# Competition Pressures and Academic Performance in a Generalized Vouchers Context

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## 1. Introduction

The capacity of a voucher system to improve learning depends on the ability parents have to choose schools based on quality and on the capacity schools have to respond on the incentives competition creates. That is, vouchers are associated with competition, a driving force to improve results. Most prior studies define market scope and hence competition in a rather arbitrarily way. They associate competition with the number of private schools in a given geographic area, where the areas are defined following an administrative and political divisions criteria (i.e., counties). This proxy for competition will be poor though, when as in the Chilean case, students have the freedom to choose their school independently of the neighborhood where they live, and they are able to travel across counties. In addition, the most common methodology employed to estimate the impact of competition on academic results uses cross-sectional data.

The 1980 reform and a change in the law in 1992 allowed parents to complement the voucher provided by the Government, generated a massive influx of new schools. Unequivocally, that changed the competitive landscape and drove a significant reduction in public schools, favoring private subsidized schools. This change in the competitive environment allows to analyze its effect on the school's academic performance. We propose a proxy to measure the change in the competitive pressure affecting each school that recognizes that substitution among different schools depends on a set of attributes that are identified and weighted depending on parents' decisions. In particular, since within a given school each family needs to travel different distances

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to reach it, the emergence of new schools affect each family differently, depending where the new school is placed.

## 2. The Literature

Competition among schools is expected to increase social welfare when families can choose and school budgets depend on family decisions. Pioneering research on the relationship between competition and academic performance was done by Borland and Howsen (1992) as well as Couch, Williams and Shugart (1993). Using cross section, Borland and Howsen (1992) measured the level of competition by the relative participation of private schools in the State of Kentucky, USA, finding a positive relationship between this and academic performance. Likewise, Couch, Williams and Shugart (1993) measured competition as the percentage of students who attend private schools and they found a positive and significant relationship between the competition provided by these private schools and academic performance of public schools in 100 counties in the State of North Carolina,USA.

Hoxby (1994, 2001) used a Tiebout (1956) type model which included choices based on the proximity between school and the family residence, also using cross-sectional data. The model assumed that public schools have access to parental information regarding resource productivity. Epple y Romano (1998) developed a theoretical computational model which included schools financed by taxes – competitive, free public schools- as well as private schools financed with a voucher system, including students with varying abilities and incomes. Their results showed that the performance of these schools are explained by the students´ socioeconomic factors; they also demonstrated that the voucher system drives private sector growth and sorting, which benefits the most qualified students as compared to those with lower grades. Epple and Romano (2002) then studied a voucher system designed to increase competition, without creating student sorting. The results of this model indicated that a voucher system that recognizes student characteristics can reach higher levels of efficiency, increasing quality of results and equality in private and public schools.

Toma (1996) evaluated the effect of private school enrollment and the financing system in five countries. She finds that the public effort to promote private enrollment does not reduce the public school performance and that the government restrictions on decision making reduced the private school performance. Sander (1999), also using a cross-sectional analysis evaluated how competition by private schools affect mathematical performance in public primary and secondary education in Illinois, USA.

Ladd and Fiske (2001) evaluated the effects of the 1991 reform which provided complete freedom of school choice and created competitive conditions between primary schools in New Zealand in 1996. They concluded that greater competition, measured as the percentage of private schools, negatively affected students´ learning, learning styles, relationships with parents and relationships with the principals. Bayer and McMillan (2005) also focused on the impact of free choice on public school performance using information from the 1990 Census for the San Francisco Bay area. They developed a more direct measure of competition faced by each of the schools, associated with the effect of a reduction in quality in the school demand. The authors use as an instrument the price of homes in the area where the schools were located. The results showed that competition is closely and positively related to academic performance of the schools. Braun-Munzinger (2005) conducted a review of 21 voucher programs in 14 countries and identified factors which impact the quality of education through competition between schools. They found that including the greatest number of schools and publishing the results of the school´s tests contributed to the proper operation of a voucher program. The factors which get in the way of the success of the voucher system are the existence of barriers to entry, unequal financing of public and private schools as well as a low rate of participation of private schools. Böhlmark and Lindhal (2008) evaluated the effects of free choice and competition on the results of private and public schools in Sweden. They defined competition as the number of students in a neighborhood who are enrolled in private schools. They found that an increase in participation of private schools improved the results of public schools in the short term.

Gibbons, Machin and Silva (2008) evaluated if the greater availability of schools and competition between primary schools in England improved academic results. They proxied competition by the Herfindhal index in each zip code area. Initially, they did not find any significant relationship between choice, competition and academic

performance, which they attributed to the endogenous relationship between breadth of choice and competition.

For Chile, McEwan and Carnoy (1998) using cross-sectional data analyzed the impact of competition on the academic performance of fourth graders from 1988 to 1996. Competition was proxied by the percentage of enrollment in subsidized schools in each neighborhood. The results showed that competition had a negative impact on public schools, and that the effect is greater in neighborhoods with a higher participation of private subsidized schools. Hsieh and Urquiola (2003) studied the effects of competition on academic performance in math and language arts in 150 municipalities from 1982 to 1996, defining competition as the participation of private schools in each municipality. They found that when competition increased, the SIMCE results of the public schools fell, but the years of schooling increased. Gallego (2002) made a similar estimation using SIMCE results and cross-sectional data from 1994 to 1997. He also proxied competition as the percentage of private enrollment per municipality, and concluded that competition improved school results in the case of private subsidized schools. Auguste and Valenzuela (2003) evaluated the impact of competition on academic results using SIMCE scores for the year 2000. They explicitly assumed that municipalities represent independent markets. The competition proxy is, once again, enrollment in subsidized schools by municipality. They found that higher competition has a positive but small effect on the SIMCE, though an increased inequality of the results and that the segmentation observed within municipalities negatively impacted public schools.

3. Methodology.

The typical model applied in the industrial organization field is as in (1)

(1) $$Return_{i,j} = \alpha_o + \beta_1 Competition_{i,j} + \beta_2 X_{i,j} + u_{i,j}$$

where the dependent variable, return of firm i in the industry j is for instance measured as the quotient between profits and the company assets, competition is empirically associated with the industry concentration, X summarizes other controls, and "*uij"* is an error term not related to the competition variable. Model (1) typically is estimated with

cross-sectional data and assumes a variance in the level of competition between industries at one moment in time.

A main problem with this approach for the Chilean case is that the reform allowed entry with no different restrictions by area, county or region. Consequently, after a period of entry, it is expected that no differences in return should prevail among counties or areas. More precisely, there are at least two problems to directly estimate model (1) with Chilean data. First, information about school profitability is not available and furthermore, we are more interested in learning than in financial return. This is however, a small technicality, since the implicit idea behind equation (1) is that a competitive process results in dropping prices to attract customers, with the subsequent reduction of profitability. The variable associated with "customer attraction" for the ideal voucher system would be the school quality. Even though it is possible to think that schools compete to attract students by providing other services, the objective of the voucher system is competition driven by quality. Thus, the analogy between the variables of financial profitability and educational performance is clear when we think that to maximize the financial benefit, each school must promote quality and that has a cost. It is to be expected that competition will reduce the economic benefit by causing schools to incur greater costs to provide greater quality. In summary, it is plausible that financial profitability is negatively related to educational performance and therefore equation (1) can be estimated by replacing profitability with performance (obviously the sign assumed for $\beta_1$should be positive, and not negative as when it is used for profitability).

The approach to face this problem comes from the fact that competitive pressures for each school, after the entry of other schools, should have changed. The reform allowed the entry that presumably was more intense in areas where there was a larger deficit or less competition or where competition was less intense. Thus, to test the basic hypothesis that competition increases learning we consider two different periods (prior and post entry). Thus, we can follow model (1) to test the effect of competition on learning performance through model (2:

(2) $\Delta Perf_{i,t} = \alpha_0 + \beta_1 \Delta Comp_{i,t} + \beta_2 (\Delta Comp * ST)_{i,t} + \beta_3 Perf_{i,0} + \beta_4 \Delta Control_{i,t} + \varepsilon_{i,t}$

where the dependent variable is the change in the performance of incumbent *school* $_i$ in the period *t;* $\Delta Comp_{i,t}$ is the change in the competitive pressures faced by *school* $_i$ in the period t , $Perf_{i,0}$is the initial SIMCE score of *school* $_i$, and ST is the school type, so $\Delta Comp * ST$ , an interactive variable that captures the effect of competition for the different types of schools.[2] Equation (2) also considers controls for the change in sociodemographic characteristics ($\Delta Control_{i,t}$). We also consider as an instrument of the change in competition, the enrollment in the base year.

In the definition of market scope, it will be wrong to define the market or the competitive pressures based only in one characteristic, like for instance, distance among schools. Substitution among schools depends on all the factors parents consider relevant to choose them, including infrastructure, academic performance, distance, and tuition costs. To define the factors parents consider and the weight given to each of them, we follow the choice model developed by Chumacero, Gomez and Paredes (2011). We estimate factors determining the probability of choosing a given school.

The parameters obtained from the school choice model allow to compare the indirect utility for each family associates with choosing each school. We define as a proxy for the "increase in the competitive pressure" between two periods, to the proportion of students from each incumbent school had preferred a new school had it been available. Thus, by comparing the indirect utility associated with the incumbent and a new school, we define a dichotomous variable $S_i$ for each student attending the incumbent schools where Si = 1 if $U_{ij}^{chosen} \leq U_{ij}^{new}$, 0 otherwise. Getting Si for each student in the incumbent schools, the proxy of the increased competitive pressure for each incumbent school is the proportion of the students in an incumbent school that would have been better off in a different school had this been available (5).

$$(5)\ C_{ik} = \sum S_j / n$$

To get distance, we used the College Entrance Exam (PSU) 2009 database provided by The Department of Educational Evaluation, Measurement and Registration of the Universidad de Chile (DEMRE), which included the student´s address when he/she took

[2] Following Barro and Sala-i-Martin (1992), we considered the Simce in the base year as a way to test convergence of results between schools over time.

the test at the end of 12th grade. This database was combined with the SIMCE tests, which had information regarding the school, the students and their families. We assumed that the student lived in the same location in 2004, as he/she lived in 2009, so we could have a proxy for the distance between home and school in 2004. Then, we re-estimated the school choice model, to create the competition pressure metric.

Results.

The results from a Probit estimation for the school choice model, that is, the parameters associated with the different attributes which are valued by families when selecting their school are consistent with economic theory and empirical evidence obtained in Gómez, Chumacero and Paredes (2011) in terms that families marginally prefer a closer school in the case of female students, but that probability declines with increased family income and increased level of education of the mother.

The estimation of model (2) differentiated the grade when the SIMCE test was taken. This is necessary due the uneven entry pattern of new schools and the different decisions which are made by parents depending on the age of the child.[3] The estimated derived from this model using 2SLS, are presented in table 3.

The results consistently show that greater competitive pressure significantly increase the performance of private pay schools and private subsidized schools for the $4^{th}$ and $8^{th}$ grades, and no significant effect is observed for the $10^{th}$ grade. The results suggest the effect is also positive for public schools, but significatively smaller (join significance test for the coefficients). Finally, the results show a convergence path over time, shown by a negative impact of the initial SIMCE coefficient.

More relevant, the size of the effect of the competitive pressure variable is quite high. Thus, for example, let's consider the differentiated impact on $4^{th}$ year student performance for two otherwise identical schools. School 1 and 2 had an increase in the competitive pressure they face by 20 and 30, respectively. If both schools were private, that would imply a difference in their performance by 10.4 points. In the case both schools were municipal, the differentiated effect would be 3.9 points. Considering that

[3] As an example in 2008, there were 8,829 schools teaching 4th and 8th grade, and 3,675 schools teaching high school.

the standard deviation of the SIMCE test is 50, and that the results have been almost unchanged over the last 10 years, these magnitudes are huge.

Table 3. Effect of competitive pressures on Academic Performance (2SLS).

| | 10th grade | 8th grade | 4th grade |
|---|---|---|---|
| Variables | Coefficient | Coefficient | Coefficient |
| Constants | -72.7229*<br>(36.3945) | -118.7656**<br>(18.7403) | -162.5068**<br>(9.2809) |
| Change in competitive pressure (range 0 – 100) | 0.7502<br>(0.4448) | 2.5540**<br>(0.2392) | 1.0459**<br>(0.0743) |
| Change in competitive pressure * School Type | -0.0269<br>(0.0229) | -0.7825**<br>(0.0686) | -0.6605<br>(0.0468) |
| Initial SIMCE score of school | 0.0301*<br>(0.0258) | -0.2304**<br>(0.0264) | -0.8491**<br>(0.0478) |
| Income variation | 0.0005<br>(0.0078) | 0.0369**<br>(0.0055) | -0.0028<br>(0.0018) |
| Tuition variation | 0.0532<br>(0.0673) | -0.0023<br>(0.0587) | 0.5520**<br>(0.0616) |
| Variation of mother´s education | 3.1124*<br>(1.4108) | 2.7053**<br>(0.8382) | 1.8055*<br>(0.8154) |
| Variation of father´s education. | 1.8253<br>(1.4257) | 5.0632**<br>(0.8521) | 0.3610<br>(0.8132) |
| Desviaciones estándar entre paréntesis. | *p < 0.05, **p < 0.01. | | |
| Observaciones | 599 | 526 | 554 |
| F(7, 592) | 1.81 | 20.71 | 52.34 |
| Prob > F | 0.0835 | 0 | 0 |
| R- Squared | 0.0209 | 0.2427 | 0.4345 |

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