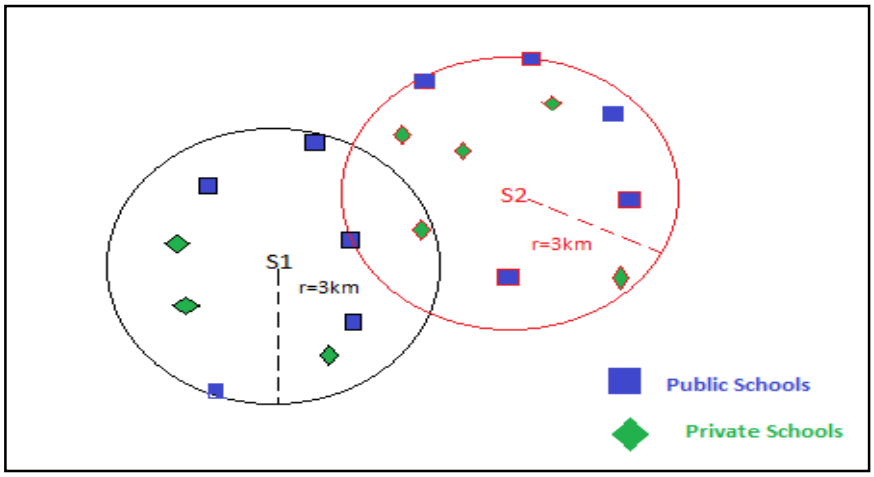
y_{st} corresponds to the average academic performance (understood as quality of education even though it is certain that other factors influence it[5]) of children in school *s* at year *t* (2009). $y_{st-1}$is theaverage performance of the same children in an earlier year (2005) in school *s*. CI_Public_{st} corresponds to the competition index of school *s* at year *t* from public schools. The index $CI_Public_{st}$is the number of public schools that are in a straight line distance of less than 3 km from the school analysed[6]. In a similar way, $CI\_Voucher_{st}$ represents the competition index of the school *s* at year *t* from voucher schools. X_{st} is a vector of student, school and neighbourhood characteristics and ε_{st} is the error term.

As an example, Figure 1 shows 2 schools (S1 and S2) and a number of public and private schools around them, within a radius of 3 km. In the case of S1, there are 5 public schools and 4 private schools around it. On the other hand, S2 has 6 public schools and 5 private schools around it.

Figure 1: Competition Index Calculation

[5] Quality is much more than a standardised academic test, it could also be measured by class size, expenditures, student performance, by measures of teachers' skills (Hanushek, 1986) or by the success of children in their future labour market, even though academic tests are found to have a weak correlation with labour market outcomes (Card and Krueger, 1996).

[6] The distance was selected using the average distance that students travel from their residence to their school presented by Chumancero*, et al.* (2009).



For practical reasons, the competition index is applied only to primary schools in urban areas. Only primary schools are considered since children often move between schools when they pass to secondary education, so that past performance of the same children in that school could not be controlled for (many primary schools do not allow for the possibility of continuing secondary studies at the same institution).

Additionally, competition indices could undesirably capture the effect of urban density and school size effects (Gibbons, *et al.*, 2006). Therefore, the competition indexes described above have also been calculated, dividing them by the number of people living in the municipality where the school *s* is located.

Since the choice of 3km distances was chosen somewhat arbitrarily (as the average distance travelled to school), alternatives distances were also tried, to check the robustness of the results to this choice. In particular, competition indices based on 2km and 4km distance were also derived and used in the estimated equation. A final variation considered competition in terms of the *quality* of other schools, rather than the *quantity.* The quality of competition was measured as the average test performance of public schools located less than 3 km from school *s*, and the average test performance of voucher schools located less than 3 km from school *s*, as suggested by Bradley, *et al.* (1999).

One aspect not considered thus far is that competition from voucher schools could be an endogenous variable. One possible argument is that more schools could be established in a particular area because, for example, better performing students could be located there, so that the academic performance in school *s* and the competition index (number of other schools in the area) would both be a function of other variables

that influence pupil performance, such as the socio-economic background of the area. This will be controlled for as far as possible through the municipality characteristic variables. However, to the extent that some characteristics that determine the degree of competition and pupil performance are unobserved, then thiswould cause a correlation between the competition variable and the error term and OLS (Ordinary Least Square) estimation would be biased and inconsistent. Alternatively, the number of voucher schools could be endogenous to public school quality (i.e. more voucher schools set up where public schools suffer from a bad reputation, precisely because of the poor choice of available public schools). The public school competition index is considered as exogenous because local governments do not have a clear policy that makes them decide to build new schools, and also the possibility of closing public schools seems to be very unlikely.

The solution to the problem of voucher school competition endogeneity is to use the instrumental variable approach.The instrument we use is the number of Catholic churches by municipality. The argument is that the more churches there are in a municipality, then the more voucher schools are likely to be created thereon average, since a significant percentage of voucher schools are officially Catholic and many others are at least named after Catholic saints. More churches aid the creation of schools by offering buildings to share and providing more available teachers (nuns and priests). Lastly, a greater number of churches suggests a larger catholic clientele for catholic voucher schools.[7]It is argued that the number of churches does not affect school performance directly (due to space or teachers for example) because the church variable is measured at the municipality level and so does not directly influence particular individual schools.

The church variable was created using information posted on-line by Catholic archbishoprics on their respective web sites. It was not possible to acquire information for all the municipalities involved, mostly because there was not information related to church location or inexistent records available to the general public or researchers. Therefore, there are only 212 municipalities that have information related to the number of Catholic churches.

A final methodological consideration is to examine the effect of competition across the full distribution of school performance, rather than just at the mean.

[7]An alternative instrument would have been the proportion of Catholic individuals in the local area. However, the proportion of Catholics could be misleading in the sense that many people claim to be Catholic, but are not fully practicing their faith.

Therefore quantile regression techniques were also use. The hypothesis was that a higher effect of competition would be found amongst higher performing schools, as parents in such schools may care more about schools' academic achievements, as well as having access to more information about performance.

Additionally, the variation in competition effects was also examined by splitting the sample according to the socioeconomic condition of schools. The sample was divided into five according to the average socioeconomic status of families that attend each school as given by the Ministry of Education and using the conglomerate technique.[8] They are classified in this way considering the education and monthly income of each household, and the vulnerability index of students as explained previously.

4.Results

4.1 Descriptive Statistics for Key Variables

<Table 1 about here>

In terms of average academic performance, voucher schools perform better, though this could simply be due to them having better students.Looking at *changes* in performance (value-added), the percentage of schools that improved their academic performance from the year 2005 to the year 2009 is higher among free voucher schools (63.4%) and very similar between public schools and private voucher schools (49% and 50% respectively)[9], which casts doubt on whether it is really worth parents paying for education when public schools offer similar improvements (see Table 2).

<Table 2 about here>

Turning to the competition variables, these varydepending of the type of school analysed. Schools face competition from an average of 2.7 public schools in a 3 km radius, but face on average 3 times more voucher schools around them (9.09). Schools face more competition from voucher schools that charge tuition fees (7.33), which is expected since free voucher schools are usually run by Catholic or charitable institutions, therefore it is unlikely for them to build too many schools in the same area.

[8]In this way, a school's characteristics within the same group are similar and different to a school's characteristics in other groups.

[9] Any level of improvement has been considered.

4.2 Estimates of the Competition Effect

Table 3 reports the results from different specifications, investigating the performance-competition relationship. Our base specification is in column a.

<Table 3 about here>

TheOLS results suggest that one additional public school in the area (3 km) improves a school's academic performance by 1.598 points, while the effect of voucher schools in the area decreases the performance of neighbour schools by 0.763 points. Both effects are small if it is considered that the possible average academic performance varies from 175 to 334 points, but relevant if it is considered that the results control for previous academic performance results (year 2005) to appreciate the improvement from one period of time to another, instead of just measuring the absolute effect on academic performance. Therefore, the effect of competition mentioned above corresponds to an improvement/decrease in academic performance, relative to a previous performance.

The effect of competition may depend on the ease of travel, since a competing school is only a realistic competitor if it is accessible. Therefore, the competition variables were interacted with a variable measuring the perception of being close to the public transportation system. A higher value to this variable represents having better access to public transportation. However, contrary to what was expected, it seems that when the public transportation system provides a higher coverage, the effect of competition from public schools decreases (by -0.018 test score points per transport perception point, while the effect from voucher schools increases by 0.008 test score points per transport perception point). Therefore, the effect of competition on school performance tends towards zero in either case, as the perception of access to public transport increases.One possible reason for this effect could be a decrease in the quality of the service due to the expansion of public services, since the question concerns *access to* transport, rather than the quality of that transport.[10]

As described in the methodology section, the results were tested for robustness, considering the level of competition involved within2 km and 4 km radii. In the 2 km case[11], positive effects of competition from public schools were found, which are even

[10] For example, the Metropolitan Region public transportation service has experienced a thorough modernisation and expansion in its coverage, since the 'TranSantiago' plan started being implemented in 2005, but massive chaos was faced by commuters and the new system was largely rejected by the popular opinion.

[11] See Table C1 in Appendix C.

higher than when the 3 km radius was considered. Larger effects, in this case a higher negative impact on performance,are observed from voucher school competition when a 2 km radius was considered rather than 3 km. Using 4 km, the absolute size of the competition effectis smaller for both types of schools, compared to the 2 km and 3 km cases[12]. It therefore appears that the strength of the competition effect depends on the proximity of the schools being considered.

Column b measures competition as the *quality* of surrounding schools, rather than quantity. The results show, however, that the effect of this competition variable is highly statistically insignificant, in the case of both public and voucher schools. It therefore seems that if schools respond to surrounding other schools, it is the number of them that they respond to, rather the results obtained by them.

Column c presents the IV results, treating competition from voucher schools as endogenous and instrumented by the number of Catholic churches in the region. The first stage of the estimation[13]shows that the number of Catholic churches is a good instrument for the number of voucher schools, showing a positive and significant relationship between both variables. Using the rule of thumb of having a joint significance (F-test) in the first stage above 10, it is possible to suggest that it is a good instrument[14]. The second stage IV estimation includes bootstrapped standard errors, because of the use of the predicted voucher competition index.[15] The results in column c show that the statistically significant negative coefficient on the voucher school competition variable remains, and indeed is larger in absolute value compared to the OLS specification in column a. Having ruled out reverse causality and endogenous variation in the extent of voucher school competition, it therefore still seems to be the case that an exogenous increase in the number of voucher schools is *negatively* related to performance in other local schools. The most plausible explanation for this finding is sorting, whereby the additional voucher schools are attracting good pupils away from other schools, lowering the latter's average performance.

The final two columns in Table 3 include interactions between the competition variables and the type of school being considered, to determine whether competition from different types of schools affects public and voucher schools differently. This specification is estimated by OLS (column d) and IV (column e). The OLS results show

[12] See Table C2 in Appendix C.

[13] See Table C3 in Appendix C.

[14] F(19,148)=36.21, Prob>F=0.000

[15] The first stage was estimated manually because the instrumented competition variable was interacted with other variables in the second stage regression (column e). Without using bootstrapping (300 iterations) the standard errors in the second stage would be wrong (Wooldridge, 2002).

that public school competition has a positive impact on the performance of both public and voucher schools, but significantly larger for voucher schools. The IV result is similar in size, though the difference is no longer statistically significant due to the higher standard error in this specification. The coefficients on the interactions with the voucher school competition variable are extremely small and statistically insignificant in both specifications. Overall, these results suggest that the effect of competition is similar regardless of type of schools, with the exception that competition from voucher schools has a slightly larger effect on other voucher schools than on public schools.

Briefly considering the coefficients on the other explanatory variables in the estimated equations, voucher schools seem to provide a better quality of education of around 13 points relative to public schools even though pupil and school characteristics are held fixed, confirming previous descriptive results. This could be a reason for why their coverage has increased over time and a consequence of the way that voucher schools allocate their resources. In addition, as was expected, parents' education plays an important role in the performance of children but parents' income strangely seems to have no significant effect. Moreover, the results also suggest that, as in many other countries, schools that only accept girls or boys perform better relative to mixed gender schools. Few of the municipality level variables reveal significant effects.

4.3 Is the Competition Effect Homogenous?

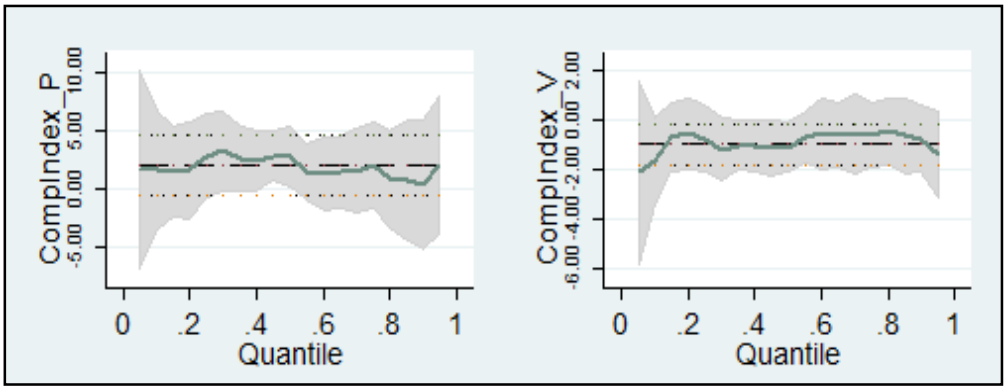
The Chilean educational system seems to be suffering an evident segregation of students by social class: the poorest children attend public schools, generating segregation in the education system and likely negative peer effects. Table4shows the distribution of socio-economic groups into public and voucher schools. It can be seen that pupils from the poorest backgrounds (group A) are over-represented in public schools A (34% of public school students are from group A). However, free voucher schools also service very poor students (34% of this type of schools' pupils are group A children). On the other hand, voucher schools that charge a fee to parents seem to serve middle class students (group C and D are the most popular among these schools). Group E is actually very small in all three school types being discussed, because the number of students from richer families that do not go to fully private schools is very small. This analysis revealssorting in the Chilean educational system, where students are clustered in their schools by considering primarily their social background.

<Table 4 about here>

When the sample is split into different socio-economic groups, the results suggest that middle-class groups (B and C, and also D though not statistically significant) student performance would be positively affected by competition from public schools (see Appendix C, Table C4). Amongst the poorest students, competition from public schools has a negative and statistically insignificant effect. Presumably, the threat of pupils changing schools when offered alternatives is less credible.

In terms of the quantile regression estimations (see Appendix C, Table C5), the impact of public school competition increases with better school performance until a certain point around the median, but decreases thereafter, with no statistically significant effect amongst the best performing schools. Thus competition does not lead to further improvements when a school is already amongst the best. This could be because better schools are already good, so for them to perform better than they are currently doing is more difficult than for schools that perform a bit worse. Similarly, the impact of public school competition for the worst schools is lower, probably because the pupils attending those schools do not have the option of moving to other schools[16], so competition plays a weaker effect (See Figure 2).

Figure 2:Quantile Regression Estimation



5. Conclusions

There is no unique voucher system:they differ in terms of their finance, regulation and in how much information parents haveavailable to them regarding their

[16] Using some small surveys asking schools or parents directly in 1996 (Estudio Nacional de Opinion Publica Nov-Dec 1996), some parents wanted to move their children from public to voucher schools, but there was not enough availability to enrol them, that is whythe demand has grown but not at a high speed because there are no incentives to create new voucher schools since the owners do not make enough of a profit from them (Lehmann and Hinzpeter, 1997).

possible options. Therefore, the results of this research are not intended to be extended to other countries, understanding every case as unique, especially because voucher reforms are not necessarily unrelated to political and economic circumstances (Belfield, 2001).

The major inference of this research is that there is no evidence that voucher schools have positively contributed to education quality in Chile, leaving doubts about whether or not a privatised market of education really achieves its objectives. This is especially so considering that the benefits of competition could be enjoyed by implementing school choice without the need of implementing a strongly privatised educational system, such as the Chilean one. Even though this research did not expect to rule out the idea that competition through privatisation brings benefits, especially to the most disadvantaged of students, the results could be taken as an alert for other nations that want to implement similar educational reforms. The main impact of voucher schools seems to be to a sorting one, with better pupils leaving public schools and therefore reducing average performance in the latter schools.

This does not mean that creating competition between public schools has no effect, however, and our results suggest that an increase in the number of public schools in an area is associated with improved performance in schools in that area. The effect seems to be largest amongst middle-class families and in middle-ranking schools, the inference being that rich families do not use public schools and more successful schools are not threatened by competition, while poorer pupils in low-performing schools are less likely to move between schools to better performing ones.

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Table 1: Average Student Performance by School (2009)

Type of School	Mean	Std. Dev.	Min	Max
Public	238.10	18.45	175	329
Free Voucher	241.18	22.86	184	322
Fee Voucher	263.89	23.59	183	334

Table 2: Percentage of Schools Improving their Academic Performance (2005-9)

Variable	N	%
Public	1,187	49.23
Free Voucher	405	63.98
Fee Voucher	673	50.37
Total[17]	2,265	

[17] The sample is reduced because the tuition fee information is not available for all schools.

Table 3: Competition Index Regressions[18]

	a:OLS (Quantity)	b:OLS (Quality)	c:IV	d:OLS (Interact.)	e:IV (Interact.)
	coef/se	coef/se	coef/se	coef/se	coef/se
CompIndex_Public (Pop)	1.598**	0.203	3.092**	1.450**	3.024*
School Level	(0.625)	(0.387)	(1.449)	(0.610)	(1.556)
CompIndex_Voucher (Pop)	-0.763**	-0.063	-1.646*	-0.761**	-1.649*
School Level	(0.377)	(0.334)	(0.916)	(0.376)	(0.951)
PerceptionTranport_CompIndexPublic (interaction)	-0.018**	-0.001	0.014	-0.018**	0.015
School Level	(0.007)	(0.004)	(0.010)	(0.007)	(0.010)
PerceptionTranport_CompIndexVoucher (interaction)	0.008*	0.000	-0.032*	0.008*	-0.033*
School Level	(0.004)	(0.004)	(0.017)	(0.004)	(0.018)
avgTest_2005	0.559***	0.565***	0.574***	0.559***	0.574***
School Level	(0.017)	(0.024)	(0.021)	(0.017)	(0.021)
ContractHoursClass_PerStudent	0.460	-0.368	-0.089	0.309	-0.158
School Level	(0.712)	(0.976)	(0.811)	(0.731)	(0.756)
voucher_School	13.903***	13.988***	13.578***	13.077***	13.298***
School Level	(2.014)	(2.499)	(2.329)	(2.269)	(2.713)
voucher_ContractHourCPS (interaction)	-5.455***	-3.796**	-5.284***	-5.236***	-5.167***
School Level	(1.119)	(1.552)	(1.308)	(1.141)	(1.199)
ComIndexPublic_VoucherSchool (interaction)				0.284*	0.328
School Level				(0.149)	(0.260)
ComIndexVoucher_VoucherSchool (interaction)				-0.039	-0.086
School Level				(0.045)	(0.171)
%_Father_UniversityDegree	0.228**	0.220	0.198**	0.227**	0.197**
School Level	(0.089)	(0.140)	(0.095)	(0.089)	(0.099)
%_Mother_UniversityDegree	0.240**	0.343*	0.251**	0.244**	0.251**
School Level	(0.100)	(0.178)	(0.103)	(0.100)	(0.105)
avgIncome_Parents	0.451	1.054	0.460	0.481	0.506
School Level	(0.517)	(0.740)	(0.602)	(0.515)	(0.604)
Boys	9.320***	9.109***	9.340***	9.452***	9.428***
School Level	(2.328)	(2.458)	(2.431)	(2.306)	(2.459)
Girls	9.604***	8.379***	9.685***	9.829***	9.844***
School Level	(1.287)	(1.665)	(1.621)	(1.289)	(1.609)
Fee	0.043	-0.146	0.016	0.040	0.015
School Level	(0.068)	(0.094)	(0.076)	(0.068)	(0.077)
Density_5_14	-1.158	-4.995	15.484	-1.687	14.339
Municipality Level	(6.071)	(5.173)	(17.269)	(5.944)	(17.447)
% Poverty	-0.013	0.044	-0.043	-0.004	-0.032
Municipality Level	(0.072)	(0.095)	(0.091)	(0.073)	(0.096)
%_Indigenous	-0.040	-0.055	-0.128	-0.039	-0.129
Municipality Level	(0.060)	(0.089)	(0.257)	(0.060)	(0.269)
BooksperCapita_2001	0.222**	0.172**	0.326	0.223**	0.319
Municipality Level	(0.096)	(0.077)	(0.532)	(0.094)	(0.509)
%_Illiteracy_2006	0.869***	0.895***	0.780	0.860***	0.787*
Municipality Level	(0.253)	(0.271)	(0.505)	(0.251)	(0.454)
AvgSchoolingPop	-0.022	0.404	0.057	-0.017	0.063
Municipality Level	(0.243)	(0.265)	(0.352)	(0.242)	(0.347)
Munispe_EducPC	-6.894	-25.408	-24.531	-8.382	-23.784
Municipality Level	(19.103)	(18.490)	(34.915)	(18.841)	(35.838)
_cons	99.609***	67.776***	100.478***	100.120***	100.422***
	(4.532)	(13.442)	(6.250)	(4.573)	(6.405)
Number of observations	2,909	1,755	2,578	2,909	2,578
R2	0.659	0.659	0.651	0.659	0.651

[18] All the results include robust-clustered (by municipality) standard errors.

Table 4:Distribution of Schools According to Socio-economic Group

Type of School	SocioEconomic Group											
	A		B		C		D		E		Total	
Public	820	33.70%	1,258	51.71%	331	13.60%	24	0.99%	0	0.00%	2,433	100%
Voucher_Fee	4	0.29%	144	10.52%	627	45.80%	565	41.27%	29	2.12%	1,369	100%
Voucher_Free	222	33.89%	246	37.56%	167	25.50%	19	2.90%	1	0.15%	655	100%
Total	1,046	23.47%	1,648	36.98%	1,125	25.24%	608	13.64%	30	0.67%	4,457	100%

Appendix A: Data Sets

Table A1: Data Sets, Variables and Years Included

Source	Variables	Years
SIMCE 2009, Ministry of Education http://www.simce.cl/	Average Academic Test Performance (SIMCE) by School	2009
	Average Income Parents of Schools	2009
	Educational Level of Father by School	2009
	Educational Level of Mother by School	2009
	Average Income of Households by School	2009
	SocioEconomic Level of School	2009
	Type of School	2009
Schools Directory, Ministry of Education http://www.mineduc.cl/	Number of Students by School	2009
Enrolment, Ministry of Education http://www.mineduc.cl/	Number of Teachers by School	2009
	Number of Teachers' Working Hours by School	2009
	Gender Students by School	2009
Vulnerability Index, Ministry of Education http://www.mineduc.cl/	Vulnerability Index of Schools	2009
	Students Socioeconomic Groups	2009
Voucher Registration, Ministry of Education http://www.mineduc.cl/	Type of Voucher School (Fee or Free)	2009
	Fee	2009
Vulnerable Children, Ministry of Education http://www.mineduc.cl/	Number of Vulnerable Children by School	2009
SIMCE 2005, Ministry of Education http://www.mineduc.cl/	Average Academic Test Performance (SIMCE) by School	2005
School Geographic Location, Ministry of Education, Chilean Government http://www.mineduc.cl/	(X,Y) Coordinates by School	2009
CASEN 2006, Ministry of Development and Planning http://www.ministeriodesarrollosocial.gob.cl	Poverty Level by Municipality	2006
Municipality Indicators, Ministry of Housing and Urbanism http://www.observatoriourbano.cl/indurb/seleccion.asp	Perception Close to Public Transportation by Municipality	2010
	Perception of Traffic Jam Level by Municipality	2010
	Books per capita by Municipality	2001
	Illiteracy Level by Municipality	2006
	Water Coverage by Municipality	2006
	Electricity Coverage by Municipality	2006
	Average Schooling Population by Municipality	2006
Municipality Information, SINIM: Municipality Information National System http://www.sinim.gov.cl/	Education Spending Per Capita (Municipality)	2006
Human Development Index by Municipality, UNDP & Ministry of Development http://www.desarrollohumano.cl/	Human Development Index (Municipality)	2003
Census 2002, National Estadistics Institute) http://www.ine.cl/	Number of Indigenous People (Municipality)	2002
	Number of Catholic People (Municipality)	2002
	Population Density (Municipality)	2002
	Population Total and 5 to 14 years old (Municipality)	2002

Appendix B:Descriptive Statistics

Table B1:Descriptive Statistics

Variable	Obs	Mean	Std. Dev.	Min	Max
N. Churches by Municipality	3,529	7.08	6.06	1.00	28.00
Spending Education per capita (Thousands of Chilean Pesos) by School	4,415	74.21	37.93	9.39	297.84
Density (5 to 14 years old) by Municipality Population by Km2	4,457	3,340	6,075	0	29,654
fee by School	4,457	5,178	11,742	0	76,402
average Income Parents by School	4,355	283,954	189,536	50,000	1,631,429
% Mother University Level by School	4,355	4.04	7.69	0	100
% Father University Level by School	4,355	4.95	9.17	0	100
Total Population by Municipality	4,457	121,110	115,789	507	492,915
Population (5 to 14 years old) by Municipality	4,473	21,749	21,777	8	102,760
% Indigenous by Municipality	4,457	5.49	9.43	0.18	78
% Vulnerable Students by School	4,415	75.69	15.28	14.57	100
% Catholics by Municipality	4,457	70.71	9.53	23.04	96
Average Schooling Population by Municipality (years)	4,016	8.34	1.46	5.57	14
% Infant Mortality by Municipality	4,058	9.06	9.03	0.00	77
IDH 2003 by Municipality	4,400	0.71	0.05	0.51	1
% Poverty by Municipality	4,455	14.79	6.69	0.60	51
Weekly Classes Working Hours Total Teachers per Students by School	4,457	1.73	0.70	0.31	7
Score_Language8_2009by School	4,457	243.80	23.71	154	329
Score_Math8_2009 by School	4,457	248.95	25.64	180	340
Score_Language8_2005 by School	4,386	249.59	25.28	150	329
Score_Math8_2005 by School	4,382	240.84	27.01	150	326
avgSIMCE_2009 by School	4,457	246.37	23.82	175	334
avgSIMCE_2005 by School	4,380	245.23	25.64	150	325
Total Teachers per 20 Student by School 2009	4,457	0.07	0.01	0.07	0
Size School 2009 (number of Students) by School	4,457	491.75	426.78	20	5,107
% Illiteracy by Municipality	4,058	4.19	2.92	0.30	14.09
% Positive Perception Public Transportation by Municipality	3125	85.10	7.54	43.20	99.00

Appendix C: AlternativeResults

Table C1:Competition Index Regressions: Robustness (2 Km)

	coef/se	coef/se	coef/se	coef/se	coef/se	coef/se	coef/se
CompIndex_Public	2.468**	2.955**	2.933**	2.705**	2.931**	2.716**	2.623**
School Level	(0.962)	(1.314)	(1.211)	(1.216)	(1.203)	(1.256)	(1.179)
CompIndex_Voucher	-0.130***	-1.424**	-1.334**	-1.290**	-1.300*	-1.276*	-1.349**
School Level	(0.046)	(0.672)	(0.647)	(0.646)	(0.664)	(0.750)	(0.632)
%_PerceptionClosetoPublicTransport	0.133*						
Municipality Level	(0.074)						
PerceptionTranport_CompIndexVoucher (interaction)		0.014*	0.014*	0.013*	0.014*	0.013	0.014*
School Level		(0.007)	(0.007)	(0.007)	(0.008)	(0.009)	(0.007)
PerceptionTranport_CompIndexPublic (interaction)	-0.029**	-0.034**	-0.034**	-0.031**	-0.034**	-0.032**	-0.032**
School Level	(0.011)	(0.015)	(0.014)	(0.014)	(0.014)	(0.015)	(0.014)
avgTest_2005	0.560***	0.558***	0.558***	0.559***	0.559***	0.565***	0.558***
School Level	(0.016)	(0.016)	(0.016)	(0.017)	(0.016)	(0.016)	(0.017)
ContractHoursClass_PerStudent	0.480	0.387	0.452	0.451	0.464	0.829	0.232
School Level	(0.694)	(0.729)	(0.712)	(0.717)	(0.713)	(0.688)	(0.738)
voucher_School	14.067***	14.198***	14.154***	13.893***	14.105***	14.206***	12.466***
School Level	(2.068)	(2.109)	(2.076)	(2.079)	(2.061)	(2.039)	(2.335)
voucher_ContractHourCPS (interaction)	-5.506***	-5.540***	-5.540***	-5.443***	-5.549***	-5.705***	-5.089***
School Level	(1.119)	(1.146)	(1.136)	(1.126)	(1.136)	(1.111)	(1.147)
ComIndexPublic_VoucherSchool (interaction)							0.689**
School Level							(0.279)
ComIndexVoucher_VoucherSchool (interaction)							-0.022
School Level							(0.077)
%_Father_UniversityDegree	0.225**	0.222**	0.222**	0.222**	0.225***	0.250***	0.224**
School Level	(0.088)	(0.087)	(0.087)	(0.088)	(0.086)	(0.087)	(0.088)
%_Mother_UniversityDegree	0.236**	0.240**	0.237**	0.241**	0.239**	0.299***	0.245**
School Level	(0.098)	(0.098)	(0.099)	(0.099)	(0.099)	(0.098)	(0.099)
avgIncome_Parents	0.450	0.454	0.464	0.461	0.452	-0.117	0.502
School Level	(0.507)	(0.512)	(0.510)	(0.518)	(0.505)	(0.504)	(0.516)
boys	9.284***	9.426***	9.357***	9.381***	9.370***	9.599***	9.604***
School Level	(2.322)	(2.334)	(2.313)	(2.316)	(2.318)	(2.343)	(2.304)
girls	9.713***	9.889***	9.773***	9.808***	9.819***	10.059***	10.079***
School Level	(1.284)	(1.288)	(1.288)	(1.286)	(1.291)	(1.271)	(1.273)
fee	0.046	0.045	0.045	0.044	0.045	0.049	0.042
School Level	(0.068)	(0.068)	(0.068)	(0.068)	(0.067)	(0.066)	(0.067)
% Poverty	0.002	-0.003	-0.011	-0.011	-0.011		0.003
Municipality Level	(0.071)	(0.071)	(0.071)	(0.071)	(0.071)		(0.071)
Density_5_14	-2.235	-1.891	-2.311	-3.554			-4.251
Municipality Level	(5.117)	(5.178)	(5.114)	(5.887)			(5.718)
%_Indigenous	-0.041	-0.041	-0.040	-0.042	-0.039	-0.006	-0.038
Municipality Level	(0.063)	(0.063)	(0.062)	(0.060)	(0.063)	(0.053)	(0.060)
BooksperCapita_2001	0.183***	0.197***	0.191***	0.206**	0.193***	0.142***	0.211**
Municipality Level	(0.065)	(0.065)	(0.065)	(0.093)	(0.064)	(0.039)	(0.090)
%_Illiteracy_2006	0.839***	0.820***	0.840***	0.864***	0.855***		0.851***
Municipality Level	(0.234)	(0.227)	(0.232)	(0.248)	(0.229)		(0.245)
AvgSchoolingPop	0.070	-0.039	-0.033	-0.021	-0.031		-0.008
Municipality Level	(0.249)	(0.232)	(0.235)	(0.241)	(0.234)		(0.238)
CompIndex_P_sq		-0.004					
School Level		(0.018)					
CompIndex_V_sq		0.004					
School Level		(0.003)					
Munispe_EducPC				-6.927			-8.693
Municipality Level				(19.059)			(18.632)
HumDevelopIndex_2003						-2.351	
Municipality Level						(12.316)	
_cons	86.628***	99.888***	99.446***	99.645***	99.276***	102.992***	100.454***
	(8.556)	(4.449)	(4.437)	(4.478)	(4.366)	(9.926)	(4.512)
Number of observations	2,927	2,927	2,927	2,909	2,927	2,944	2,909
R2	0.659	0.659	0.659	0.659	0.659	0.656	0.660
note: *** p<0.01, ** p<0.05, * p<0.1							

Table C2:Competition Index Regressions: Robustness (4 Km)

	coef/se	coef/se	coef/se	coef/se	coef/se	coef/se	coef/se
CompIndex_Public	0.005	1.352**	1.150**	1.024**	1.151**	1.028**	0.966**
School Level	(0.034)	(0.562)	(0.469)	(0.460)	(0.470)	(0.517)	(0.455)
CompIndex_Voucher	0.124	-0.647**	-0.520*	-0.485*	-0.527*	-0.496	-0.490*
School Level	(0.193)	(0.298)	(0.271)	(0.272)	(0.277)	(0.326)	(0.268)
%_PerceptionClosetoPublicTransport	0.108						
Municipality Level	(0.089)						
PerceptionTranport_CompIndexVoucher (interaction)	-0.002	0.006*	0.006*	0.005	0.006*	0.005	0.005*
School Level	(0.002)	(0.003)	(0.003)	(0.003)	(0.003)	(0.004)	(0.003)
PerceptionTranport_CompIndexPublic (interaction)		-0.015**	-0.013**	-0.012**	-0.013**	-0.012**	-0.012**
School Level		(0.006)	(0.005)	(0.005)	(0.005)	(0.006)	(0.005)
avgTest_2005	0.560***	0.557***	0.558***	0.558***	0.558***	0.564***	0.559***
School Level	(0.016)	(0.016)	(0.016)	(0.017)	(0.016)	(0.016)	(0.017)
ContractHoursClass_PerStudent	0.570	0.420	0.488	0.484	0.486	0.831	0.368
School Level	(0.698)	(0.723)	(0.712)	(0.716)	(0.712)	(0.680)	(0.730)
voucher_School	14.335***	14.266***	14.192***	13.965***	14.219***	14.361***	13.330***
School Level	(1.997)	(1.992)	(1.996)	(1.990)	(1.980)	(1.947)	(2.231)
voucher_ContractHourCPS (interaction)	-5.602***	-5.560***	-5.564***	-5.468***	-5.560***	-5.718***	-5.300***
School Level	(1.118)	(1.132)	(1.130)	(1.119)	(1.131)	(1.101)	(1.136)
ComIndexPublic_VoucherSchool (interaction)							0.183**
School Level							(0.093)
ComIndexVoucher_VoucherSchool (interaction)							-0.036
School Level							(0.031)
%_Father_UniversityDegree	0.224**	0.229**	0.229***	0.229***	0.228***	0.251***	0.228**
School Level	(0.088)	(0.089)	(0.088)	(0.087)	(0.087)	(0.089)	(0.089)
%_Mother_UniversityDegree	0.236**	0.239**	0.237**	0.240**	0.236**	0.290***	0.243**
School Level	(0.099)	(0.098)	(0.099)	(0.099)	(0.099)	(0.097)	(0.099)
avgIncome_Parents	0.460	0.440	0.455	0.450	0.462	-0.070	0.471
School Level	(0.511)	(0.512)	(0.511)	(0.511)	(0.507)	(0.514)	(0.518)
boys	9.483***	9.296***	9.261***	9.279***	9.250***	9.471***	9.335***
School Level	(2.326)	(2.382)	(2.324)	(2.339)	(2.337)	(2.361)	(2.325)
girls	9.589***	9.647***	9.494***	9.516***	9.474***	9.592***	9.672***
School Level	(1.304)	(1.295)	(1.286)	(1.287)	(1.292)	(1.273)	(1.285)
fee	0.044	0.041	0.042	0.042	0.043	0.045	0.040
School Level	(0.068)	(0.068)	(0.068)	(0.069)	(0.068)	(0.067)	(0.068)
% Poverty	-0.003	-0.003	-0.012	-0.013	-0.012		-0.005
Municipality Level	(0.073)	(0.072)	(0.073)	(0.072)	(0.072)		(0.073)
Density_5_14	0.675	2.387	1.363				0.036
Municipality Level	(5.531)	(5.620)	(5.708)				(6.239)
%_Indigenous	-0.035	-0.035	-0.036	-0.037	-0.036	-0.003	-0.037
Municipality Level	(0.062)	(0.063)	(0.062)	(0.060)	(0.062)	(0.052)	(0.060)
BooksperCapita_2001	0.211***	0.224***	0.225***	0.236**	0.222***	0.187***	0.235**
Municipality Level	(0.071)	(0.072)	(0.074)	(0.103)	(0.071)	(0.048)	(0.101)
%_Illiteracy_2006	0.847***	0.807***	0.863***	0.880***	0.859***		0.871***
Municipality Level	(0.241)	(0.233)	(0.243)	(0.257)	(0.243)		(0.256)
AvgSchoolingPop	0.051	-0.051	-0.027	-0.020	-0.027		-0.025
Municipality Level	(0.266)	(0.239)	(0.245)	(0.246)	(0.247)		(0.245)
CompIndex_P_sq		-0.002					
School Level		(0.002)					
CompIndex_V_sq		0.001					
School Level		(0.001)					
Munispe_EducPC				-5.652			-6.917
Municipality Level				(18.520)			(19.098)
HumDevelopIndex_2003						-3.237	
Municipality Level						(12.814)	
_cons	88.623***	100.026***	99.133***	99.347***	99.187***	103.629***	99.795***
	(10.123)	(4.493)	(4.555)	(4.591)	(4.564)	(10.291)	(4.595)
Number of observations	2,927	2,927	2,927	2,909	2,927	2,944	2,909
R2	0.658	0.659	0.658	0.658	0.658	0.656	0.659
note: *** p<0.01, ** p<0.05, * p<0.1							

Table C3: First Stage Estimation (IV)

Competition Index 1st Stage Regressions	
	coef/se
Number of Catholic Churches	0.256**
Municipality Level	(0.109)
CompIndex_Public	1.012***
School Level	(0.153)
avgTest_2005	0.030***
School Level	(0.010)
ContractHoursClass_PerStudent	-0.546
School Level	(0.513)
voucher_School	0.698
School Level	(1.589)
voucher_ContractHourCPS (interaction)	-0.637
School Level	(0.639)
%_Father_UniversityDegree	-0.070
School Level	(0.062)
%_Mother_UniversityDegree	0.019
School Level	(0.035)
avgIncome_Parents	-0.308
School Level	(0.333)
boys	1.000
School Level	(1.620)
girls	0.977
School Level	(1.261)
fee	-0.002
School Level	(0.029)
Density_5_14	47.062***
Municipality Level	(11.636)
% Poverty	-0.134
Municipality Level	(0.093)
%_Indigenous	-0.000
Municipality Level	(0.094)
Munispe_EducPC	-77.556***
Municipality Level	(21.491)
BooksperCapita_2001	0.169
Municipality Level	(0.149)
%_Illiteracy_2006	-0.386**
Municipality Level	(0.188)
AvgSchoolingPop	0.004
Municipality Level	(0.391)
_cons	6.690*
	(3.818)
Number of observations	3,092
R2	0.586
note: *** p<0.01, ** p<0.05, * p<0.1	

Table C4: Regression Results by Socio-Economic Group

	A	B	C	D
	coef/se	coef/se	coef/se	coef/se
CompIndex_Public	-1.420	1.341*	2.261*	4.326
School Level	(3.591)	(0.780)	(1.272)	(3.268)
CompIndex_Voucher	0.004	-0.509	-1.406***	-0.403
School Level	(1.389)	(0.479)	(0.525)	(0.744)
PerceptionTranport_CompIndexPublic (interaction)	0.014	-0.016*	-0.024	-0.050
School Level	(0.042)	(0.009)	(0.015)	(0.037)
PerceptionTranport_CompIndexVoucher (interaction)	-0.000	0.005	0.015**	0.004
School Level	(0.016)	(0.006)	(0.006)	(0.009)
avgTest_2005	0.498***	0.404***	0.616***	0.596***
School Level	(0.032)	(0.028)	(0.036)	(0.053)
ContractHoursClass_PerStudent	0.211	1.900**	-0.126	7.185
School Level	(1.259)	(0.834)	(2.669)	(11.246)
voucher_School	6.898	16.824***	8.851*	17.994
School Level	(4.878)	(3.784)	(4.805)	(15.618)
voucher_ContractHourCPS (interaction)	-2.693	-8.872***	-1.548	-13.056
School Level	(2.307)	(2.631)	(3.646)	(11.351)
%_Father_UniversityDegree	-0.006	-0.042	0.116	0.232*
School Level	(0.335)	(0.203)	(0.155)	(0.130)
%_Mother_UniversityDegree	-0.000	-0.497**	0.438**	0.123
School Level	(0.351)	(0.240)	(0.208)	(0.148)
avgIncome_Parents	-3.573**	0.210	-2.175*	0.596
School Level	(1.531)	(1.175)	(1.160)	(0.896)
boys	20.637***	10.056***	0.392	9.876***
School Level	(5.811)	(1.614)	(5.823)	(3.643)
girls	(dropped)	7.663*	6.296***	10.439***
School Level		(3.936)	(1.901)	(1.549)
fee	-1.633	1.323**	-0.002	-0.015
School Level	(4.266)	(0.548)	(0.124)	(0.078)
Density_5_14	-42.440***	4.799	6.394	22.094
Municipality Level	(14.103)	(7.808)	(10.805)	(16.588)
% Poverty	-0.133	-0.072	-0.087	0.130
Municipality Level	(0.177)	(0.097)	(0.151)	(0.169)
%_Indigenous	-0.098	0.170*	-0.194	-0.321
Municipality Level	(0.080)	(0.097)	(0.124)	(0.245)
Munispe_EducPC	-0.703***	-0.173	0.154	0.232**
Municipality Level	(0.254)	(0.133)	(0.099)	(0.103)
BooksperCapita_2001	0.296	1.059***	1.022**	1.565**
Municipality Level	(0.384)	(0.346)	(0.415)	(0.612)
%_Illiteracy_2006	-0.544	-0.172	-0.097	0.235
Municipality Level	(0.424)	(0.310)	(0.418)	(0.464)
AvgSchoolingPop	131.249***	134.702***	96.611***	82.720***
Municipality Level	(8.972)	(7.109)	(10.625)	(20.885)
_cons	406	1,011	923	559
	0.428	0.320	0.396	0.453
Number of observations	406	1,011	923	559
R2	0.430	0.320	0.409	0.453
note: *** p<0.01, ** p<0.05, * p<0.1				

Table C5: Quantile Regression Results

	OLS	BSQR_10	BSQR_25	BSQR_50	BSQR_75	BSQR_90
	coef/se	coef/se	coef/se	coef/se	coef/se	coef/se
CompIndex_Public	1.598**	1.205	1.623*	2.396***	1.408*	0.423
School Level	(0.625)	(1.779)	(0.895)	(0.702)	(0.768)	(1.876)
CompIndex_Voucher	-0.763**	-0.827	-0.621	-0.981***	-0.479	-0.440
School Level	(0.377)	(0.796)	(0.417)	(0.331)	(0.358)	(0.534)
PerceptionTranport_CompIndexPublic (interaction)	-0.018**	-0.012	-0.018*	-0.028***	-0.017*	-0.006
School Level	(0.007)	(0.020)	(0.011)	(0.008)	(0.009)	(0.022)
PerceptionTranport_CompIndexVoucher (interaction)	0.008*	0.009	0.007	0.010***	0.005	0.004
School Level	(0.004)	(0.009)	(0.005)	(0.004)	(0.004)	(0.006)
avgTest_2005	0.559***	0.518***	0.541***	0.542***	0.572***	0.595***
School Level	(0.017)	(0.037)	(0.021)	(0.015)	(0.020)	(0.029)
ContractHoursClass_PerStudent	0.460	-0.649	-0.547	0.461	1.963**	2.786*
School Level	(0.712)	(1.528)	(0.794)	(0.734)	(0.942)	(1.554)
voucher_School	13.903***	13.341***	14.468***	15.179***	15.669***	14.894***
School Level	(2.014)	(4.116)	(2.395)	(2.264)	(2.249)	(3.570)
voucher_ContractHourCPS (interaction)	-5.455***	-7.482***	-6.476***	-6.112***	-4.969***	-4.843**
School Level	(1.119)	(2.751)	(1.518)	(1.489)	(1.377)	(2.281)
%_Father_UniversityDegree	0.228**	0.170	0.318***	0.224***	0.164	0.130
School Level	(0.089)	(0.211)	(0.098)	(0.087)	(0.119)	(0.123)
%_Mother_UniversityDegree	0.240**	0.261	0.372***	0.329***	0.265**	0.155
School Level	(0.100)	(0.173)	(0.114)	(0.095)	(0.104)	(0.112)
avgIncome_Parents	0.451	0.111	0.105	0.243	0.861	1.087
School Level	(0.517)	(0.844)	(0.545)	(0.414)	(0.693)	(0.734)
boys	9.320***	10.301**	7.005	9.590***	4.741	9.993**
School Level	(2.328)	(4.610)	(4.403)	(1.820)	(4.839)	(4.861)
girls	9.604***	14.729***	11.317***	9.775***	6.916***	4.463*
School Level	(1.287)	(2.905)	(2.078)	(1.514)	(1.607)	(2.665)
fee	0.043	0.152*	0.055	0.074	-0.022	0.000
School Level	(0.068)	(0.087)	(0.062)	(0.055)	(0.067)	(0.069)
Density_5_14	-1.158	1.467	-6.154	0.556	-2.216	3.295
Municipality Level	(6.071)	(11.048)	(6.193)	(5.274)	(7.308)	(11.908)
% Poverty	-0.013	-0.086	0.021	0.047	-0.020	-0.108
Municipality Level	(0.072)	(0.122)	(0.075)	(0.084)	(0.087)	(0.123)
%_Indigenous	-0.040	0.081	-0.040	-0.053	-0.057	-0.044
Municipality Level	(0.060)	(0.123)	(0.070)	(0.070)	(0.073)	(0.102)
Munispe_EducPC	-6.894	5.895	3.264	14.506	-15.244	-34.535
Municipality Level	(19.103)	(28.590)	(18.582)	(17.620)	(17.160)	(29.139)
BooksperCapita_2001	0.222**	0.261	0.088	0.190**	0.182*	0.213
Municipality Level	(0.096)	(0.168)	(0.163)	(0.097)	(0.110)	(0.185)
%_Illiteracy_2006	0.869***	0.780*	0.834***	0.564**	0.703**	1.072***
Municipality Level	(0.253)	(0.404)	(0.257)	(0.223)	(0.283)	(0.383)
AvgSchoolingPop	-0.022	-0.012	0.031	-0.251	0.054	0.093
Municipality Level	(0.243)	(0.419)	(0.252)	(0.241)	(0.245)	(0.428)
_cons	99.609***	94.408***	95.705***	104.633***	102.350***	104.653***
	(4.532)	(9.727)	(6.417)	(4.807)	(4.884)	(8.695)
Number of observations	2,909	2,909	2,909	2,909	2,909	2,909
R2	0.659					

note: *** p<0.01, ** p<0.05, * p<0.1