

PONTIFICIA UNIVERSIDAD CATOLICA DE CHILE

SCHOOL OF ENGINEERING

**CHOICE, COMPETITION AND SWITCHING COST IN EDUCATION**

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Thesis submitted to the Office of Research and Graduate Studies in partial fulfillment of the requirements for the Degree of Doctor in Engineering Sciences.

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Santiago de Chile, September 2015

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*To me dear mother and father, who taught me the value of study and the love of a job well done. To my beloved wife Giovanina, and my children Joaquín, Benjamín and Lucas, my inspiration for self-improvement and balance. To everyone who supported me, especially Ricardo Paredes, for his patience and dedication, and Rómulo Chumacero, for the great opportunity to work together.*

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SCHOOL OF ENGINEERING

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**THESIS SENT TO THE OFFICE OF RESEARCH AND GRADUATE  
STUDIES IN PARTIAL COMPLIANCE WITH THE REQUIREMENTS FOR  
THE DEGREE OF DOCTOR OF ENGINEERING**

**JUAN A. GALLEGOS**

**ABSTRACT**

The benefits of competition are recognized and promoted in most industries, however they are not evident and have been questioned in the Education sector. The difficulty to measure competition, the idea that parents don't rationally choose schools for their children and that schools do not react to that choice is in the center of the debate. We critically analyze the prevailing methodology in the literature that relates competition and educational performance and the data used to estimate that impact. We propose a methodology that considers relevant substitutes for each school

while simultaneously using various attributes that parents consider when choosing school, and we apply this methodology to evaluate the effects of competition on academic performance in Chile. The evidence supports the hypothesis that competition has a positive, significant and relevant educational impact on private and public schools.

A main obstacle a voucher system has to produce effect in the short run is the existence of cost of moving a child is already in a given school. In fact, the voucher effect in the short run not only depend on parents' ability to choose the best school for their children, but on their capacity to switch. The factor that can decrease this capacity is the existence of switching costs, caused by different factors such as stress experienced by the children, and the loss of social networks.

We developed a methodology that quantifies switching cost. We then analyze the existence of these costs in Chile. By using flexible evaluation techniques, which consider the existence of structural changes in the possibility of switching schools, we found that the switching costs are statistically significant and economically relevant.

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Key words: Vouchers, Competition, Performance, and Chile.

## 1. INTRODUCTION TO VOUCHER MODELS AND MAIN REFORMS IN THE CHILEAN EDUCATION SYSTEM.

In the 1980s, Chile implemented changes to its education system, which at the time, presented low academic performance levels and high dropout and repetition rates. The education system was also so rigid that it did not meet the country's social and economic challenges, or the changes in the student body makeup. The system was centralized, with public and private establishments; the curriculum was centrally instituted for each and every school, with the exception of those who requested authorization for special plans and programs. In addition, all faculty and staff for each school were hired by and answered to the Ministry of Education; therefore they were managed by the central government.

Given this scenario, an unprecedented and large-scale reform was implemented in Chile. The reform introduced massive decentralization, passing the schools that had previously been administered by the State to municipal governments. It also allowed for the creation of private schools with public financing through vouchers, which were also used for funding municipal schools.

The use of subsidies in Chile is not new since the end of the 19th century, the State has given resources to churches and foundations for their collaboration with the task of educating. But the non-discriminatory voucher was installed in 1980, establishing the payment of a monthly subsidy based on average attendance for all entities that provide education. This system consists of a monthly amount per student given to municipal and subsidized private schools, and varied depending on actual attendance, grade level, school day and type of teaching. Later, the preferential school subsidy was added, which made increasing resources for priority students possible. The Chilean subsidy system is of great

interest, as it was applied exactly as proposed by Friedman (1962), and because of its degree of coverage: in 2013 it serviced more than 90% of students enrolled in the system (see Table 1).

As was previously mentioned, public schools were handed over to their corresponding municipalities. Those from the private sector interested in education were permitted to participate as owners and administrators of schools, that is to say, they could create and manage a school, provided certain conditions were fulfilled, as well as take charge of recruiting, hiring and firing professors, all within a framework of greater freedom compared with the municipal schools. A fixed amount of funding was set, determined by the number of students and their attendance. This subsidy per student was equal for subsidized private and municipal schools, and it was assumed that the competition of attracting and retaining students would positively affect the schools' performances levels. As was previously stated, there were multiple objectives of this reform, one of which was to increase the coverage rate via the participation of private entities. One effect of the reform was the increase in voucher enrollment, which in 2013 was over 53% (see Table 1). In addition, and according to this, the total offer of schools has increased, especially subsidized private: in 1993, 2,653 of these types of establishments existed, while in 2013, there were a total of 6,017 schools (see Table 2), presenting an increase of 127% during this period.

Table 1: Student enrollment according to type of school

Year	Enrollment according to school type						
	Municipal	%	Subsidized Private	%	Private	%	Total
2004	1,921,969	51.4%	1,534,349	41.0%	284,257	7.6%	3,740,575
2005	1,889,669	50.4%	1,608,077	42.9%	254,163	6.8%	3,751,909
2006	1,816,329	48.5%	1,681,105	44.9%	250,800	6.7%	3,748,234
2007	1,737,417	46.9%	1,716,258	46.3%	254,031	6.9%	3,707,706
2008	1,662,538	45.1%	1,764,355	47.9%	256,380	7.0%	3,683,273
2009	1,617,682	43.7%	1,825,031	49.3%	255,864	6.9%	3,698,577
2010	1,536,230	42.1%	1,852,661	50.8%	258,716	7.1%	3,647,607
2011	1,482,937	41.2%	1,861,754	51.7%	258,311	7.2%	3,603,002
2012	1,408,981	39.7%	1,884,934	53.1%	255,233	7.2%	3,549,148
2013	1,374,094	38.8%	1,897,949	53.7%	265,044	7.5%	3,537,087

Source: MINEDUC.

With the reform, the educational supply became more ample and diverse in terms of administration and curriculum. The underlying idea of this reform was that the State was inefficient because, among other things, it was not subject to the pressures of competition. Therefore, the entry of new competitors was encouraged.

In order for the voucher system to promote and increase quality, parents must choose schools by focusing on achievement outcome, and therefore schools must react to the parents' decisions. Given that, a causal relationship between competition and educational achievement should be observed, as parents have the ability to select the best school for their children, schools should make additional efforts in quality to maintain and attract students. However, impact studies of competition in academic achievement show contradictory results and do not shed light on this relationship (Chumacero, Gallegos, and Paredes, 2012).

Table 2: Number of schools according to type

<b>Year</b>	<b>Total</b>	<b>Municipal</b>	<b>Subsidized Private</b>	<b>Private</b>
1993	9,831	6,347	2,653	831
1994	9,810	6,313	2,637	860
1995	10,296	6,448	2,790	1,058
1996	10,515	6,527	2,883	1,105
1997	10,318	6,411	2,857	1,050
1998	10,631	6,407	3,065	1,159
1999	10,712	6,367	3,170	1,175
2000	10,610	6,325	3,217	1,068
2001	10,799	6,309	3,459	1,031
2002	10,879	6,248	3,640	991
2003	11,223	6,209	4,084	930
2004	11,296	6,160	4,274	862
2005	11,561	6,168	4,630	763
2006	11,671	6,041	4,897	733
2007	11,763	5,979	5,054	730
2008	11,905	5,917	5,262	726
2009	12,116	5,899	5,536	681
2010	12,144	5,796	5,674	674
2011	12,063	5,650	5,756	657
2012	12,174	5,584	5,965	625
2013	12,114	5,495	6,017	602

Source: MINEDUC

Looking into detail of the school supply in 2013 according to type and geographic area (see Table 3), it can be observed that most subsidized private schools are concentrated in urban areas, such as the V, VIII and metropolitan region. However, when analyzing the school supply in rural areas, it is observed that the municipal schools have greater participation, with a large presence in the VIII and IX Regions. These areas predominantly correspond to poor cities and towns, where there is not a potential market large enough to justify the existence of many schools.

Part of this phenomenon could be explained by the existence of economies of scale. However, no systematic evidence exists. For example, Tironi (2004) argues that the minimum enrollment for a subsidized private school to finance itself is approximately 650 students. This contrasts with a situation in which the average enrollment in these areas is 886 students. This situation has a series of implications on levels of and gaps that may exist both in educational results and financial costs between the schools operating in the zones in question and those in the rest of the country.

After the educational changes of the 1980s, the most relevant alteration in the educational structure was observed in the 1990s, when private schools with public funding were allowed to complement the state contribution, or subsidy, with payments from parents (shared funding). The introduction of this shared funding model would explain to a certain extent the increase in the supply of subsidized private schools from this date onward. The opening of new schools increased competition, causing a significant reduction in municipal education in favor of subsidized private schools (see, for example, Paredes and Pinto, 2009). On the other hand, Tokman (2005) suggests that the shared funding system restricts the right to choose a school, since selection depends on the parents' ability to pay, therefore increasing segregation in schools.

Table 3: Schools by type and geographic area in 2013

Region	Geographic area	Schools according to establishment type			
		Municipal	Subsidized private	Private	Total
I	Urban	30	136	12	178
	Rural	42	7	0	49
II	Urban	105	85	37	227
	Rural	19	0	0	19
III	Urban	79	51	12	142
	Rural	37	2	0	39
IV	Urban	133	286	25	444
	Rural	286	59	0	345
V	Urban	297	686	100	1,083
	Rural	172	15	0	187
VI	Urban	156	252	23	431
	Rural	256	12	0	268
VII	Urban	174	259	12	445
	Rural	406	28	0	434
VIII	Urban	395	540	35	970
	Rural	538	69	0	607
IX	Urban	187	288	12	487
	Rural	349	389	0	738
X	Urban	153	280	22	455
	Rural	497	127	0	624
XI	Urban	25	29	0	54
	Rural	30	2	0	32
XII	Urban	38	32	5	75
	Rural	16	0	0	16
R.M.	Urban	647	1,997	291	2,935
	Rural	115	26	3	144
XIV	Urban	71	116	9	196
	Rural	177	159	0	336
XV	Urban	30	82	4	116
	Rural	35	3	0	38
Country Total	Urban Total	2,520	5,119	599	8,238
	Rural Total	2,975	898	3	3,876
	Total	5,495	6,017	602	12,114

Source: MINEDUC

Many other reforms have been carried out in education, including those driven by the Governments of Aylwin, Frei, Lagos and Piñera, who maintained the principle components

to the educational system (subsidies, free choice and teaching, and decentralization). The most relevant among them were:

- Teacher Statute, in which job stability, salary enhancements and improved labor conditions were ensured for teachers.
- Full school days, extension of compulsory education to 12 years of age, evaluations of municipal teachers, enactment of the Preferential School Subsidy Law (SEP for its name in Spanish).
- Increased investment in early childhood education centers, as well as a boost in the amount of the subsidy. Compulsory kindergarten and the creation of the Education Superintendence.

## 2. QUALITY OF EDUCATION IN CHILE

The origins of the SIMCE (standardized test) dates back to the 1960s. The first National Test was given in 1968, and its purpose was to measure 8th grade students' performance. This test was administered annually until 1971, and was then discontinued. In 1982, the Evaluation of School Achievement Program (PER for its name in Spanish) was implemented for 4th and 8th grade students; this program was designed and carried out by the Department of Research and Technology of the Universidad Católica de Chile (DICTUC), by means of an agreement with the MINEDUC. The PER was understood as a tool for enforcing the decentralization in education, by transferring educational improvement initiatives to teachers, parents and guardians, providing information about the students' learning results (Himmel, 1997).

Between 1985 and 1986, the System for Evaluation of the Quality of Education (SECE) was created by the Center for Pedagogical Improvement, Experimentation and Research (CPEIP) of the MINEDUC. Its objective was to analyze the data generated by the PER (Román, 1999). In 1988, the SIMCE commenced. Its purpose was to evaluate school performance and the quality of education imparted in 4th and 8th grades in all of the schools in our country. Among its original objectives are:

- Assist the MINEDUC in its normative task and system supervision.
- Provide supervision and support to regional and local authorities, as well as offer technical assistance.
- Estimate the quality of education imparted in each school; compare these results, seek explanatory factors and evaluate the results of pedagogical programs.
- Guide teacher improvement, supervisory actions and the allocation of resources.

Finally, in 1992 the MINEDUC assumed control of the SIMCE, basing this initiative on the Constitutional Organic Law on Teaching (LOCE for its name in Spanish) of March of 1990, which establishes that: “It is the Ministry of Education’s responsibility to design the instruments that allow for the creation of a system of periodic evaluation, both at a primary and secondary level of instruction, of the fundamental objectives and minimum content of those levels” (Decree – Law N°40, MINEDUC, 1990). In addition, this regulation determines the system’s main characteristics, namely: the tests must evaluate the current curricular framework, and each school’s results must be made public. As was previously stated, beginning in 1992 the SIMCE is institutionalized by the MINEDUC; however, its installation in the system and recognition by institutions was not established until the mid-1990s, when a newspaper with national circulation began to publish each school’s results and teachers and administrators recognize that the SIMCE is a useful tool for pedagogical administration (Himmel, 1997). In fact, since the results have been published, their revelation has become a milestone not only for the schools, but also for public opinion, due to the extensive coverage given by mass media. Between 1992 and 1997, these evaluations were concentrated on academic achievement in Spanish Language and Mathematics, but they also gathered information on the students personal and creative development, attitudes towards the environment, and on the parents acceptance of educational work, as well as technical-administrative information about the schools (Meckes, 2003). The obtained results were comparable among schools or groupings of schools within the same year, but they were not comparable over different years, as the construction of the tests and the analysis methodology did not consider the technical characteristics required for such evaluations.

However, scores have unfortunately begun to be used to establish comparisons among different years, despite these limitations.

In 1998, the SIMCE changed its dependency within the MINEDUC, from a unit that was directly supervised by Undersecretary of Education, to becoming part of the Curriculum and Evaluation Unit (UCE). In its first period as part of the UCE, from 1998 to 2003, three lines of development of the SIMCE were prioritized (Meckes, 2003). They were:

- Align national tests with the curricular reform and communicate the new guidelines for teacher evaluation, aiming to contribute to the implementation of the new curriculum in the classroom.
- Modernize the evaluation's analysis methodologies, making it possible to compare results between different years, and providing an analysis of trends over time.
- Encourage Chile's participation in different international studies, in order to place Chilean students' achievement in an international context and provide feedback on the curriculum design.

In 1998, the SIMCE measurement model was updated, replacing the classical theory with the item response. The implementation of this new methodology aided in the comparison of results between different years, and also provided descriptions of the students' achievement levels based on the results. It also propelled Chile's participation in different international studies, organized by the International Education Association (IEA), the Organization for Economic Co-operation and Development (OECD), and the Regional UNESCO Office. Thus, the SIMCE brought forth the First Regional Comparative and Explicative Study (PERCE) from the Latin American Laboratory of Education Quality,

UNESCO, in 1997; the first applications of the International Study of Trends in Mathematics and Science (TIMSS 1999 and 2003) and the International Study of Civic Education (ICCS 1999), IEA; and the first application of the Programme for International Student Assessment (PISA) from the OECD, in 2000. According to Heyneman, 1991, 2004; Bellei and González, 2004; and Brunner, 2005, Chile has low achievement rates on international tests such as PISA or TIMSS. Since 1997, Chile has participated in different international studies of education results, which provide external measurements, indicating the situation in Chile and its educational system in comparison with the other participating countries and regarding agreed upon international academic standards. This allows for expanding and contextualizing the country's reality on a global level, as well as providing information that permits designing and evaluating education policies, especially regarding curriculum, since they show trends in the results over time. In the 2009 PISA test, Chile placed 44th of a total of 65 countries, with an average of 449 points, below the average of 493 points for the countries belonging to the OECD that took the reading comprehension test (see Table 4).

Table 4: Trends in text book reading from 2000 – 2009

Reading Score	2000	2006	2009
Average Score OECD	501	495	499
Average Score CHILE	410	442	449

Source: MINEDUC

Despite this, Chilean students obtained the highest reading comprehension scores among all of the participating Latin American countries. To measure performance levels, the PISA test defines achievement levels from 1 to 5 or 6, depending on the area tested. 1 is the lowest level, while 5 or 6 correspond to more advanced skills. Students who achieve at least a level 2 are considered to have the minimum proficiency to get along in the world and

productively integrate into society. In Chile and Latin America, the challenge is to reduce the percentage of students who achieve less than 2, and increase the number of students reaching level 5 or 6. In 2009, Chile significantly increased the percentage of students that attained level 2 or higher (see Table 5). It can also be observed that the gap between the highest and lowest socio-economic groups has decreased. While all socio-economic groups increased their reading scores between 2000 and 2009, the most notorious improvement in PISA comes from the most vulnerable students (see Tables 6, 7 and 8).

Table 5: Percentage distribution according to reading comprehension levels in Chile

Evaluation	Level 1	Level 2	Level 3	Level 4	Level 5 and 6
Year 2000	48%	30%	16%	5%	1%
Year 2001	31%	33%	26%	9%	1%

Source: MINEDUC

Table 6: Trends in reading comprehension from 2000 – 2009

Reading Scores	2000	2006	2009
High Socio-economic Group	479	519	512
Low Socio-Economic Group	359	394	405

Source: MINEDUC

Table 7: Reading achievement levels according to socio-economic group in 2009

Evaluation	Level 1	Level 2	Level 3	Level 4	Level 5 and 6
High Group	9%	24%	37%	25%	5%
Upper Middle Group	22%	33%	32%	11%	2%
Middle Group	28%	38%	26%	7%	1%
Lower Middle Group	39%	37%	20%	4%	0%
Low Group	52%	32%	14%	2%	0%

Source: MINEDUC

Table 8: Variation in PISA reading achievement according to socio-economic group, 2000-2009

Evaluation	Level 1	Level 2	Level 3	Level 4	Level 5 and 6
High Group 2009	9%	24%	37%	25%	5%
High Group 2000	17%	32%	35%	14%	2%
Low Group 2009	52%	32%	14%	2%	0%
Low Group 2000	73%	21%	5%	1%	0%

Source: MINEDUC

To summarize, the academic achievement of the students who have taken the PISA test shows that Chile is a country that is moving forward, and that on average surpasses other Latin American nations, but it is still behind other countries in the OECD. Likewise, there

are differences in achievement within our education system, and in that sense, the country's most urgent challenges are to increase academic achievement in the lower socio-economic groups and in municipal education.

Regarding the results obtained in the periodic standardized tests carried out by the MINEDUC through the SIMCE exam, a significant increase can be observed in the average mathematics scores for 10th grade. We also see a decrease in the gap between 4th grade students in municipal schools and private schools. These results are a reflection of the levels obtained on an international level, and indicate that our education system is improving. However, it still has weaknesses, and must transition to the achievement levels of developed countries. Table 9 shows a positive evolution of the national average score for 10th grade SIMCE tests, especially in mathematics, which has been increasing since 2008. While 4th grade scores do not register a significant increase in national averages (see Table 10), there is a rise over time. Additionally, there were improvements in municipal schools in mathematics, which contributes to the decrease in the gap between municipal, subsidized private and private schools. Also, when examining Table 11, it can be observed that the gaps in average SIMCE scores between socio-economic groups have been decreasing since 2008, especially between the richest and most vulnerable groups.

In summary, there is still a significant gap between scores from municipal schools, subsidized private schools and private schools, as well as between socio-economic groups, therefore, it is possible that these reforms have had a positive impact on school performance (Agencia de Calidad de la Educación, 2009). In this sense, we can point out some initiatives that may explain this achievement:

- The implementation of a Preferential School Subsidy (SEP), which since 2008 has increased resources for students with greater educational needs. Through this law, an agreement is set up between the school, which prepares a plan for improvement in priority areas, and the MINEDUC, who in this case, finances and controls the efficiency and effectiveness of this plan.

- We can also highlight the Education Superintendence, which may be positively affecting school achievement via greater regulation.

- Another element that may positively influence this greater achievement is the empowerment of head teachers, who today are recognized as leaders in each school's process. However, there is still much more to achieve in terms of increased school autonomy, as the worlds best education systems show, success goes hand in hand with greater freedom of administering financial and human resources, and even the curriculum, adapting to each establishment's context.

- Finally, this increase in scores could be related to a growing interest from parents and teachers. The former may be acquiring greater concern for the education that their children receive, given the greater level and quality of schools academic information available, which is essential since they are monitors of and activists, demanding greater levels of quality. Meanwhile, teachers show increasing interest in being evaluated, assuming that they are the main promoters for their students achieving better results.

Table 9: SIMCE Results for mathematics and language, 10th grade 2001-2012

Test	2001	2003	2006	2008	2010	2012
Mathematics	248	246	252	250	256	259
Language	252	253	254	255	259	265

Source: MINEDUC

Table 10: SIMCE Results for mathematics and language, 4th grade 1999-2012

Test	1999	2002	2005	2006	2007	2008	2009	2010	2011	2012
Mathematics	250	247	248	248	246	247	253	253	259	261
Language	250	251	255	253	254	260	262	271	267	267

Source: MINEDUC

Table 11: SIMCE results for mathematics and language, 4th grade 1999-2012, according to

socio-economic group

Socio-economic Group	2002	2008	2012
High	301	300	299
Upper Middle	274	272	279
Middle	250	246	262
Lower Middle	229	226	246
Low	220	220	237

Source: MINEDUC

### 3. COMPETITION PRESSURES AND ACADEMIC PERFORMANCE IN A GENERALIZED VOUCHERS CONTEXT

#### 3.1 INTRODUCTION

In the 1980s, Chile transformed its educational system, which was experiencing low academic performance and high dropout rates. This reform introduced mass decentralization, placing schools under the management of municipalities, and allowed private schools to receive a subsidy through vouchers, which were also introduced to finance public schools. A change in the law in 1992 allowed parents to complement the voucher provided by the Government generated a massive influx of new schools, which, unequivocally changed the competitive landscape and has driven a significant reduction in public education to favor private subsidized schools (Paredes and Pinto, 2009). In 2013 the Chilean school voucher covers 93% of student enrollment, making it the broadest reaching voucher system compared to other countries.

The effect a voucher system has on academic performance is a highly controversial topic. 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. To analyze competition, most studies associate competition to 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 is misleading when, as in the Chilean case, students have the freedom to choose their school independently of the neighborhood where they live.

Furthermore, estimating the impact competition has on academic results using cross-sectional data is also misleading. This method follows classic industrial organizational research on the relationship between competition and performance (e.g., Bain, 1956;

Demsetz, 1973; Keppler, 2008; and Rosado, 2008). The use of cross sectional studies is inadequate to estimate the relationship between competition and performance. They typically maintain that in a moment in time, for different reasons, they face different degrees of competition, for example differentiated entrance barriers between different industries. The situation is substantially different in the case of Education in Chile. The most relevant change in the educational industry's structure is observed in the early 1990s, when private schools with state funding were permitted to compliment said contributions with private funds.

The change in the competitive environment that affected schools in Chile was not the same for each school. In this paper we propose a proxy to correctly measure the effect in competitive pressures affecting different schools and we evaluate that effect on academic performance. This chapter considers an overview of the educational system in Chile, as well as a review of relevant literature and describes also the methodology and the results for us measure of competition and its effect in the education industry.

## 3.2 BACKGROUND

### 3.2.1 THE CHILEAN EDUCATIONAL SYSTEM

Until the early 1980s, nearly 80% of the country's schools were run by the State. The Ministry of Education was in charge of funding and running Chile's schools, supervising and developing curricula, and investing in and building public school infrastructure. The system had high dropout and repetition rates, and was viewed as delivering a poor-quality education owing to its excessively bureaucratic nature, insufficient coverage and failure to provide

schools with proper incentives<sup>3</sup>. This gave rise to a far-ranging reform of the education system based on a voucher system (Friedman, 1955). This system is one of the few large scale voucher systems in the world, which is why its analysis is of great interest for empirically evaluating the theoretical arguments on the advantages and disadvantages of the voucher system on education (Aedo and Sapelli, 2001). State-run schools were handed over to the country's municipalities and were financed with subsidies that did not differentiate between students attending municipal schools and those attending non-fee private voucher schools (Mizala and Romaguera 1998). This reform was in the line of several structural reforms in Chile in the late 1970s, including market and choice elements (Castañeda, 1991; Cox, 2003). Thus, the reform gave rise to three types of schools: (i) municipal, State-funded schools (with funding provided by per-student subsidies); ii) privately run, State-funded subsidized schools (with funding provided by per-student subsidies); and (iii) privately run schools funded by tuition payments.

Since the early 1980s, the system has gone through numerous modifications, in response to an analysis to improve quality levels and equality (Cox and Lemaitre, 1999). One such change was the Program for Educational Quality and Equality (MECE), which incorporated a systematic intervention of processes and conditions used in education, with an emphasis on the segment of students and schools that were falling furthest behind. In 1995 the results for the standardized SIMCE tests were published for each institution. This standardized test measures the achievement of educational objectives and is taken by all students in 4th grade and 8th grade, with the exception of students who studied in multi-grade classrooms. Tests for 10th graders were incorporated in 1998. The publication of these

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<sup>3</sup> Hanushek (1998) suggests, for example, that in 1970 the test scores for Chile's students were 50% lower than those of students in France and the United States and 20% lower than those of students in Japan and were only 10% higher than students in India and the Islamic Republic of Iran. Barro (1999) reported that Chile's scores were 50% lower than what they would be expected to be given its level of development.

results was done so parents would have information regarding schools performance, a key element in making proper decisions.

In 1993 a provision was introduced to supplement State funding. Under this statute, some of the subsidized schools were allowed to charge parents for a portion of the tuition, and subsidized private schools and some public schools were authorized to receive donations or grants, which would be deducted from the State subsidy. This led to a steep rise in private school enrolment that has cast some doubt over the sustainability of the municipal school system (Table 2). These policies succeeded in bringing about a steep reduction in dropout rates and a steady increase in enrolment rates. The scores on the System for Measuring the Quality of Education (SIMCE) tests, however, indicate that the quality of education remains quite limited and that striking differences between the performances of students in different socio-economic sectors continue to pose a major challenge<sup>4</sup>.

The conceptual and empirical foundations underlying this discussion about the consequences of the reform clearly extend beyond the specific case of Chile. Hanushek (2003) suggests that the cost of public education has risen sharply without attaining the expected results. Chubb (2001) contends that, if education was privatized, schools would have powerful incentives for cutting costs and that this would push them to innovate and become more efficient. Others argue that this type of system would prompt private schools to cut costs in ways (e.g., recruiting less qualified teachers at lower salaries) that would lower the quality of the education that they provide. In addition, this system could lead to discriminatory practices whereby schools would give preference to students that would be less costly for them (Levin, 2002). In Hoxby's view (2000), this kind of situation arises because, in a flat-rate subsidization system, subsidized private schools have no incentive to

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<sup>4</sup> Chilean students scored substantially higher on PISA 2006, especially in language (OECD, 2008).

take on students who are in more vulnerable situations, since they will require a larger investment in order to achieve better scores.

Regarding the consequences of the Chilean reforms, there is a consensus that the reform increased coverage and reduced repetition rates. However, most analysts also find a low quality of education and that the results and the intellectual ability is strongly stratified and that the level of education is unsatisfactory by international standards (see, Hayneman, 1990 and 2004; Brunner, 2005; Garcia and Paredes, 2010).

Besides learning, the literature states a main concern regarding segregation. Hsieh and Urquiola (2003) argue that the reform spurred an exodus of middle-class students from municipal schools to private subsidized ones, which left the municipal schools with a much greater proportion of students from vulnerable sectors and therefore drove down their average scores. Tokman (2005) and Valenzuela, Bellei and De los Ríos (2008) suggest that allowing parents to pay in a State voucher context explains Chile's high segregation shown in the PISA2006 report. Using SIMCE scores, the same concern is present in Mizala and Torche (2011). More recently, Paredes, Opazo, Volante and Zubizarreta (2013) decomposing segregation within and between schools, suggest that most segregation observed is between school types, and it is particularly high in the private paid schools.

### 3.2.2 COMPETITION AND PERFORMANCE

The introduction of competition through a voucher system could induce schools to improve performance (Hoxby, 2000). 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, Shugart and Williams (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, 2000) used a Tiebout 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. So, including private schools (which are assumed to operate with greater productivity) provided information regarding academic productivity, and limited the agency problem. Results suggest that the greater the competition provided by private schools, the greater the efficiency of public schools, raising performance levels, teacher salaries and high school graduation rates.

Epple and Romano (1998) develop 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. To achieve this, they corrected their prior model, varying the voucher based on students abilities. 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. They use as a proxy for competition the percentage of students enrolled in private schools and they dealt with the endogeneity of this variable by using the density of the Catholic population per neighborhood as an instrument. They conclude that competition provided by private schools has no direct effect on the performance of public schools.

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. They 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. Then they controlled for endogeneity, using as an instrument the maximum distance travelled for the student, defined by revealed preferences in different transport modes. They found that in the whole sample, competition had a small impact on performance. However, when the population is restricted to the population of Voluntary Aided schools (schools with more administrative freedom), the results show a positive and significant impact on academic performance.

Regarding the Chilean case Carnoy (1997) suggests that the competition model induced by extensive vouchers has not been effective, as reflected in the high segmentation

in schools. McEwan and Carnoy (2000) 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. The s propose that this relationship is caused by the migration of the best students to subsidized private schools.

Gallego (2002) develops a model to estimate the effect of competition in municipal and subsidized private schools using SIMCE results and cross-sectional data from 1994 to 1997. He proxied competition as the percentage of private enrollment per municipality, and concluded that competition improved school results in the case of private subsidized schools. He finds a positive correlation between competition and performance, particularly in subsidized private schools, and interprets this as being a consequence of the existence of stronger incentives for a rapid response to potential competition. Hsieh and Urquiola (2003) contents those findings arguing that, after the reform, the private subsidized schools better showing was primarily due to the fact that they had selected out the best students. They 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.

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.

### 3.3 METHODOLOGY

#### 3.3.1 INCOMPLETE ANALOGY BETWEEN INDUSTRIAL ORGANIZATION AND EDUCATION

There is wide agreement that firm's return is negatively correlated with different proxies of competition, particularly, market concentration indicators. Whilst the interpretation that associates competition with concentration received important criticism, such as Demsetz (1973), who suggests that the relationship concentration return is spurious when size is not controlled for, the Structure-Conduct-Performance paradigm that supports it has had large impact and tends to be specifically applied by antitrust organizations in different countries (Brozen, 1971; Gilbert, 1984). In fact, it is that paradigm the implicit in most research analyzing school competition and academic performance. A basic industrial organization model to determine the effect that competition has on return is (1)

$$Performance_{i,j} = \alpha_0 + \beta_1 Competition_{i,j} + \beta_2 X_{i,j} + u_{i,j} \quad (1)$$

where the performance of firm  $i$  in the industry  $j$  is measured as the ratio profits and company assets, competition is empirically associated with the industry concentration,  $X$  summarizes other controls, and " $u_{ij}$ " is an error term not related to the competition variable. Model (1) typically is estimated with cross-sectional data taking advantage of the variance in competition between industries at a given moment of time. The source of that variance is given, for instance, since industries face different barriers to entry. McEwan's and Carnoy (2000), equation is suggested for estimating the competence's effect on school performance.

The hypothesis in this equation maintains that school performance depends on the level of competition and socio-economic characteristics, therefore it is defined that:

$$Performance_{ij} = Comp_j \beta_1 + X_{i,j} \beta_2 + \varepsilon_{i,j} \quad (2)$$

where the performance of *firm<sub>i</sub>* in the *industry<sub>j</sub>* is measured as the test score of the *ith* student in the *jth* school type in the SIMCE test, competition is associated with the effect of pressure of competition relative others competitors, X summarizes set of independent variables that describe socioeconomic, background of the student and the and  $\varepsilon_{i,j}$  is an error term not related to the competition variable.

The existing analogy between (1) and (2) is in that the company's, students, and therefore school's performance depends on the level of competition that the company and school face respectively. According to this it is to be expected that companies facing greater levels of competition obtain lower performance levels than those who have a greater monopolistic power. However, in the education sector the analysis is some-what different, as those schools who face greater levels of competition are expected to make greater efforts in order to maintain and attract students. This translates to a greater level in standardized test results.

However, there are two main problems to estimate (2) for the case of education in Chile. First, the competition variable is unclear. School concentration indexes in given areas are meaningless when parents move between areas, as has been reported elsewhere (Chumacero, Gomez and Paredes, 2012). Second, this methodology requires changes in the monopolistic power and competition through counties or areas in a given moment of time. This is unlikely in some cases and in the Chilean case in particular after the massive entry of schools. The reforms of the Chilean system allowed and encouraged an important influx of

schools, and therefore it can be expected that once the entrance of new schools with the reform is complete, the excesses in demand would basically adjust to the surrounding population. With the reform, schools had to do new things to attract and keep their students. Some schools were more prepared to do so, some had market niches because of their location or quality. The solution to this problem comes from the fact that competitive pressures for each school, after the entry of other schools, may have changed. Following the basic hypothesis that competition increases performance in the quality of schools, but considering two different periods and comparing the differences, and as a way to estimate the change in competition that schools face and how they react to said change, therefore meaning that the unit of study is not the student, rather the school which (s) he attends in a period of time, the model can be expressed as (3):

$$\Delta Perf_{i,t} = \alpha_0 + \beta_1 \Delta Comp_{i,t} + \beta_2 (\Delta Comp * ST)_{i,t} + \beta_3 Perf_{i,0} + \beta_4 \Delta Control_{i,t} + \varepsilon_{i,t} \quad (3)$$

where the dependent variable is the change in the performance in 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.<sup>5</sup> Equation (2) also considers controls for the change in socio demographic characteristics ( $\Delta Control_{i,t}$ ).

Using the estimates  $Comp_j$ , one can predict the performance of each school. This Methodology has some weaknesses that should be taken into account before interpreting our results. There are problems with endogeneity, which is caused by the variable competition referring to how the school providers behave, maintaining a constant demand. However, the

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<sup>5</sup> 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.

available offer and demand for schooling are simultaneously determined. Therefore, only the quantity of balance of offer and demand is observed. Thus for example when a school faces greater competition and does not increase its performance level, its schooling demand decreases, and enrollment rates increase in the more efficient schools. For example, school entry is endogenous and happens in places in which other schools are not doing a good job. It would be expected that new schools would first be found where current schools are doing a bad job. Estimates with problems of endogeneity are inconsistent. However, the problem of endogeneity can be resolved with valid instruments. In order to be valid, the instrument must satisfy two conditions: the first is of relevance, which means the endogenous variable is related to the instrument, and finally of exogeneity, in which the instrument is not related to the error term. However, two stage least squares with robust errors is widely used for being a general case of estimation and useful when working with numerous instruments. In the first stage the endogenous variable is decomposed into two parts, that which is not correlated to the error term and that which is correlated to the error term. In this way, the first stage consists in creating a regression of the endogenous variable with the instrument. This regression allows for the decomposition of the endogenous variable as needed: one part exogenous, which is the part predicted by the instrument (if the instrument meets the condition of exogeneity, this prediction will be precisely the exogenous part), and another part that is correlated to the error and is the one that causes the problem of endogeneity. The second stage consists of estimating the original model, but instead of using the endogenous variable, the variable predicted in the first stage is used. In our case, we consider the enrollment in the base year as an instrument of the change in competition.

### 3.3.2 MARKET SCOPE AND COMPETITION

One of the critical aspects to get a good competition proxy is the definition of the market. In general, the literature uses an empirical approach to define it. Over a given threshold for cross elasticities among two goods, a market definition should include both as part of the same market. In the case of education, two schools will be part of the same market if the entry of a new school which charge a fee slightly smaller than the incumbent, significantly affects parents choice.

The difficulty to define market in education lies in that relevant school characteristics are many. It is in general wrong to define market and the competitive pressures based only in one characteristic, like for instance, distance between. Substitution depends on all the factors parents consider relevant to choose them including infrastructure, academic performance, distance, and tuition costs and on the weights they give to each one.

To define the factors parents consider and the weight given to each of them, we follow the school choice model suggested by Gómez, Chumacero, and Paredes, (2012). They index  $i=1, \dots, Pare$  the students in the sample and  $j=1, \dots, stud$  the possible school choices. Denote by  $x_i$  the vector of characteristics of the student and its household that do not depend on the school, by  $y_i$  the vector of characteristics of the school that do not depend on the student, and by  $z_{i,j}$  the vector of attributes of the school that are specific to each student. Then define  $u_{i,j}$  as the (indirect) utility of  $child_i$  attending  $school_j$ , so that:

$$u_{i,j} = u(x_i, y_j, z_{i,j}) + \varepsilon_{i,j} \quad (4)$$

where  $u(\cdot)$  corresponds to a systematic component and  $\varepsilon_{i,j}$  is a (random) non-systematic component. Given (4), agent  $i$  chooses school  $h$  if  $u_{i,h} \geq u_{i,j} \forall j \neq h$ .

Denote  $d_{i,j}$  the distance between household  $i$  and school  $j$ ;  $d_i$  the distance between household  $i$  and the nearest school;  $u_i$  the value of the utility function in (4)

associated with choosing that school, and  $u_{mi}$  the value of the utility function associated to the choice of the school that maximizes (4). Thus, the school choice that minimizes  $d_{i,j}$  and the one that maximizes  $u_{i,j}$  may be different for each student, and when the nearest school maximizes (4),  $u_{mi}$  and  $u_{\hat{i}}$  will coincide.

Finally, they define

$$v_i = \begin{cases} 1 & \text{if } u_{mi} = u_{\hat{i}} \\ 0 & \text{if } u_{mi} > u_{\hat{i}} \end{cases} \quad (5)$$

where,  $v_i$  is the (observed) variable that takes the value of 1 when the student attends the school nearest to the household and 0 otherwise.

As mentioned by Gómez, Chumacero, and Paredes, (2012), evaluating (5) instead of (4) is convenient as now we can focus on modeling the determinants of choosing the nearest school using binary response models. Thus, an empirical model possible to be estimated is:

$$Pr(v_i = 1 | w_i) = F(\beta' w_i) \quad (6)$$

where  $F$  is a distribution function (say the standard normal),  $w_i$  is a vector of determinants, and  $\beta$  a vector of parameters to be estimated.<sup>6</sup> The parameters associated to each of the characteristics parents consider in choosing a school, define the expected utility associated to each choice. From there, a metric associated with the increase in the competitive pressure for each school incumbent school associated with the new entry. This is the proportion of students from each incumbent school that had preferred a new school had it been available.

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<sup>6</sup> As considered in Ferreyra (2007), the choice of school and of residence may be jointly determined. Whilst we have no data to control for the choice of residence, this may not be a prevalent problem in Chile because the vast majority of beneficiaries of the voucher program are from middle income and low income households. They tend to use publicly financed housing programs in which the location of the household is “exogenous” to them.

More precisely, we first compute and compare for each student in an incumbent school the indirect utility associated with that precise choice and the indirect utility she would had if a new school had been available. We then define a dichotomous variable  $S_i = 1$

if  $U_{ij}^{chosen} \leq U_{ij}^{new}$ , 0 otherwise. Using  $S_i$  for each student in the incumbent school  $k$ , the

metric for the increased competitive pressure for each incumbent school is the proportion of the students in an incumbent school that had been better off in a different school had it been available (7).

$$C_k = \sum S_i / n$$

### 3.4 THE DATA

We combine 3 data sets to apply our methodology. The Chilean National Socioeconomic Survey (CASEN) used by Gómez, Chumacero, and Paredes, (2012), does not allow estimating the competition pressure variable for each incumbent school. In turn, the SIMCE database details the academic performance for each student and school, monthly tuition and the socio-demographic characteristics of the parents of each student, such as gender, family income, education of the father and mother, but does not have information on the home address, needed to compute distance to school. 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 includes the student's address when he/she took 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<sup>7</sup>, for more information about this DATA, to see Anex for Table A1 and A2.

### 3.5 RESULTS

Table 12 shows the results of 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. The results are consistent with economic theory and empirical evidence obtained in Gómez, Chumacero, and Paredes, (2012), 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. When there are more schools close to the family home, the probability of choosing the closest school declines. As would be expected, families are more likely to choose the closest school when its quality is greater or it is closest. Thus, a trade-off between quality, distance travelled by students and the tuition paid is obtained. From the parameters of Table 12, we computed the  $C_k$  variable, as suggested above.

The estimation of model (3) 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.<sup>8</sup> The estimation of model (3) differentiated the grade when the SIMCE test was taken, without recognizing and using instruments to eliminate endogeneity, previously commented on in the discussion between competition and academic performance indicate the change in competition does not affect the

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<sup>7</sup> Whilst some families may move over the years, we don't expect a correlation between the new distance and any independent variable, so our estimates will still be unbiased.

<sup>8</sup> As an example in 2008, there were 8,829 schools teaching 4th and 8th grade, and 3,675 schools teaching high school.

schools' performance in 8th and 10th grades, and that it negatively affects municipal schools in 4th and 8th grades, according to table 13. In addition, it can be observed that the variables tuition variation, income variation, variation of mother's education and variation of father's education do not significantly affect the schools' performance despite what the literature suggests. Perhaps one of the more interesting results to highlight is the effects that the variable Initial SIMCE score of school, which shows that those schools that have lower SIMCE scores show a greater adaptation to changes in competition, which is why the number is negative. Problems of unresolved endogeneity would explain the scarce quality of the obtained results and affect the quality of the estimations.

The estimation used 2SLS and as Gallego, 2002, considered as instrument the number of schools in the county, to face a possible endogeneity regarding new school location, is presented in Table 14. The results consistently show that greater competitive pressure significantly increase the performance of private pay schools and private subsidized schools for the 4<sup>th</sup> and 8<sup>th</sup> grades, and they show no significant effect for the 10<sup>th</sup> grade. For example, for the 4<sup>th</sup> degree, an increase of 1% in the competitive pressure involves an increment of 1.05 points in the performance the private subsidized schools and private schools in the period  $t$ . Furthermore, public schools increment is 0.3854 points. For 8<sup>th</sup> and 10<sup>th</sup> degrees, an increase of 1% of increase in of change in the competition pressures involves an increment of 2.5540 and 0.7502 points respectively. For public schools the increment are 1.7715 and 0.7233 for the 8<sup>th</sup> and 10<sup>th</sup> degree respectively.

In summ, the results suggest the effect is also positive for public schools, but significantly 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<sup>th</sup> year student performance for two otherwise identical schools. School 1 and 2 had an increase in the competitive pressure they face by 5 and 15, respectively (the standard deviation of  $C_k$  is 33 for 4<sup>th</sup> year). If both schools were private, that would imply a difference in their performance of 10.4 points. In the case both schools were municipal, the differentiated effect would be 3.9 points. Considering that the standard deviation of the SIMCE test is 50, these magnitudes are huge, as it is expected that changes in competition positively affect each school, as they are forced to maintain and attract students. Finally, we estimate that the effect of change on competition is greater in 4<sup>th</sup> grade, as schools make an additional effort to attract new students, offering greater performance in early levels, ensuring parents a quality education during the educative process.

### 3.6 CONCLUSIONS

The lack of consensus in the area of education regarding the effect of greater competition on learning, contrasts with the results for other industries. Using a methodology that introduces the idea and measures competitive pressures, we found that competitive pressures does improve significantly and in a relevant way the academic performance of 4<sup>th</sup> and 8<sup>th</sup> year students. Secondly, we found that the increase in the competitive pressure positively affects all schools, regardless of the type of administration. It is true that in the case of municipal schools the effect is less important, but still there is an effect which is positive and relevant. Our findings reject some previous ideas, in the sense that higher competition among schools has a significant effect on student performance: it only occurs with private schools.



Table 12. School choice (PROBIT estimates).

Schools	Public schools		Private Subsidized Schools		Private Pay	
Variable	Estimated Value	Std Error	Estimated Value	Std Error	Estimated Value	Std Error
Constant	1.33311 (**)	0.1733	-1.67217(**)	0.1324	1.75619(**)	0.4981
Female student	0.03291	0.0346	0.0037	0.0208	0.12514(**)	0.0414
Mother's yrs. of education	-0.01050	0.0054	-0.00813(*)	0.0036	-0.02668(*)	0.0114
Log income	-0.04528	0.0249	0.00663	0.0156	-0.04145	0.0453
Tuition for selected school	-0.01979(**)	0.0035	-0.00452(**)	0.0006	-0.00793	0.0023
Tuition for closest school	0.00197	0.0031	-0.00368(**)	0.0005	- 0.00627(**)	0.0020
Quality of selected school	-0.01879(**)	0.0007	-0.00149(**)	0.0004	- 0.00423(**)	0.0010
Quality of closest school	0.01452(**)	0.0008	0.00631(**)	0.0004	0.00655(**)	0.0008
Distance to closest school	-0.15412(**)	0.0176	-0.24804(**)	0.0199	- 0.06921(**)	0.0222
Number of schools	-0.08291(**)	0.0104	-0.01935(**)	0.0018	- 0.03017(**)	0.0031

Statistically significant with a 99% (\*) and 95% (\*\*) level of confidence.

Observations 9,143 25,328 6,229

Percentage 76.0691 87.3855 86.4148

correctly predicted

Pseudo R-squared 0.2367 0.0371 0.0576

Table 13. Effect of competitive pressures on academic performance (OLS)  
10<sup>th</sup> grade 8<sup>th</sup> grade 4<sup>th</sup> grade

Variables	Coefficient	Coefficient	Coefficient
Constants	-13.2415 (6.8243)	65.1352** (10.5113)	70.6948** (7.7082)
Change in competitive pressure (range 0 – 100)	0.0132 (0.0351)	0.0326 (0.2705)	0.0875** (0.0274)
Change in competitive pressure * School Type (Municipal=1)	-0.0107 (0.0217)	-0.0865** (0.0217)	-0.1257** (0.0336)
Initial SIMCE score of school	0.0489 * (0.0236)	-0.2573** (0.3940)	-0.3076** (0.0314)
Income variation	0.0054 (0.0099)	-0.0158** (0.0030)	-0.0047 (0.0019)
Tuition variation	0.0060 (0.0673)	0.1035 (0.0794)	-0.0097 (0.0506)
Variation of mother's education	1.4548 (1.1225)	2.3919 * (1.1874)	2.9894 * (0.9979)
Variation of father's education.	-0.1473 (0.7818)	1.2278 (0.8951)	2.0027 * (0.9498)

Standard Deviation in parenthesis. \*p < 0.05, \*\*p < 0.01.

26	554
2	17.73
0	0
16	0.1772

Table 14. Effect of competitive pressures on Academic Performance (2SLS)

	10 <sup>th</sup> grade	8 <sup>th</sup> grade	4 <sup>th</sup> grade
Variables	Coefficient	Coefficient	Coefficient
Constants	-72.7229* (36.3945)	-118.7656** (18.7403)	-162.5068** (9.2809)
Change in competitive pressure (range 0 – 100)	0.7502* (0.4448)	2.5540** (0.2392)	1.0459** (0.0743)
Change in competitive pressure * School Type (Municipal=1)	-0.0269* (0.0229)	-0.7825** (0.0686)	-0.6605 (0.0468)
Initial SIMCE score of school	0.0301* (0.0258)	-0.2304** (0.0264)	-0.8491** (0.0478)
Income variation	0.0005* (0.0078)	0.0369** (0.0055)	-0.0028 (0.0018)
Tuition variation	0.0532* (0.0673)	-0.0023 (0.0587)	0.5520** (0.0616)
Variation of mother's education	3.1124* (1.4108)	2.7053** (0.8382)	1.8055* (0.8154)
Variation of father's education.	1.8253* (1.4257)	5.0632** (0.8521)	0.3610 (0.8132)
Standar Deviation in parenthesis.	*p < 0.05, **p < 0.01.		
Observations	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

## 4 SCHOOL CHOICE AND SWITCHING COSTS

### 4.1 INTRODUCTION

As previously indicated, the educational reform which Chile introduced in the early 1980s was expected to create competition through large scale decentralization and the introduction of choice through a voucher system. In 1991, a new law allowed schools with State funding to supplement income from the voucher payments with private tuition (shared financed schools). This generated a huge increase in private voucher schools, and represented one of the most relevant transformations in a short period of time in the supply of schools in Chile's history. Whilst this structural change significantly increased choice possibilities, it is not clear what effect this had on real choices and hence, in educational performance.

Switching costs, defined as the cost of changing a decision that was previously taken, have been analyzed in a context of industrial organization and strategy (e.g., Porter, 1979; Day, 1986; and Aaker, 1988). In the case of education they may be particularly relevant, since changing a child from the school they were previously attending involves, at a minimum, affecting their social circles, increasing their stress and in the Chilean example, incurring direct costs such as an enrollment fee, specifically designed uniforms, and so. If switching costs were important, they would reduce choice and the effect of a voucher system on academic performance. In that case, relevant choices would mainly apply for children entering into their first grade, and not to students whose parents had already chosen a school for them. Thus, a sudden increased competition and choice possibilities, as occurred in Chile, would not have a relevant impact in the short run if parents lack capacity to move their children to a different school once a first decision was taken.

Despite the importance of switching costs in a voucher context, to our knowledge there is no study that measures their importance and impact. The fact that choosing a school implies at least considering distance, academic performance, and costs, makes switching costs necessary to analyze in a multidimensional setting. In this chapter we suggest a method to measure switching costs and we apply it to Chile.

## 3.2 BACKGROUND

### 4.2.1 SWITCHING COSTS

Economic theory suggests that for competition to have a positive impact on performance, consumers must play an active role through their choice. However, consumers may be limited by the provider's switching costs or difficulty to evaluate and compare the different offerings (Wilson and Waddams, 2007). In fact, a line in the literature emphasizes the advantages for firms to create and rise switching costs to reduce substitution, and finally, increase monopoly power (Fornell and Larcker, 1981; Klemperer, 1987c; Porter, 1998; Hess and Ricart, 2002; Farrell and Klemperer, 2006; Nakamura, 2010; Klemperer, 1987a, 1987b, 1995; Burnham, Frels and Mahajan, 2003; Shy, 2002; Kahl, 2004; Kim, Choi and Kim, 2010).

A first attempt to empirically measure switching costs was Jackson (1985), who classified "psychological and economic" costs. He concluded that switching costs increase with product complexity and with post sales services (Gremmler and Brown, 1996; and Fornell, 1992). Maicas (2006) identifies a broad variety of product and service industries where switching costs are relevant (see also, Grzybowski, 2006; Kim, Park and Jeong, 2004; Maicas and Sese, 2008; Maicas, Polo and Sese, 2009). Guiltinan (1989) associates switching costs with economic and psychological costs. This idea was followed by a

number of scholars, including Bitner (1995), Bendapudi and Berry (1997); Jones, Mothersbaugh and Beatty (2000); Colgate and Lang (2001); Berné, Múgica and Yagüe (1996), Jones and Sasser (1995), Dick and Basú (1994), Ganesh, Arnold and Reynolds (2000), García (2000), Sharma and Patterson (2000), Lee and Cunningham (2001), and Wathne, Biong and Heide (2001).

Borenstein (1991) pioneered the measurement of switching costs in gas stations, and associate these costs to price differentiations. That pioneering work influenced Sharpe (1997) for bank deposits, Knittel (1997) for long distance telecommunications, and Elzinga and Mills (1998) for cigarette distribution during the price war of the 1980s. Shy (2002), for the Israeli cellular phone and financial industries, linked switching costs to market share and prices charged by each company. Kahl (2004) measured huge variations by industry. Chen and Hitt (2002), Johnson, Bellman and Lohse (2002), Kim, Kliger and Vale (2003) analyzed switching costs in new technologies industries. Shum (2004) evaluated how brand loyalty affected opportunity costs in the cereal industry. Wilson and Waddams (2007) estimated switching costs for the residential electrical market. Maicas, Polo and Sese (2009) concluded that portability of cell phone numbers reduced switching costs, favoring the decision to change supplier. Aydin, Gökhan, Kazan and Doğruer (2009) estimated the sources of switching costs and evaluated their impact on the credit card market, emphasizing the psychological nature of switching costs.

To our knowledge no empirical research on switching cost in education exists. This is not surprising, since in one way or another, most countries limit parents' school choice, a sort of institutionally imposed switching prohibition. In the U.S., for instance, most school enrolment is defined by the county where the family lives. Furthermore, in most cases

where parents can choose a school in a different county, lotteries are required to deal with the excess of demand.

For countries or areas where school choice is allowed, there is research on the effect that choice has on education quality (see, Hoxby, 2000; Ladd and Fiske, 2001; Böhlmark and Lindahl, 2008; Gibbons, Machin and Silva, 2008, Hanushek, Kain, Rivkin, and Branch (2007) and Imberman, 2011). For Chile, the literature on vouchers has focused on its learning consequences (Carnoy and McEwan, 2000; McEwan and Carnoy, 2000; Elacqua and Fabrega, 2004; Gallego and Hernando, 2008; Chumacero, Gallegos and Paredes, 2012); on the real possibility families have to choose (Gallego and Hernando, 2008; Chumacero, Gomez and Paredes, 2012; Chumacero and Paredes, 2012; Elacqua, 2012), and on the role of information (Gallego, Cortés, Lagos and Stekel, et al, 2008; Gomez, Chumacero and Paredes, 2012). A different approach, partially connected to switching costs is followed by Bravo, Mukhopadhyay and Todd (2010). They analyze the effect of the introduction of the voucher system on employment and wages. Using panel data, they develop a model to explain how the choice was affected by the reform, a choice that had to do with the type of school available before and after the reform, and labor market participation. As expected, the cost of staying in the same type of school (municipal, private subsidized, or private nonsubsidized) is estimated to be substantially lower than the cost of switching types of schools, and the highest switching costs are associated with the transition from private subsidized, unsubsidized primary to municipal secondary and municipal primary to nonsubsidized primary. The costs are relatively lower for transiting from one type of private primary to another type of private secondary.

Nonetheless, our research proposes a methodology for identifying and estimating switching costs in the education industry and how they affect parents' decisions on

changing their children's schools for a better one according to a set of previously identified and weighted preferences in our choice selection model. This is relevant, as the capacity of a voucher system to improve schools and students' academic performance depends on the parents' ability to select the best option in terms of quality and the establishment's ability to respond to the incentives created by competition. However, the benefits of competition can be negatively affected by the existence of switching costs, as changing a students from one school to another includes changing their social circles and friendships, which may cause stress for both the student and their family. This is of importance, as the effect a voucher system has on academic performance is a highly controversial topic and the literature does not show consensus regarding the results of competition.

### 3.2.2 THE CHILEAN EDUCATIONAL SYSTEM AND THE INCREASE IN OPTIONS.

As indicated, in the 1980s, Chile transformed its educational system. Since then, education has become more decentralized, handing the State schools to the municipalities. The goal was that the system would induce students to choose the best school, and private voucher-funded schools were created. Since then, the educational sector is composed of three types of schools: public (municipal), subsidized private and private paid. Chilean education performance is relatively poor by international standards. For example, the TIMSS test results show that, Chilean students coming from that high socio-economic group obtain a better academic achievement than other students in the country, (see, Tables 6, 7 and 8). The evaluation of different schools is mainly made with SIMCE test. The results are comparable only since 1997 and test scores from 1997 to 2008 were very stable, without significant improvement and showing a poor quality for different schools,

particularly municipal ones (Drago and Paredes, 2012). Since 2008, and particularly in 2012, however, SIMCE scores have shown quite significant improvement. But the education problem in Chile concerns not only the quality of education, but also with inequality. Among students attending private schools, SIMCE scores showed that 1 in 2 get a satisfactory score (over 300 points in the mathematics SIMCE test), while 1 in 5 students of the private subsidized schools achieve this result and, finally, only 1 in 10 students of municipal schools get this score (see Fontaine, 2002, Brunner and Cox, 1995 and García and Paredes 2010).

The voucher program used in Chile has the broadest reach when compared to other countries in the world. In 2013, more than 90% of enrolled students attended a voucher school. The government finances schools based on student attendance, in an attempt to create competition between schools to drive quality improvements (Paredes and Ugarte, 2011). However, for competition to have an impact on a school's performance, parents must first have the ability to choose schools for their children based on academic performance and schools should react positively to the choice. As suggested above, initial research of the impact of the voucher system on academic performance showed little effect, if any. More recent studies have shown positive effects, but still the relevance is questioned (see, Epple and Romano, 1998; McEwan and Carnoy, 1998; Sander, 1999; Ladd and Fiske, 2001; Hsieh and Urquiola, 2003; Auguste and Valenzuela, 2003; Bayer and McMillan, 2005; Braun-Munzinger, 2005; Gallego, 2006; Böhlmark and Lindhal, 2008; Gibbons, Machin, and Silva; 2008; Bravo, Mukhopadhyay and Todd, 2010; and Chumacero, Gallegos, and Paredes, 2012). A possible explanation for the relatively weak effect competition showed on student performance, particularly in the first wave of studies, is the presence of switching costs. Moving a child from one school to another involves, at a minimum, the

stress of cutting social circles, in addition to the payment of an installation fee in the case of many schools that may be costly and represents a sunk cost. Thus, even if better quality schools were available, some families will keep their children in the schools they originally chose, limiting the effect of competition on performance in the medium or long term.

The evidence for Chile suggests that the percentage of students who change schools is significant. Table 15 shows the total students for the year 2000 in the Santiago Metropolitan Region who were in 4th grade in schools imparting primary and high school education, and could therefore continue to study at the same school or could be at another school by 2004, when they entered 8th grade. From the total group of 17,455 students, 2,921 students changed to another school (16.7%). Consequently, the relevance of switching costs is an empirical rather than a conceptual matter.

Table 15: Decision to stay in same school or switch schools during the 2000-2004 periods

Total	Stay	Male	Female	Public	Private Subsidized	Private Pay
2,921	No	1,272	1,649	364	1,841	716
14,534	Yes	6,962	7,572	1,537	7,318	5,679
17,455		8,234	9,221	1,901	9,159	6,395

Source: Authors based on SIMCE.

### 3.3 METHODOLOGY

#### 4.3.1 DEFINITION AND MEASUREMENT OF SWITCHING COSTS

The methodology we follow can be explained in three steps. First, based on a decision model, we estimated the effect three different observed characteristics, quality, distance and price, had on the decision parents make to choose schools in 2000. The weights each of these characteristics has on their decisions to choose schools are parameters of their utility function we assume are stable over time. Second, using these estimates, we compare the expected utility parents derive from the school chosen in 2000 and every new school that was not available in that year but was available in 2004. Third, we observe whether parents changed or did not change their children to a new school that was not previously available for them.

We expect that in absence of switching costs, parent should change students to a new school if the new school provided a higher expected utility than that previously chosen. On the contrary, if there are switching costs, only high-enough differences in utilities favoring a new school will produce that change. The magnitude of the switching cost can thus be obtained and be expressed in utility gap, cost, distance or quality.

For the first part we follow Chumacero, Gomez and Paredes (2012, assuming parents have utility functions that depend on a number of school attributes, including school quality, price and distance at the same way to the chapter 3. We also use the propositions (4), (5), (6) in this chapter for developing our measure of the switching costs.

Secondly, we define  $S_i$  as the gain an individual  $i$  who choose a given school in period  $t$ , if he had the (larger) options that were available in  $period_{t+k}$  and this can be expressed as in (8)

$$U_{i, \text{effectively chosen school } t} - S_i = U_{i, \text{school would choose } t+k} - U_i \quad (8)$$

In our case, we understand  $S_i$ , as the cost a student must face when (s) he decides to change the chosen school for another which reports a greater level of utility. Also, in (8) it is observed that in order for a student to switch to the better option, the benefit must outweigh said cost. If this occurs, then the benefits of competition will be observed. In our case, switching costs are measured according to a group of appropriately weighted attributes and the level of utility reported by the chosen provider facing each new market proposal in the market. Therefore, this can be expressed as in (9).

$$U_{i, \text{effectively chosen school } t} + S_i = U_{i, \text{school would choose } t+k} \quad (9)$$

We expect that the probability of changing the original school depends on  $S_i$ , as in (10).

$$P_i = f(S_i) + u_i \quad (10)$$

Recall that in the absence of switching costs, our model suggests that a positive value of  $S_i$  should induce parents to change the school previously chosen. However, switching costs could make such a change inconvenient unless  $S_i$  is big enough to compensate the costs associated with that change. If different families face the same positive switching cost, this should be reflected by a discontinuity in the probability of changing school once the benefit of that change exceeds the switching cost, as illustrated in the dashed line in figure N°1. If instead switching costs differ among families, the probability they change schools would increase with  $S_i$ , but may not show a discontinuity. In any case, a positive relationship between the probability of changing school and  $S_i$ , for enough positive value for  $S_i$ , would suggest switching costs.

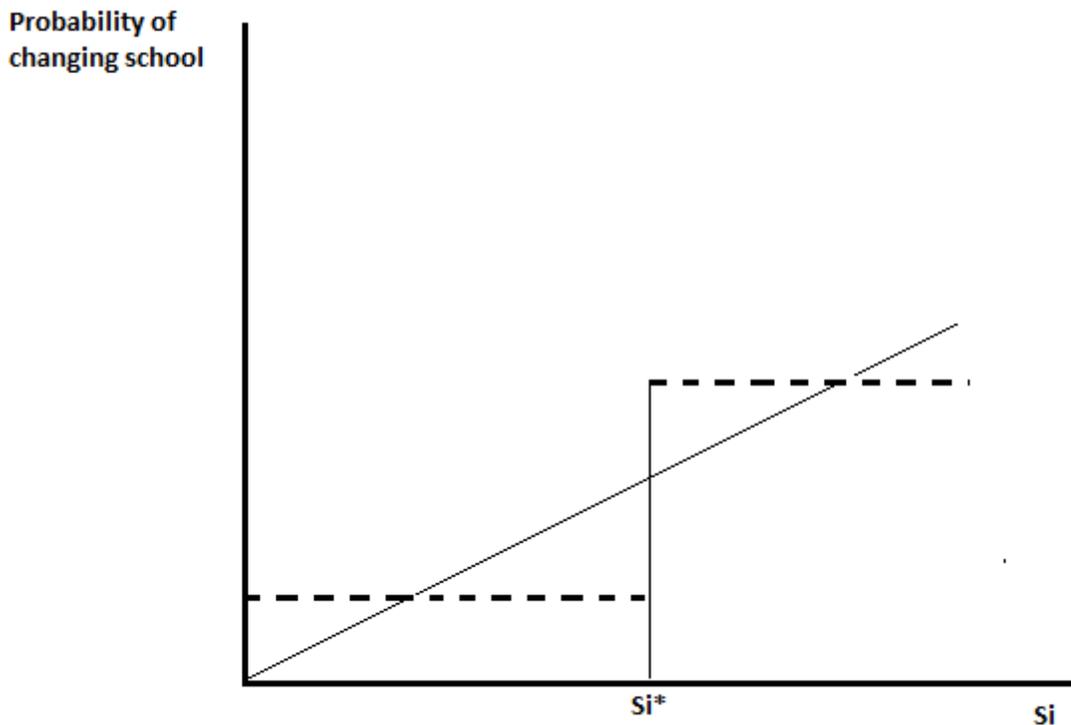


Figure 1: Probability of changing school with switching costs.

#### 4.3.2 THE DATA AND THE EMPIRICAL MODEL.

We used the database proposed in chapter 2 of this thesis, which considers an identification code for each student. We were able to follow this cohort of students who were in fourth grade in 2000, went back to observe them in their eighth grade in 2004, and were able to verify if they changed schools. Thus, we can compare the expected utility associated with the chosen school and that associated with a new school that was not available when they were in 4<sup>th</sup> grade, but that was available when they were in the 8<sup>th</sup> grade, as in (8). To this end, we merged a number of databases. The first data base is SIMCE that allows identifying students, the school they attended, and number of socio-demographic characteristics. The second is the database of students applying to universities in 2009 (i.e., those who were in their 12th grade in 2008) to get their addresses at the

moment they applied to the university. Assuming the address didn't change in the period considered, we georeferenced each home and school with digital maps, and we determined the Euclidian distance from each student's home to every school.

A merged database included individual and school SIMCE results (the latter considered as school quality indicator), individual characteristics, school characteristics, and distance to each school. With that information, we estimated the school choice model suggested in Chumacero, Gomez and Paredes (2012), as in (6), and we get the parameters associated with distance, price and quality, and hence, the empirical tradeoffs into the indirect utility function.<sup>9</sup> The results of this estimation are presented in Table N°12, and they are consistent with the theory and those obtained in the mentioned paper. In particular, it is more likely to choose a school when is closer to home, it is cheaper, and it shows better quality (see descriptive statistics in Table A1, in the annex).

In the period 1995-2004, the number of private subsidized schools grew 24%. Thus, in 2000 families decided the school for their children with substantially fewer options than those they had in 2004.

To estimate the parameters associated with the probability that parents decide to keep the child in the original school, we consider the model (10). We expect that the greater the difference between utilities, the more probability the student will change from one school to the better option.

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<sup>9</sup> We tested our model using the residuals of an equation that considered SIMCE as dependent variable, and socio demographic variables as independent ones, to adjust for the influence of the family. The endogeneity problem arising from the endogenous nature of school location, as treated in that paper was addressed by using as instrument the number of schools in the county and in given ratio around each school. We pursue using SIMCE because the choice predictions were better, and an adjusted quality metric assumes particularly highly sophisticated parents.

The empirical versions of (10) first directly estimate the probability in terms of S, and second decompose the effect of each variable on the probability of changing school over the period considered as in (11) to estimate a possible differentiated effect, as in (11).

$$P_{i,j} = f(\Delta R_j; \Delta Price_j; \Delta D_{i,j}; L_{i,j}; G_i) \quad (11)$$

Where  $P_{i,j}$  is a binary variable for *student<sub>i</sub>* that chooses *sch<sub>j</sub>* in the year 2004, and takes the value 1, when the student remains in the school in 2000, and 0 if they moved to another school.  $\Delta R_j$  is the difference in SIMCE (standardized test score) between the originally chosen school and the best option;  $\Delta Price_j$  is the difference in the tuition charged between the chosen school and the best new option (in US\$),  $\Delta D_{i,j}$  is the difference in the distance between home to the chosen school and home to the best new option;  $L_{i,j}$  is the student's academic performance when he/she was in the 4<sup>th</sup> year and  $G_i$  is a dummy variable that is 1 if the student is male.

However, this increase of probability may not be linear, and in particular, can rise sharply once the benefit of the change outweighs its cost. Figure N°1 illustrates this possibility in which two regimes exist. The existence of a non-linear probability is explained by the families' degree of sensitivity facing the change in wellbeing created by new schools, which translates to families not switching their children's schools for small changes in levels of utility, or changing schools when said level reaches a threshold that depends on their preferences. Therefore, we estimate a threshold for each student and recalculate the probability of remaining in the chosen school despite the fact that there are better alternatives available Hasen (2000).

#### 4.4 RESULTS

Table 12, presented in chapter 2, shows the variables and estimates for calculating resulting levels of utility when comparing the chosen school with other new alternatives. With this, we can estimate  $S_i$  (10). Results of this estimation are consistent with economic theory in terms that the price, distance and quality coefficients have the expected sign. We observe (Table 16), that from 17,455 observations (students), 16.7% switched schools and 83.3% did not. We must remark that this variable is built from a different data set, and is used to evaluate if it can help to account for the observed switching behavior. To test whether S helps to explain the switches and how, we define C=1 when a student switches schools, 0 otherwise. The sample correlation between C and S is 0.05 and is statistically significant, unlike 0. A simple way to see that C helps to account for S is to evaluate if there are statistical differences in C for cases in which S = 1 (switch) or S = 0 (stay). The objective of this hypothesis is to evaluate if change in the gain an individual who chooses a given school in a period of time and who later faces new options, affects the decision to change the chosen school. Moreover Table 16 shows that, regardless of the test used, there are statistical differences on C depending on the value of S. That is, S is statistically larger in cases in which a student switched schools, which would indicate that the changes in the function of utility by the entrance of new schools affect the decision of remaining in the chosen school.

Table 16: Is S statistically different when C=0 or C=1?

Method	df	Value	Probability
t-test	17453	-6.534007	0.0000
Satterthwaite-Welch t-test	3499.472	-5.137258	0.0000
Anova F-test	(1, 17453)	42.69325	0.0000
Welch F-test	(1, 3499.47)	26.39142	0.0000

To estimate the mean value of the difference, a simple PROBIT model is fitted. The results presented in Table 17 show that the model has a low adjustment power, which is explained by the lack of more variables that affect the decision to change the chosen school. In addition, it is observed that when S increases, so does the probability of switching schools. This can be seen in Figure 2, as the S variable shows a positive slope and is statistically significant, in line with our initial claim, confirming that as schools report greater levels of utility, the probability of changing schools also increases. As can be seen from these results, although the direct link is documented, the model predicts fewer switches than those observed. However, the poor adjustment of the model suggests that in addition to the existence of other non-observed variables explaining the decision to remain in the original school, switching costs may significantly differ among families. We tested the existence of a structural change in the function, but we found no evidence of that change.

Table 17: PROBIT Switching Estimations

Variable	Coefficient	Std. Error	z-Statistic	Prob.
Constant	-1.028113	0.015371	-66.88856	0.0000
C	0.076172	0.012373	6.156285	0.0000
McFadden R-squared	0.002418	Mean dependent var		0.167345
S.D. dependent var	0.373294	S.E. of regression		0.372733
Akaike info criterion	0.901346	Sum squared resid		2424.747
Schwarz criterion	0.902236	Log likelihood		-7864.499
Hannan-Quinn criter.	0.901639	Deviance		15729.00
Restr. Deviance	15767.12	Restr. log likelihood		-7883.562
LR statistic	38.12685	Avg. log likelihood		-0.450559
Prob(LR statistic)	0.000000			

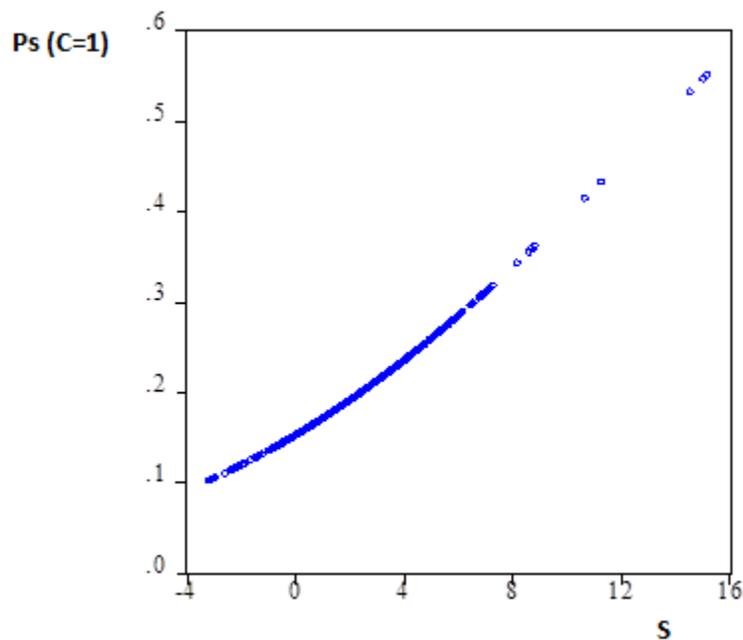


Figure 2: Probability of Switching

The economic relevance of the results in table N°17 can be seen “recovering” the values of the differences in performance (SIMCE), cost and distance between the new and

the old schools associated with the difference of 0.076 in S reported. It was also observed that families that choose public schools are substantially more sensitive to the change than families that choose private schools. We can say that this result is not surprising; public schools are less differentiated, the educational project is basically the same, and hence, small differences in the attribute quality as only 4 SIMCE points, less than 1/10 of the standard deviation of that test, produce a change (results for private schools showed a difference of over 40 points). In the case of monthly tuition, the mean values to explain changes are US\$ 4 in the case of public schools; US\$ 10 and US\$ 17 for the case of privately paid and private subsidized. Given what is presented in this chapter, it is plausible to maintain that when people experience marginal changes in their levels of utility, they do not change providers, rather they will when this change is sufficiently significant to make such a decision. This effect is described in Figure N°1, which shows the students' probability of changing the originally chosen school.

Threshold models have some popularity in current applied econometric practice. The model splits the sample into classes based on the value of an observed variable—whether or not it exceeds some threshold. When the threshold is unknown (as is typical in practice) it needs to be estimated, and this increases the complexity of the econometric problem. A theory of estimation and inference is fairly well developed for linear models with exogenous regressors, including Hansen (2000). Since Hansen's theory allows for one threshold for each threshold variable, we proceed by selecting among the three threshold variables, like this, performance, distance and price by employing the heteroscedasticity consistent lagrange multiplier test for a threshold. Our finding, allow to identify an eventual threshold, which is unknown,  $S_i^i$  and appropriate estimation technique is described in

Hansen (2000). We found three possible thresholds for performance 33.5 points in the SIMCE test, 2.8 kilometers for the variable distance and \$48.3 dollars in tuition. The p-values were significant for the all variables in studies. For example, for the variable performance this threshold value divides our entire sample of 17,455 students into a less than performance points with 16,080 8 students and a more than the threshold group with 1,375 students. Table 17 presents the estimates that consider the decision to remain at school, evaluating possible thresholds for each one of the attributes. Under each estimation the models explain a small percentage of the total variance, but on a whole, it is significant and the variables considered are also significant and economically relevant. Such as, the probability, to remain in the original school decreases when the new school's performance is better, when it is cheaper and when the student is female. Some details of descriptive statistics of the population used in the estimates are shown in annexes A1 and A2 at the end of this chapter.

Table 18. Probability of staying at the originally chosen school

Variable	Differences in School Performance (New is better than the chosen)		Differences to School Distance (New is farther than chosen)		Differences in Prices Paid (New is cheaper than chosen)	
	Less than 33.5 points	More than 33.5 points	Less than 2.8 kms	More than 2.8 kms	Less than US\$ 48.2	More than US\$ 48.3
Constant	0.71 (*)	1.24 (*)	0.75 (*)	0.92 (*)	0.86	0.82 (*)
Differences in School performance	-0.003 (*)	-0.002	0.003 (*)	-0.006 (*)	0.001	-0.004 (*)
Differences in School prices	-0.001 (*)	-0.001	-0.006 (*)	0.001 (*)	-0.002	-0.0008 (*)
Differences in distance to school	0.009 (*)	0.082 (*)	-0.015 (*)	0.07 (*)	-0.014	0.017 (*)
Student Ranking	0.089	-0.92 (*)	0.205	-0.13	-0.082	-0.048
Gender (1 = Male)	0.06 (*)	0.26 (*)	0.098 (**)	0.10 (*)	0.092	0.085 (*)

Significance 0.01 (\*); 0.05 (\*\*)

Number of Observations	16,080	1,375	5,488	11,967	751	16,074
Pseudo R2	0.021	0.08	0.071	0.04	0.005	0.03

For example, the results for attribute tuition is illustrated in Figure N°3, where the results are easier to interpret, and it is observed that the probability of staying at the chosen school decreases as the chosen school is more expensive than the new entries, more so when it surpasses the threshold of US \$ 48.25, when the new school is best alternative and is much cheaper.

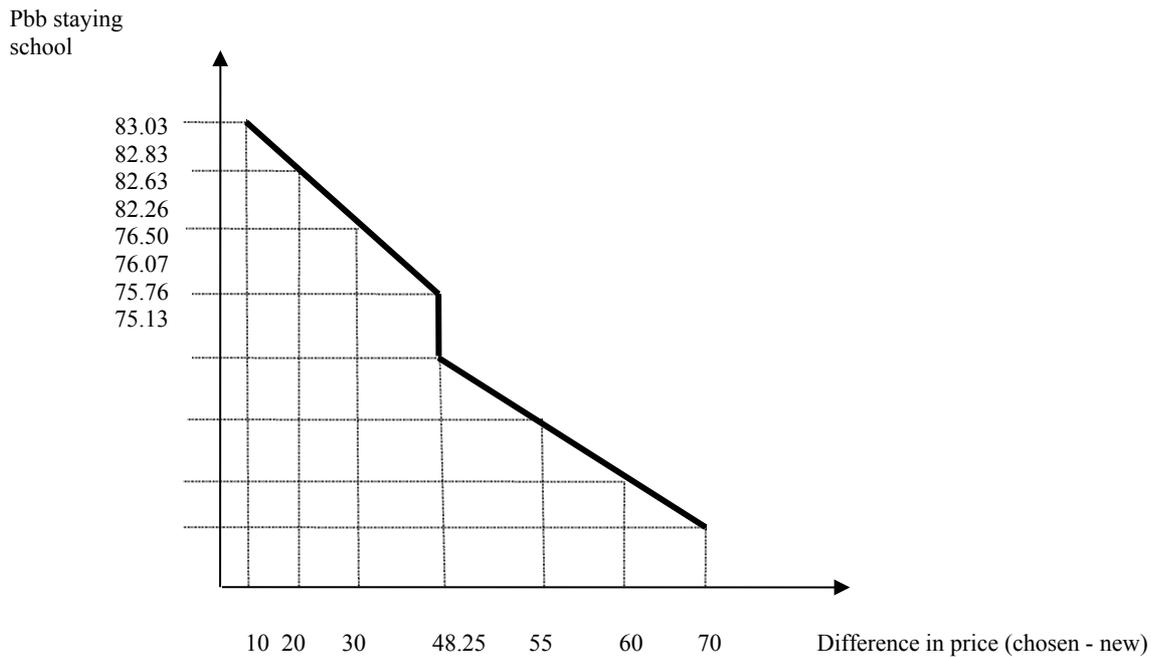


Figure 3. Probability of remaining in the chosen school facing changes in Price.

As observed in Figure N°3, the probability of staying in the same school increases when the chosen school is the better alternative to the new schools, that is to say, it is less expensive. The found results are coherent, but that there is a “jump”; a particularly huge reduction appears when the new best alternative is much cheaper (over US\$48). It is also observed that the probability of staying in the same school decreases with the entrance of new schools that are a better option than the chosen school.

## 5. CONCLUSION

We proposed an approach to measure switching costs in a context of consumers that value different characteristics simultaneously, and we apply it to the case of education in Chile, where a voucher system covers over 90% of the population. The voucher system in education firmly relies on parents having the possibility to choose their children's school, and that parents actually make use of that choice. The economic theory suggests the effect of competition on school performance is positive, but it may be small when choice is limited. The speed in which parents respond to quality signals depends on whether they can reverse a previous decision. Thus, the natural concern regarding parents' capacity to react is given by the existence of switching costs. If they are substantial, the impact competition could have on academic performance would only occur through the effect of new students and the short run impact on quality would be very weak. Switching costs would dissuade parents from changing children to a different school once they are already enrolled in a school.

Whilst our findings must be taken carefully, as other attributes that allow for more completely estimating a function of utility are missing, the results do illustrate that switching costs exist and they significantly impact the decision to stay or to change schools. Still, we found that the probability that parents change their children from the original school increases with the presence of new schools and better opportunities. The existence of switching costs, however, may help to solve a main puzzle regarding the contradictory results in different waves of studies. In particular, that the most recent evaluations of the voucher system, focusing on longer periods, are showing a higher impact on results.

**Annex**

Table A1. Descriptive statistics Variables considered for the School Choice Model, for students from the Metropolitana Region, who took the PSU in 2009.

Variable	Public Schools		Private Subsidized Schools		Private Pay Schools	
	Mean	Std. Deviation	Mean	Std. Deviation	Mean	Std. Deviation
% Female	0.51	0.50	0.57	0.49	0.51	0.50
Mother's Educ. Level	13.34	3.52	13.77	3.21	17.88	1.79
Log income	4.57	0.83	4.75	0.80	6.27	0.46
Price of chosen school US \$	6.49	6.84	38.09	25.08	181.84	9.40
Price closest school US \$	4.31	6.17	35.40	25.49	181.30	11.36
Quality chosen school (SIMCE)	273.53	44.43	266.16	28.52	319.99	21.19
Quality closest school (SIMCE)	235.41	28.87	257.50	31.30	309.08	34.04
Distance to closest school kms	1.21	1.20	0.67	0.85	0.79	1.19
Number of schools	2.44	2.09	10.51	6.60	9.96	7.96

Table A2. Descriptive statistics Switching Cost model, for students from the Metropolitan Region, who took the PSU in 2009

Variable	Mean/ (standard deviation)
Differences in School performance in SIMCE scores	27.08 (43.69)
Differences in School prices en US \$	49.93 (79.78)
Differences in distance to school en kilometers	2.27 (5.19)
Student Ranking	1.03 (0.12)
Gender (1 = Male)	0.47 (0.50)

## REFERENCES

- Aaker, D. (1988): *Strategic Market Management*, John Wiley and Sons, New York.
- Aedo, C. y C. Sapelli (2000), El Sistema de Vouchers en la Educación: Una Revisión de la Teoría y la Evidencia Empírica para Chile. *Manuscrito*, Universidad Alberto Hurtado y Pontificia Universidad Católica de Chile.
- Auguste, S. and Valenzuela, J. (2003), Do students benefit from school competition? Evidence from Chile, <http://www.utdt.edu/congresos/pdf-sri/eco-637.pdf>.
- Aydin, S., Gökhan Ö., Kazan, H. and Dogruer, C. (2009), The Measurement of Switching Costs as a Perception of Customers In The Turkish Credit Card Market, *Journal of Electrical and Electronics Engineering* 9, 1015-1028.
- Bain J. S. (1956), *Barriers to New Competition*, Cambridge MA: Harvard University Press.
- Barro, R. (1999), Determinants of economic growth: implications of the global evidence for Chile, *Cuadernos de economía*, vol. 36, N° 107, Santiago de Chile, Pontificia Universidad Católica de Chile.
- Barro, R. and X. Sala-i-Martin (1992), Convergence, *Journal of Political Economy*, vol. 100, Issue 2, (april), 223-251.
- Bayer, P. and R. McMillan (2005), Choice and Competition in Local Education Markets, *NBER Working Paper* W11802.
- Bendapudi, N. and Berry, L., (1997), Customers motivations for maintaining relationships with service providers. *Journal of Retailing*, 73 (1), 15-37.
- Bellei, C. and González, R. (2004). Educación y competitividad en Chile. *Centro de Economía Aplicada*, Departamento de Ingeniería Industrial, Facultad de Ciencias Físicas y Matemáticas, Universidad de Chile.
- Berné, C., Múgica, J. and Yagüe, M., (1996), La gestión estratégica y los conceptos de calidad percibida, satisfacción del cliente y lealtad. *Economía Industrial*, n° 307, 63-74.
- Bitner, M., (1995), Building service relationship: It's all about promises, *Journal of the Academy of Marketing Science*, Vol.23, 246-251.
- Borland, M.V. and Howsen, R.M. (1992), Student Academic Achievement and the Degree of Market Concentration in Education. *Economics of Education Review*.
- Borenstein, S., (1991), Selling Costs and Switching Costs: Explaining Retail Gasoline Margins, *RAND Journal of Economics*, XXII, 354-369.

Böhlmark, A. and Lindahl, M. (2008), Does School Privatization Improve Educational Achievement?, Evidence from Sweden's Voucher Reform, *Discussion Papers Series*, Forschungsinstitut zur Zukunft der Arbeit Institute for the Study of Labor.

Burnham, A., Frels, J. and Mahajan, V., (2003), Consumer Switching Costs: A Typology, Antecedents and Consequences, *Journal of the Academy of Marketing Science*, Vol. 31 (2), 109–126.

Braun-Munzinger, C. (2005), Education Vouchers: An International Comparison, Center for Civil Society. <http://www.ccsindia.org/ccsindia/pdf/corinna-paper.pdf>

Bravo, D., Mukhopadhyay, S. and Todd, P., (2010), Effects of school reform on education and labor market performance: Evidence from Chile's universal voucher system, *Quantitative Economics*, pp. 470m5

Bravo, J. (2011). SIMCE: Pasado, presente y futuro del Sistema Nacional de evaluación. *Estudios públicos*, 123 (invierno 2011).

Brunner, J. and Cox, C., (1995), Dinámicas de transformación en el sistema educacional de Chile. *En Jeffrey M. Puryear y José Joaquín Brunner*, eds. Educación, Equidad y Competitividad Económica, Vol. II. Washington, D.C.: Organization of American States.

Brunner, J. (2005). Educación en Chile: el peso de las desigualdades. *Conferencias presidenciales de Humanidades* Santiago de Chile.

Castañeda, T. (1991). *Para combatir la pobreza*. Santiago de Chile: Centros de Estudios Públicos (CEP).

Carnoy, M. (1997), Is Privatization through Education Vouchers Really the Answer? A Comment on West. *World Bank Research Observer* 12 (1).

Carnoy, M. and McEwan, P., (2000). Competition and Sorting in Chile's Voucher System, *Manuscript*, Stanford University.

Chen, P. and Hitt L., (2002), Measuring Switching Costs and their Determinants in Internet Enabled Businesses: A Study of the on-line Brokerage Industry, *Information Systems Research* 13, 255-74.

Chubb, J. (2001), The profit motive, *Education Matters*, vol. 1, Cambridge, Massachusetts, Education Matters.

Chumacero, R., Gómez, D., and Paredes, R. (2012): I would walk 500 miles: Vouchers and school choice in Chile, *Economics of Education Review*, (30), pp. 1103-1114.

Chumacero, R. y Paredes, R. (2012): Vouchers, Choice, and Public Policy: An Overview, *Estudios de Economía*, Vol. 39, N° 2, pp. 115 - 122

Chumacero, R., Gallegos, J. and Paredes, R. (2012). Competition Pressures and Academic Performance in a Generalized Vouchers Context, *Estudios de Economía* forthcoming 2015.

Colgate, M. and Lang, B. (2001), Switching barriers in consumer markets: an investigation of the financial services industry, *Journal of Consumer Marketing*, Vol.18, n°4, 332-347.

COX, C. (2003). Las políticas educacionales de Chile en las últimas dos décadas del siglo XX. En: C. Cox (editor). Políticas Educacionales en el Cambio de Siglo. *La reforma del sistema escolar en Chile*. Capítulo I. Santiago: Editorial Universitaria. Pp. 19-114.

Cox, C. and Lemaitre, M.J (1999), Market and State Principals of reforms in Chilean education: Policies and result. En G. Perry y D. Leipziger, Chile Recent Policy Lessons and Emerging Challenges, Washington D.C., World Bank.

Couch, J.F. Shughart, II. and Williams, A.L. (1993), Private School Enrolment and Public School Performance, *Public Choice* 76:301-312.

Day, G. (1986), Analysis for strategic market decisions, *West Publishing*, St. Paul.

Demsetz, H. (1973), Industry Structure, Market Rivalry, and Public Policy, *Journal of Law and Economics*, Vol. 16, N°1, pp. 1-9.

Dick, A. and Basú, K., (1994), Customer loyalty: toward an integrated conceptual framework, *Journal of the Academy of Marketing Science*, Vol.22, n°2, 99-113.

Drago, J. and Paredes, R. (2011). The Quality Gap in Chile's Education System. *Cepal Review*, 104.

Elacqua, G., and Fabrega, R. (2004). El consumidor de la educación: El actor olvidado de la libre elección de escuelas en Chile. In S. Cueto (Ed.), *Uso e impacto de la información educativa en América Latina*. Santiago, Chile: PREAL

Elacqua, G. (2012). The impact of school choice and public policy on segregation: Evidence from Chile. *International Journal of Educational Development* 32 pp. 444-453.

Elzinga, G. and Mills, D., (1998), Switching Costs in the Wholesale Distribution of Cigarettes, *Southern Economic Journal* 65, 282-293.

Epple, D and Romano, R. (1998), Competition Between Private and Public Schools, Vouchers, and Peer-Group Effects, *American Economic Review* 88 (1), 33-62.

Epple, D and Romano, R. (2002), Educational Vouchers and Cream Skimming, *Working Paper 9345*, NBER.

Farrell, J. and Klemperer, P., (2006), Coordination and Lock-In: Competition with Switching Costs and Network Effects. Competition Policy Center, Institute of Business and Economic Research, UC Berkeley. <http://www.escholarship.org/uc/item/9n26k7v1>.

Ferreya, M. (2007). Estimating the Effects of Private School Vouchers in Multi-District Economies. *American Economic Review*, 97 (3): 789-817.

Fontaine, A., (2002), Equidad y calidad en la educación: cinco proposiciones interrelacionadas, *Estudios Públicos* 87.

Fornell, C. and Larcker, D., (1981), Evaluating Structural Equations Models with Unobservable Variables and Measurement Error, *Journal of Marketing Research*.

Fornell, C., (1992): A national customer satisfaction barometer: the Swedish experience, *Journal of Marketing*, Vol.56, n°1, 6-21.

Friedman, M., (1955) The Role of Government in Education. In R. A. Solo (ed.) Economics and the Public Interest. *New Brunswick*: Rutgers University Press.

Friedman, M., (1962), The Role of Government in Education, in Capitalism and Freedom, Chapter VI, Chicago: Chicago University Press.

Ganesh, J., Arnold, M. J. and Reynolds, K., (2000): Understanding the Customer Base of Service Providers: An Examination of the Differences Between Switchers and Stayers, *Journal of Marketing*, Vol. 64, July, pp. 65-87.

Gallego, F. (2002), Competencia y Resultados Educativos: Teoría y Evidencia para Chile, [Competition and Academic Results: Theory and Evidence in the case of Chile] *Cuadernos de Economía*, 39 (118): 309-352.

Gallego F. (2006), Voucher-School Competition, Incentives, and Outcomes: Evidence from Chile, *Manuscript, Catholic University of Chile*.

Gallego, F. and Hernando, A. (2008). School choice in Chile: Looking at the demand side, *Manuscript, Pontificia Universidad Católica de Chile*.

Gallego, F., Cortés, C., Lagos, F. and Stekel, Y., (2008). El Rol de la Información en la Educación: Cartillas de Información sobre Indicadores de Resultados Educativos de Establecimientos Educativos Subvencionados a Padres y Apoderados, in Camino al Bicentenario: Propuestas para Chile, Pontificia Universidad Católica de Chile.

[García Palomer, C.; Paredes, R. \(2010\) Reducing the Educational Gap: Good Results in Vulnerable Groups. \*The Journal of Development Studies\*, Vol. 46, N.3, Católica](#)

García, M., (2000), La importancia de mantener la fidelidad de los clientes como un activo estratégico de gran valor para la marca, Esic Market, Septiembre-Diciembre, pp. 37-53.

Gómez, D., Chumacero, R. and Paredes, R. (2012), School Choice and Information, *Estudios de Economía* 39 (2), 115-122, Universidad de Chile.

- Gibbons, S., Machin, S. and Silva, O. (2008), Choice, Competition and Pupil Achievement, *Journal of the European Economic Association* June 2008 6(4):912–947.
- Gilbert, R.A. (1984), Bank Market Structure and Competition: A Survey, *Journal of Money, Credit and Banking*, 16:617-645.
- Gremler, D. and Brown, S., (1996), Service loyalty; its nature, importance and implications, in Edvardsson B., Brown, S.W., Johnston, R. and Scheuing, E. (Eds), *QUIS V: Advancing Service Quality: A Global Perspective*, ISQA, New York, NY, pp. 171-81.
- Grzybowski, L., (2006) Estimating switching costs in the mobile telephony in the UK, *Discussion paper, Munich Graduate School of Economics*.
- Guiltinan, J., (1989): A classification of switching cost with implications for relationship marketing, *AMA Winter Educators Conference: Marketing Theory and Practice*.
- Hansen, B., (2000), Sample Splitting and Threshold Estimation. *Econometric Society, the University of Chicago* 68, 3, 575.
- Hanushek, E. (1998), Conclusions and Controversies about the Effectiveness of School Resources. *FRB New York Economic Policy Review* 4 (1), 11-27.
- Hanushek, E.A. (2003). The failure of input-based schooling policies. *Economic Journal* 113 (485), F64– F98.
- Hanushek, E., Kain, J., Rivkin, S. and Branch, G., (2007), Charter School Quality and Parental Decision Making With School Choice, *Journal of Public Economics*, 91, 2007.
- Hess, M. and Ricart, J., (2002), Managing customer switching cost: a framework for competing in the networked environment, *Research Paper*, N° 472, October.
- Heyneman, S.P. (1991), Inequality in educational quality: An international perspective, *Spheres of Justice in Education*, *American Education Finance Association Yearbook*, D. Verstegen y J. Ward (comps.), Nueva York, Harper-Collins Publishers.
- Heyneman, S.P. (2004), International education quality, *Economics of Education Review*, vol. 23, N° 4, August, Amsterdam, Elsevier.
- Himmel, E. (1997). Impacto de los Sistemas de Evaluación y Rendimiento Escolar: El Caso Chileno. En B. Álvarez y M. Ruiz-Casares (eds), *Evaluación y Reforma Educativa: Opciones de política*. PREAL
- Hoxby C. (1994), Do Private Schools Provide Competition for Public Schools? *Working Paper 4978*, NBER.
- Hoxby C. (2000), Does Competition Among Public Schools Benefit Students and Taxpayers? *American Economic Review* 90 (5), 1209-1238.

Hsieh, C. y Urquiola, M. (2003), When Schools Compete, How Do They Compete? An Assessment of Chile's Nationwide School Voucher Program, *The American Economic Review*; 95, 4; 1310 - 1326.

Imberman, Scott A., (2011), The Effect of Charter Schools on Achievement and Behavior of Public School Students. *Journal of Public Economics*, 95, 2011

Jackson, B., (1985), Winning and keeping industrial customers: The dynamics of customer relationship. *Lexington, MA: Lexington Books*.

Johnson, E., Bellman, S. and Lohse, G., (2002), Cognitive Lock-in and the Power Law of Practice. *Working Paper, Columbia University, New York*.

Jones, M. A., Mothersbaugh, D. and Beatty, S. E. (2000), Switching Barriers and Repurchase Intentions in Services. *Journal of Retailing*, 76(2), 259-74.

Jones, T.O. and Sasser, W., (1995), Why satisfied customer defect, *Harvard Business Review*, 88-99.

Kahl, S. (2004), A proposal for an Econometric *Analysis of Switching Costs in the Software Industry*.

Klemperer, P., (1987a), Markets with Consumer Switching Costs. *The quarterly journal of economics* 102, 375-394.

Klemperer, P., (1987b), The Competitiveness of Markets with Switching Costs. *The RAND Journal of Economics* 18, 138-150.

Klemperer, P., (1987c): Entry deterrence in markets with consumer switching cost *Economic Journal*, 99-117.

Klemperer, P. (1995). Competition when consumers have switching costs: An overview with applications to industrial organization, macroeconomics, and international trade. *The Review of Economic Studies*, 62(4), 515-539.

Keppler J. (2008), Barriers to Entry: Abolishing the Barriers to Understanding. Working Paper, LEDa, Université Paris – Dauphine.

Kim, H., Choi, S. and Kim, K. (2010), Examining Online Switching Costs over Search Product and Experience Product Contexts, <http://aisel.aisnet.org/pacis2010/61>.

Kim, M., Kliger, D. and Vale, B., (2003), Estimating Switching Costs: The Case of Banking, *The Journal of Financial Intermediation* 12, 25-56.

Kim, M., Park, M. and Jeong, D., (2004), The Effects of Customer Satisfaction and Switching Barrier on Customer Loyalty in Korean Mobile Telecommunications Services, *Telecommunications Policy*, 28, 145-159.

Knittel, C., (1997), Interstate Long Distance Rate: Search Costs, Switching Costs and Market power, *Review of Industrial Organization*, Competition, 12, 519-536.

Ladd, H. and E. Fiske (2001), Does Competition Generate Better Schools? Evidence from New Zealand, *Working Papers Series*, Terry Sanford Institute of Public Policy, Duke University.

Lee, M. and Cunningham, L., (2001), A cost/ benefit approach to understanding service loyalty, *Journal of Service Marketing*, Vol.15, n°2, 113-130

Levin, H. (2002), Potential of for-profit schools for educational reform, Occasional Paper Series, N° 47, Columbia, Center for the Study of Privatization in Education, Teachers College.

Maicas, J., (2006), Costos de Cambio y Efectos de Red en la Industria de la Telefonía Móvil. El Referente Español, *Economía Industrial*, 361, 33-44.

Maicas, J., and Sese, F., (2008), A Study of The Magnitude and Drivers of Switching Costs in the Mobile Communications Industry, *Cuadernos de Economía y Dirección de la Empresa*, 35, 27-56.

Maicas, J., Polo, Y. and Sese, F., (2009), Reducing the level of switching costs in mobile communications: the case of mobile number portability. *Telecommunications Policy*, 33(9), 544-554.

McEwan, P. and Carnoy, M., (2000). The Effectiveness and Efficiency of Private Schools in Chile's Voucher System, *Educational Evaluation and Policy Analysis* 22 (3), 213-239.

Meckes, L. (2003). SIMCE: Su Desarrollo y sus Desafíos Actuales. *Revista Pensamiento Educativo* Vol. 33, pp. 160-178, Santiago, Chile.

Mizala, A. and Romaguera, P. (1998), *Desempeño Escolar y Elección de Colegios: La Experiencia Chilena*.

Mizala, A. and Romaguera, P. (2000), Determinación de Factores Explicativos de los Resultados Escolares en Educación Media en Chile.

Nakamura, A., (2010), "Estimating switching costs involved in changing mobile phone carriers in Japan: Evaluation of lock-in factors related to Japan's SIM card locks," *Journal Telecommunications Policy*, Volume 34.

Paredes, R. M. Opazo, P. Volante and J.R. Zubizarreta (2013): Shared financing in the public education in Chile, in Policy proposals to Chile, *Centro de Políticas Públicas*, Universidad Católica, Chile.

Paredes, R. and Pinto, J., (2009), ¿El fin de la educación pública en Chile. *Estudios de Economía*, Vol. 36, N1.

Paredes, R. and Ugarte, G., (2011), Should Students Be Allowed to Miss?. *The Journal of Educational Research*, 104(3), 194-201.

Porter, M., (1979), *Competitive strategy, Techniques for analyzing industries and competitor*”. *Macmillan*, New York.

Porter, M., (1998), *Competitive Advantage*” (Macmillan Publishing Co., Inc. New York).

Rosado, A., (2008), *The success of an economic idea: barriers to entry*.

Román, M. (1999). *Usos Alternativos del SIMCE: Padres, Directores y Docente*. Documentos N°5, CIDE, Santiago, Chile

Sander, W. (1999). *Private Schools and Public School Achievement*. *The Journal of Human Resources* 34(4), 697-709.

Sharpe, S. (1997). *The Effects of Consumer Switching Costs on Prices. A theory and its application to the bank deposit market*. *Review of industrial organization* 12(1), 79-94.

Sharma, N., and Patterson, P. (2000). *Switching costs, alternative attractiveness and experience as moderators of relationship commitment in professional consumer services*. *International Journal of Service Industry Management*, 11(5), 470–490.

Shum, M., (2004). *Does Advertising Overcome Brand Loyalty? Evidence from the Breakfast Cereals Market,*” *Journal of Economics and Management Strategy* 13(2), 241:272.

Shy, O., (2002). *A quick-and-easy method for estimating switching costs*. *International Journal of Industrial Organization* 20(1), 71-87.

Tironi, E. (2004). *Educación informada: Visión de un sostenedor*.

Tokman, A. (2004). *Educación y crecimiento en Chile*. Documentos de Trabajo (Banco Central de Chile), (289), 1.

Toma, E. (1996). *Public Funding and Private Schooling across Countries*. *Journal of law and economics*.121-48.

Valenzuela, J.P., Bellei, C. and De los Ríos, D. (2008). *Evolución de la segregación socioeconómica de los estudiantes chilenos y su relación con el financiamiento compartido*. Proyecto FONIDE, (211 -2006).

Wathne, K., Biong, H. and Heide, J. (2001). *Choice of supplier in embedded markets: relationship and marketing program effects* .*Journal of Marketing*, Vol. 65(2), 54-66.

Wilson, C. and Price, W. (2007). *Do consumers switch to the best supplier?* . Available at SSRN 982530.