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Destructive Creation: School Turnover and Educational Attainment

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Destructive Creation: School Turnover and Educational Attainment

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Abstract

In this paper we analyze the effect of school entry and exit in the Chilean market-oriented educational system. During the period 1994-2012 nearly 2,150 schools closed (more than 2,800 if pre-K and kindergarten centers are included), nearly one-fifth of the current stock of schools. Close to 3,800 new schools entered the school system, mostly voucher private schools. Given this significant school turnover we estimate the potential "productivity gains" associated to market's creative destruction dynamics by studying its impact on standardized achievement tests. We find that, at the municipality level, school turnover predicts only minor changes in school performance after controlling for parents socioeconomic status. Finally, we estimate the potential educational costs of this dynamics, trying to identify the causal effect of school closure on grade repetition and high school dropout rates. Using a large panel of individual student data that contains academic achievement and socio-demographic controls, we identify a causal effect of school closures on grade retention and school dropouts. School exit is associated with a 50 per cent increase in the probability of grade repetition (2.5 percentage points) and a 79 per cent increase the probability school dropout in tenth grade (1.1 percentage points).

Keywords. school choice, exit, entry, market turnout, education, grade retention, dropout.
JEL Classification: H4; I2; R2.

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1 Introduction

It is common to postulate that free-entry is central -even indispensable- for a market to work well. It is argued that "creative destruction" (Schumpeter, 1942) could lead both to vertical innovations (e.g. quality and productivity improvements) and horizontal innovations (e.g. product variety). In theory, free entry and exit may allow an industry to cleanse, leading low-quality providers to exit the market and offering more alternatives for consumers. In education, the potential benefits of creative destruction should translate into better school quality and and a greater variety of educational projects available to parents.

A more skeptical view emphasizes the costs and disruption that could be associated to creative destruction. This might be especially sensible in markets with significant failures such as information asymmetries and incomplete contracts, or if the costs of entry and exit are important (e.g. large infrastructure costs). In education, "school destruction" is associated with a disruption of children's learning and socialization process. It may also affect the live of families and involved communities. This paper explores three different aspects of school entry and exit in Chile between 1994 and 2012. We first try to establish the main stylized facts of school entry, exit and turnover during this period. Next, we estimate the potential "productivity benefits" associated to market's creative destruction dynamics by studying the impact of school turnover on standardized tests. Finally, we try to estimate the potential educational costs of this dynamics. Specifically, we attempt to identify the causal effect of school closure on grade repetition and high school dropout rates.

The paper contributes to two literatures. On the one hand, to the vast literature on market innovation that has studied the impact of Schumpeterian creative destruction in industries on productivity, economic growth and labor markets.

On the other hand, while much research exists on the Chilean school choice system, mainly on the relative performance of public and private voucher schools (McEwan, 2001, Sapelli and Vial 2002 and 2005, Anand et al, 2009, Lara et al, 2011, among others), and on the impact of school competition on school performance (Hsie and Urquiola 2006, Gallego 2002 and 2006), surprisingly little is known about a salient aspect of the Chilean school market, i.e., the lack of entry and exit regulation and its impact on school turnover.

Our results confirm that a feature of the Chilean education market is the massive closure

and replacement of schools. The creation and destruction rates found in this paper for the Chilean school market are comparable to that shown by small-to-medium-sized industries. Between 1992 and 2012, the total number of schools in the system increased from 10,000 to 12,000. The net increase in schools seems to be significantly driven by demographics and an increase in coverage. However, it hides an impressive turnover. Indeed, between 1994 and 2012 we found that 2,151 primary and secondary schools exit the market and about 3,770 entered the market (if we include pre kindergarten and kindergarten the numbers are higher 2,835 exists and 4,647 entries) . Nearly half of exiting schools was public and the remainder private. The annual "destruction rate" for public schools and publicly-funded private schools, hereafter referred as private voucher schools, was around 1.1% per year. The number of new schools instead was overwhelmingly dominated by private voucher schools. Larger turnover rates seem to be associated to neighborhoods that experienced population changes during this period.

The schools that exit seem to be significantly different from to those that survive and enter on a number of characteristics: their overall enrollment prior to closing is around 114 students in contrast to an average of 334 for the whole sample; closing schools have students with lower SES, pay lower add-on fees and relative to the Rural/Urban distribution, the share of rural exits is higher.

While schools that exit have lower average scores in standardized achievement tests than those who survive, this difference seems to be strongly associated by socio-economic differences between schools. Indeed, using administrative individual data we estimate the residual component of the standardized SIMCE test after controlling for parental socio-economic characteristics. In principle, the residual test score contains the school's contribution to student academic performance. We find that, at the municipality level, school turnover predicts only minor changes in school performance after controlling for parents socioeconomic status. That is, we do not find an economically relevant productivity improvement.

Closing schools has potentially important pedagogic and social costs that have been emphasized by a large body of recent evidence. In general, adaptation to new schools produced stress among students. In our case, since closures are unanticipated, the costs of adaptation are potentially larger as parents may not be prepared for the change and the choice set of a

new school could be more constrained, since schools could have fewer slots in grades different from the entry grades of most schools (pre-K, first grade and ninth grade).

Using a rich panel database with detailed educational and socio-demographic information for every student we estimate the potential educational costs of schools' exit. Specifically, we attempt to identify the causal effect of school closure on grade repetition and high school dropout rates. Our identification strategy is based on comparing grade repetition of students who switch to a different school once their school exits with similar students in the new school attending the same class. We found that the closing of schools has a causal impact on grade repetition, increasing the probability of failing by 50 percent. We also find that the effect of disrupting schooling continuity on high school dropout rates is large, increasing probability of dropping out by 79 percent.

These findings contribute to a recent literature on the impact of student displacement on academic achievement in the United States. Using data from the closure of Chicago schools due to low enrollment and low achievement, De la Torre and Gwynn (2009) find minor effects on different student outcomes that include standardized tests. Hanushek et (2007) find instead significantly negative effects not only on displaced students but also on the academic achievement of the classmates in the receiving schools. A recent paper by Engberg et al. (2012), uses a matching methodology and finds significant effects on attendance and persistent negative effects on achievement for displaced students. The effects seem to depend on characteristics of the receiving school such as teacher-parents' trust.

The rest of the paper is organized as follows. Section 2 briefly describes the Chilean school system. Section 3 describes our measures of entry and exit, the data, and presents the basic statistics. Stylized facts describing the connection of market turnover with socio-demographic variables are presented in Section 4. Section 5 explores the association between school turnover and school improvement. Section 6 presents our findings on the impact of school closure on grade repetition and high school dropouts.

2 Chile's School System

In 1981, Chile introduced school finance reforms creating a liberalized school market. Three types of schools emerged: (i) Public or municipal schools are run by 345 municipalities which

receive a per-student subsidy from the central government. These schools cannot turn away students unless oversubscribed; they are the suppliers of last resort. (ii) Private subsidized or voucher schools; these are independent religious or secular institutions that receive the same per student subsidy as public schools. Unlike the public schools, they can select their student.[1] (iii) Private unsubsidized schools are also independent, but receive no public funding.

In 1994, private institutions accounted for about 40.7 percent of all schools, and private voucher schools alone for about 31.8 percent. In 2012 private institutions accounted for about 60.5 percent of all schools, and private voucher schools alone for about 53.2 percent. All private schools can be explicitly for-profit. Some are run by privately or publicly-held corporations that control chains of schools, but the modal one seems to be owned and managed by a principal/entrepreneur. There are few barriers to entry.

While initially private voucher schools were not allowed to charge tuition to supplement the voucher subsidy, this restriction was eased in 1993. Public schools are allowed to charge fees only at the secondary level, although in practice few of them do.

3 Data and Basic Statistics

We are interested in quantifying some of the consequences of the school exit and entry in the Chilean educational system during the period 1994-2012. This requires an accurate identification of individual school entry and exit. We start with a detailed description of our measures and the data used.

3.1 Measuring Entry and Exit

To identify individual school entries and exits, our starting point is the official listing of schools (*Base Directorios*) published annually by the Ministry of Education (MoE). It contains all schools -Pre-K, Kindergarten (K), primary, and secondary- since 1992.[2] In principle, each school is uniquely identified by an ID (labeled *RBD*). For each school, the listing contains the school name, address, municipality where it is located and whether it is located in a rural

[1] Until 2009 they could select students in elementary and secondary education, since that year selection in primary school was forbidden.

[2] These databases, as well as the majority of the other sources of information used in this paper, can be accessed by any researcher at www.centroestudios.mineduc.cl.

area. It also specifies the levels taught by each school, namely, whether or not the school offers Pre-K, K, primary and secondary education grades.

To identify entries and exits we conduct a procedure in three stages. Each stage refines the set of schools identified as potential entries and exits in previous stages. Hereafter, each period t is a year in the set {1994, 1995,..., 2012}.

The *first-stage* definition of entry and exit is obtained using an unbalanced panel built from the official listing data base. A school i is a first-stage exit candidate at time t if that school was present, at least, for the previous two periods ($t-1$ and $t-2$) and is not in the listing for the next two periods ($t+1$ and $t+2$).[3] Similarly, a school i is a first-stage entry candidate at time t if the school was not in the listing in previous years and remains in the list for at least two years ($t+1$ and $t+2$). Although the listing is an official data base, it is well known that it has some missing values which implies that our *first stage* definition of entry and exit could overestimate these values. Further, during the period considered there have been administrative changes affecting the RBD of a subset of schools.[4] Due to these considerations our next stages depurate the initial definition.

In the second stage, each first-stage candidate exit is validated using an Official Exit Record of the MoE that contains all the schools that were registered as closed by local officers of the MoE between 1990 and 2014.[5] Thus, while the first source of information (the panel data from the official listings) is required to specify the year of the exit, the second source of information (the Official Exit Record) is useful to validate whether it was a real closing. Regarding entries, we validate our first stage by merging such a data base to an administrative record of the MoE that specifies the year in which the school was granted official recognition by the State.

The third and final step of the procedure takes advantage of an administrative panel data set with student individual information. The panel provides information for all the students

[3]Since we only have information until 2013, we make an exception for 2012, checking just one year ahead.

[4]During the late nineties, some schools had different RBDs for different education levels and normalized this situation by assigning the oldest RBD to all of them. Similarly, between 1997 and 2003 roughly one-thousand schools expanded and for some of them -120 according to the Ministry's information- these expansions ("anexos") were initially associated to a different RBD. Since then, 80 have reverted to a single RBD.

[5]From our conversations with the staff of the MoE we concluded that, if anything, this source of information underestimates the number of closings. The registry of exits relies on declarations sent by exiting schools and schools were not mandated to declare their closing.

in the system for the years 2002-2013. It includes each student's school, GPA, attendance rate and gender (and other variables not used herein). Using this information we can eliminate errors associated to a school that may appear with two different IDs (RBD) at different points in time. For example, some schools changing from one type of administration to another -for instance from non-voucher private to voucher private- may have changed their RBD as part of the process. Our filter avoids errors associated to these changes, that would otherwise be counted as *fake* closures and entries. The method used is as follows: for each school j that is considered as closed at time t (given our second-stage definition), we find the school j' that, at time $t+1$, has the highest number of students from school j. Then we compare by eye's inspection, school by school, whether the names and addresses of schools j and j' coincide suggesting that both are the same school. Hence, the student panel data is used to pair each second-stage candidate exit school in t with a single school in $t+1$ that might be the same school and, if so, it is confirmed as a *fake* closure. This makes the procedure feasible and accurate.[6]

Table 1: Stages to validate the number of exits and entries

	Pre K + K-12		Primary and Secondary (1-12)	
	Exits	Entries	Exits	Entries
Stage 1	4,264	5,056	3,216	4,042
Stage 2	2,971	4,694	2,281	3,817
Stage 3	2,835	4,647	2,151	3,770

Table 1 shows how each stage of validation reduces the number of entries and exits. Comparing Stage 1 with Stage 3, the depuration process affects much more the identification of exits. The last step, a school-by-school check –that covers all candidates for 2002-2012 and private schools for 1997-2001-, implied a small reduction of the number of exits and entries,

[6]There is anecdotal evidence that following the Asian crisis of 1997-98 many non-voucher private schools changed their type of administration to voucher private and some also changed their RBD. This is prior to 2002, the first year of the panel. To filter these potential errors, we checked one-by-one all the names and addresses of the non-voucher private schools that closed between 1997 and 2001 and searched for voucher private schools with similar addresses and names one year after the possible closing. This exercise led us to identify 16 *fake* closures. Since we don't have the student panel data prior to 2002, our search for *fake* closures was more time-consuming and presumably more error-prone for the 1994-2001 period than it was for 2002-2012 period.

especially when compared to the number reduction between the first and the second stage (Stage 1 - Stage 2 = 935 vs Stage 2 - Stage 3 = 130). Since our last filter leaves little room for an error, we are confident of the accuracy of our measures for the last decade of our sample. At the same time, since this rigorous check decreased the number of exits by a small amount (around 5%), it reassures us that the level of accuracy of the first two stages is quite high. Of course, there is always a margin of error.

In addition to the sources of information above described we use other data sources. In particular, we consider: (1) The SIMCEs: standardized test taken every year by all students in the 4th and every other year by all 10th grade students. This database is critical to identify the effect of school closures on grade retention and high school dropouts. (2) Schools' IVE: a school-level measure of the students' socioeconomic vulnerability of students defined by a department of the MOE in order to allocate school meals. (3) Other variables to characterize the social, demographic and economic characteristics of each municipality such as municipal population, income and unemployment rates.

3.2 Basic Facts: School Entry, Exit and Turnover 1994-2012

In line with the industrial organization and economics of innovation literature we use market or school turnover in a particular year to designate the sum of market entry and exit during that year. The creation rate at time t is simply the number schools that enter normalized by the total number of schools in the system that year. Similarly, the destruction rate is the number of exits normalized by the total number of schools at the time of exit.

Figure 1 summarizes the basic facts of school entry and exit in Chile. Between 1994 and 2012, the number establishments that closed was 2,822, an average of 149 establishments per year. The annual destruction rate was 1.28 per cent of the total number of establishments. If we exclude the establishments that offer only pre-K and K ("educación parvularia"), the number of exits was 2,151, yielding an average annual exit of 113 schools per year and annual destruction rate of 1.10 per cent. Recent studies, with a smaller sample of schools than ours, have found very similar destruction rates for this period.[7]

[7]For the sample of voucher schools offering primary school grades, Elacqua et al (2015, in preparation) report exits that amount to an average destruction rate between 1990 and 2008 of around 1 per cent. Similarly, for private-voucher and municipal primary schools, De Iruarrizaga (2010) also finds a creation rate of 1%. Using our measures, if we restrict our sample to these schools, we obtain the same number.

Nearly 15 per cent of the entire universe of schools that operated during the last two decades closed. If we use the enrollment figures of the year prior to an exit, the estimated total number of students displaced by school closures was around 245,000.

Importantly, over time, the pattern of closures does not seem to be declining at all. Indeed, if we consider primary and secondary schools only, during the span 2002-2012 the average number of closures was 129 schools per year (the number is 158 schools per year if we consider Pre-K and K establishments as well). As discussed above, this is also the period for which our data is more accurate.

The number of new establishments that entered the system during this period was 4,647, that is, 245 establishments per year, with a creation rate of 2.2 per cent. Excluding establishments that offer only pre-K and Kindergarten, the total entries amounted to 3,770, with an annual average of 198 schools, and a creation rate of 2.0 per cent.

How large are these magnitudes? As mentioned earlier, the Chilean school system is, by design, one the most market-based in the world. Private-voucher schools are funded on a per-student formula and can be explicitly for profit [8]; they can charge add-on fees to parents; price-discrimination with parents in the same school is a common practice and selection based on family characteristics and academic performance was widespread during this period; the creation of new schools is weakly regulated and any entrepreneur willing to create a new school can do so, making it a free-entry-and-exit market. Thus, a natural "positive benchmark" are simply small and middle-sized firm industries. Indeed, the turnover rate of the Chilean school system -between 3.0% (3.5% if pre-K and K only establishments are considered) is in fact quite similar to the average turnover rates found historically for middle and small-sized-firms industries, that range between 1% and 4% (See Grilliches and Regev 1979; Bartelsman, Haltiwanger, Scarpetta 2004 present cross-country comparisons; Benavente and Kulzer 2008, provide estimates for Chilean firms).[9]

[8] In 2012, nearly one third of total enrollment attended schools that -at least from a legal point of view- were for profit.

[9] Perhaps a more sensible benchmark would to compare with other education systems but there are no systematic statistics and the causes across countries could be quite different. Still, a handful of examples are consistent wit the view that the Chilean school closure rates are relatively high. In Ontario, between 1999 and 2002, 200 schools were closed prompting the community to mobilize. Normalizing by the population, this number is approximately one half of the Chilean figures. Most of these closures seem to be ultimately driven by demographic changes as the birth rates have decreased considerably. In the United States, the large

In principle, public, private-voucher and private non-voucher schools have different motives and constraints to create and close schools. For example, in contrast to private schools, a new public elementary school was required to offer all elementary grades and could not start by offering a few grades to expand gradually. At the same time, since public schools are under the administration of municipalities and many of them face significant financial deficits, the public supply of new schools has faced severe financial constraints.

During the period of study, if we focus on primary and secondary schools, 52% of the exits correspond to public schools, 33% to private-voucher schools and the rest private non-voucher schools. In contrast, entry was largely dominated by voucher private schools, accounting for 81% during this period. Only 10% of entries were public schools. Private non-voucher schools represented a smaller fraction of the creation and destruction of schools -9% and 14%, respectively- but exhibited a high exit rate -2.5% on average-, especially during years of economic downturn.

number of closures during the last decade has led to public outcry in cities like New York, Chicago, and others. The destruction rate between 1995-2011 is similar to Chile but normalizing by population, it is 50% lower. In Denmark, with one-third of the Chilean population, between 1990 and 1999, the closure of schools 10 to 15 per year, most of them rural (Egelund and Laustsen 2006).

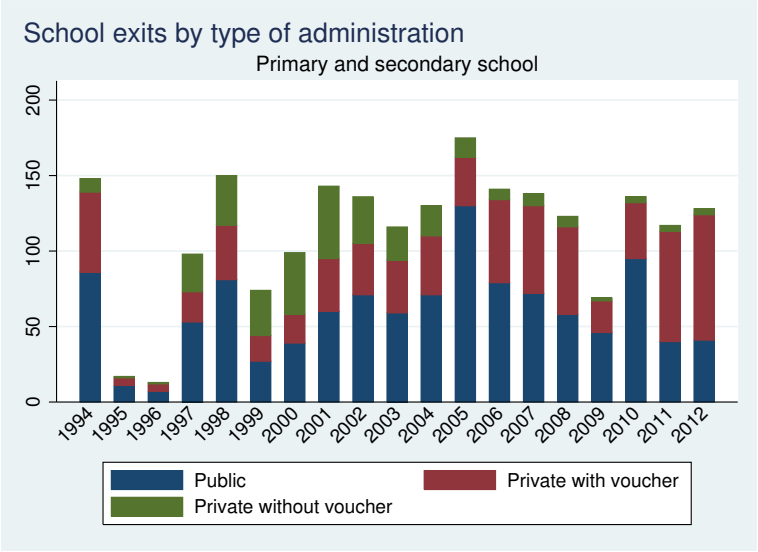

Figure 1: Annual Exit by Type of Administration (Primary and Secondary)

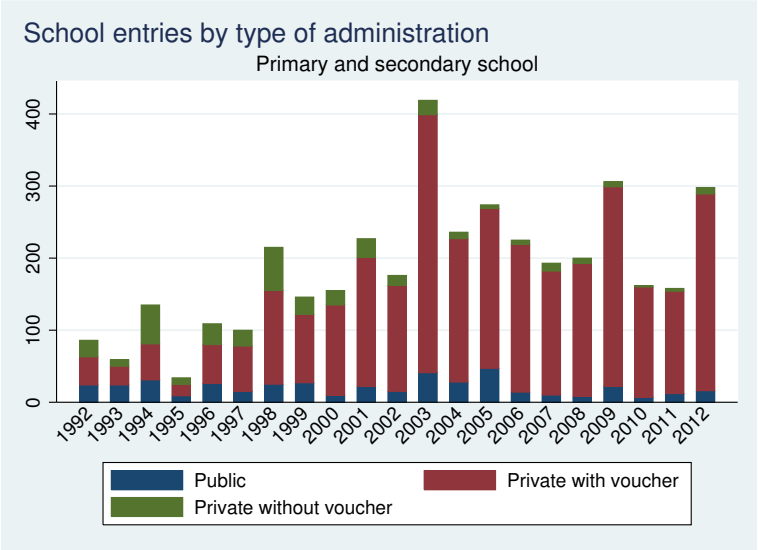

Figure 2: Annual Entry by Type of Administration (Primary and Secondary)

4 Stylized Facts

We highlight some of the main stylized facts regarding the school entry, exit and turnover dynamics in Chile between 1992 and 1994:

1. Schools that closed were relatively small, they had significantly lower levels of enrollment than the average for the system.

2. The socio-economic status of students in schools that closed is significantly lower than the average for the system.

3. There was more school closure in rural areas areas. School entry is heavily concentrated in urban areas.

4. School turnover, entry and exit is strongly associated with demographic patterns.

The schools that closed during this period had an average enrollment (the year prior to exit) of 114 students. This number is markedly smaller than the average enrollment of 336 students for schools that did not close during this period. Moreover, as shown in table 13, almost half of the schools that closed were in the first quintile of the enrollment distribution.

Table 2: Distribution of Exits by Enrollment Quintile

	Enrollment Quintiles				
	I	II	III	IV	V
Exit	49.17	18.05	21.26	8.14	3.38

This fact is not particularly surprising as most schools need a critical mass to be viable given the considerable fixed costs of school provision. Enrollment is a common factor for education administrators to consider closing or merging schools in systems with regulated entry and exit. Since school financing in Chile is largely based on a voucher system, so that the resources for each school increase almost linearly with enrollment, schools unable to enroll a critical mass of students are not viable.

A second fact to highlight is that school exits affect more students with a lower average socioeconomic status (SES). Our SES measure is the IVE index, a measure of student vulnerability produced by the MoE for each school. Higher values are associated with more vulnerability, i.e., lower SES.

Table 3: School Exits by Students' SES

		IVE Quintiles				
		I	II	III	IV	V
Exit	2002-2012	12.91	11.73	20.76	29.33	25.27
	1994-2012	14.58	11.36	20.57	27.24	26.25

Table 3 shows that the distribution of IVE for schools that closed is concentrated on the higher levels of the index relative to school that did not close. Three quarters of the schools that closed are in three highest vulnerability quintiles, that is, in the lowest SES quintiles. The average IVE for closing schools is 0.21 standard deviations higher than the average for schools that do not close. This fact is important because it points out that the effects -good or bad- associated to a free-entry and exit may have been larger for lower socioeconomic status children and communities. It also raises a caution on plain comparisons of educational outcomes between schools that close and those that survive as the population of students differ substantially in a dimension that covaries strongly with those outcomes. [10]

Table 4 illustrates the Rural/Urban distribution of schools and turnover.

Table 4: Rural/Urban Distribution of Entry and Exit

	Total	Entry	Exit
Rural	43.77	10.21	48.32
Urban	56.23	89.79	51.68
N obs	10.468	3.917	2.117

Relative to the Rural/Urban distribution during this period, the share of rural exits is somewhat higher (48.3% versus 43.8%). However the pattern of entries was much more imbalanced in favor of urban schools (89.8% versus 56.2%).

Figure 5 shows the bivariate relationship between total entry normalized by population at the municipality level and changes in population between 2000 and 2012. In turn, figure 4 does the same with normalized exit.[11] (The left figures include the whole sample, the right ones exclude outliers, i.e., 8 municipalities that had population changes in the highest and lowest 1%.) A strong association between population growth and entry is to be expected. The

[10] It is interesting to note that since 2004, in the set of schools that charge add-on fees, private-voucher schools that closed charged average monthly add-on fees slightly above $9,000 Chilean pesos (15 US dollars) while those that entered charged around $17,000 Chilean pesos (28 US dollars).

[11] Municipal population data is from the CENSUS and the National Statistics Institute.

interesting fact is that not only the creation but also the destruction of schools was strongly associated with population growth. This might reflect a more intense market dynamics in high population growth areas and begs for further analysis. As a matter of fact, 11 out the top 20 municipalities with more entries during this period were also among the top 20 with more exits.

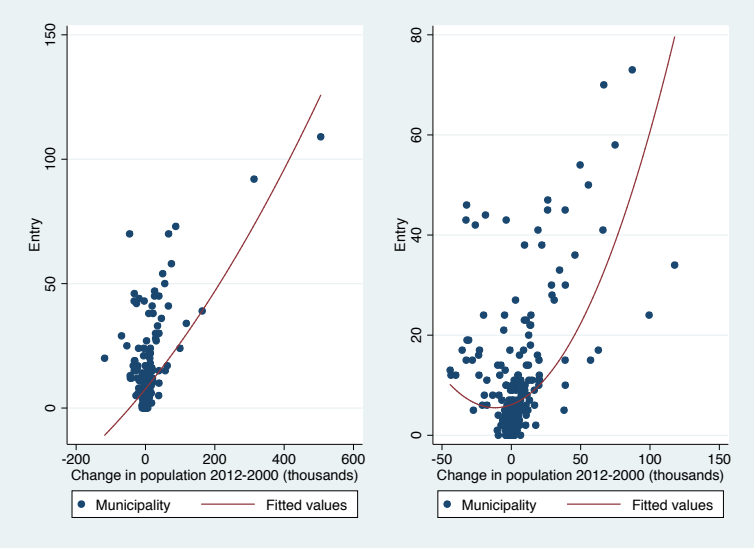

Figure 3: School entry and population changes 2000-2012

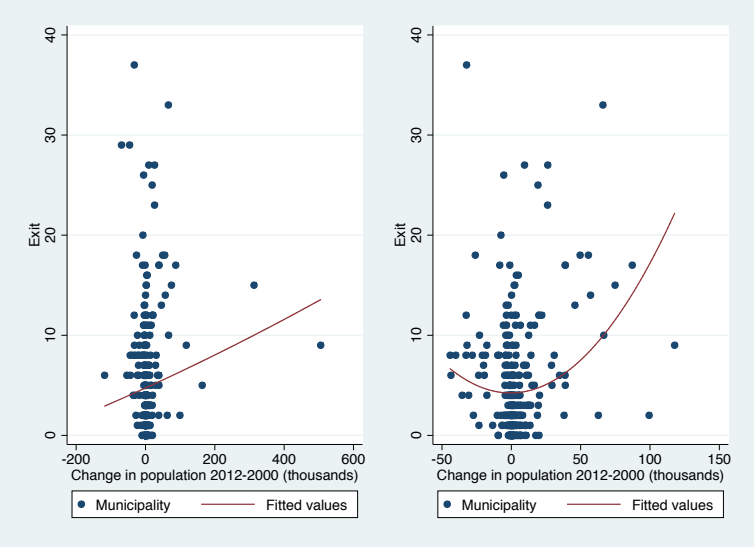

Figure 4: School exit and population changes 2000-2012

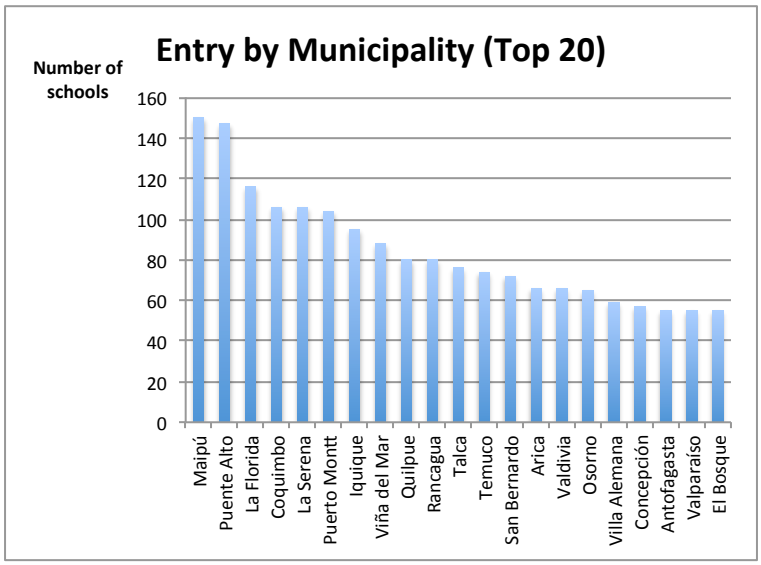

Figure 5: Top 20 school entry municipalities. The numbers include pre-K and K centers, primary and secondary schools.

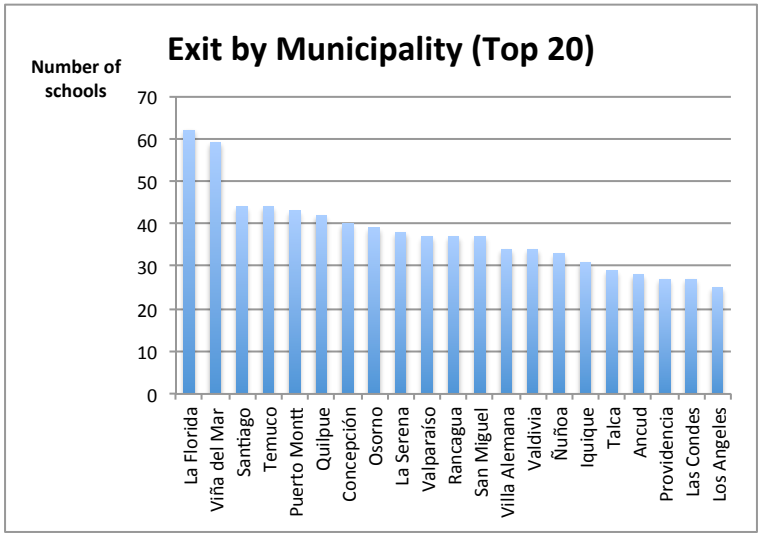

Figure 6: Top 20 school exit municipalities. The numbers include pre-K and K centers, primary and secondary schools.

Together, the entry patterns by type of school presented in section 2 and the facts just outlined, suggest that school creation during this period was predominantly an urban phenomenon driven by private-voucher schools in areas of urban expansion. The fact that high population growth areas experience both high entry and exit may suggest market miscoordination.

5 Market Turnout and Standardized Test Results

In order to investigate the association between the creation and destruction of schools and school performance, we ask whether market turnover predicts improvements in standardized test results (SIMCE).[12] The performance in tests results is explained both by individual variables such as socioeconomic background and school quality. If anything, market turnover should affect the contribution of the school to test results. To isolate the contribution of schools, we obtain standardized test scores controlling for parents education. Using administrative data from the 2000-2012 student panel data we start with an OLS estimation of

$$SIMCE_{i,s,t} = \beta * \text{Parents Education}_{i,t} + r_i, t$$

where $SIMCE_{i,s,t}$ is the simple average of SIMCE language and math scores of student i in school s in year t. The variable Parents Education$_{i,t}$ is a vector of indicators with the level of education achieved by both parents and r_i, t is a residual that captures the school contribution and other effects. Using the predicted scores we calculate the residual test score of student i at time t as $\hat{R}_{i,s,t} = SIMCE_{i,s,t} - \hat{\beta} * \text{Parents Education}_{i,t}$. Next, for each school s, we construct a residual score $R_{s,2002}$ around 2001 by averaging the individual residual scores for each school in years 2000-2002.[13] We interpret these numbers as indicators of each school's contribution to test scores around that time. A similar number is obtained for 2012 averaging the individual residual scores for each school in years 2010-2012. An improvement of the school's contribution is measured as $\Delta ResidualSIMCE_s = R_{s,2012} - R_{s,2000}$. The average of this variable is 0.0259 and its standard deviation is 1.090.

We are interested in studying the extent to which school turnover in a local market for the time period 2002-2012 affected the school quality of providers in that local market. As a

[12] The results in this section are exploratory.
[13] SIMCE scores are normalized each year.

first approximation, we use the municipality of the school as its local market and calculate the turnover in each municipality during the 2002-2012 normalizing by population [14] The average normalized turnover (per 1000s of inhabitants) is 0.3735 and its standard deviation is 0.2951.

Figure 7 shows the association between residual SIMCE improvements and normalized turnover using a quadratic fit. Figures 8 and 9 show a similar exercise using exit and entry in local markets (normalized by municipal population) rather than turnout. The figures show a positive association between score improvement and market turnout. The regression results are in the Appendix The positive association is largely driven by the average improvements in municipalities with more exits. The analysis does not allow for a causal interpretation and omits other predictors of school improvement. However, the results suggest that the association is weak: an increase of normalized market turnout by one-standard deviation is associated with a increase of 0.024 standard deviations of the SIMCE scores.

[14] A more precise geographic demarkation of the market would consider school turnover within a radius from each school.

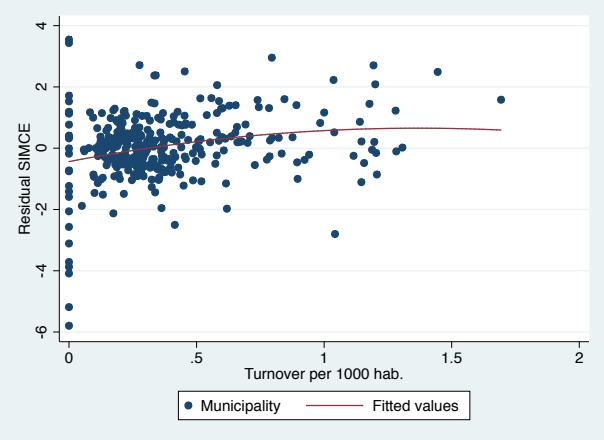

Figure 7: Residual SIMCE improvement (school contribution) and school turnout

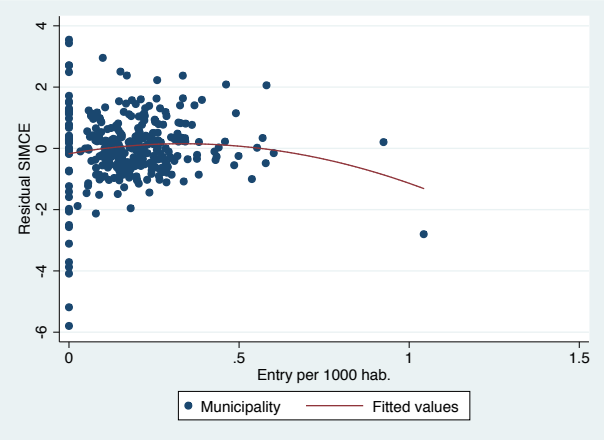

Figure 8: Residual SIMCE improvement (school contribution) and school entry

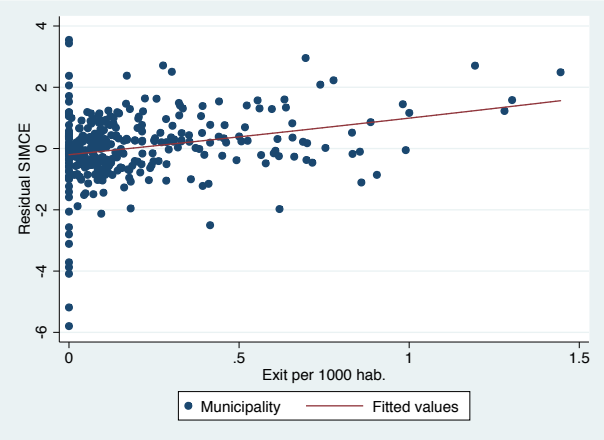

Figure 9: Residual SIMCE improvement (school contribution) and school exit

6 School Closures, Academic Success and Dropouts

In this section we study two potentially adverse effects of school closure on educational attainment, namely, the effect of school closure on grade retention and high-school dropout.[15]

6.1 Grade Retention

To estimate the effect of primary school closure on the probability of grade retention we use individual data on standardized test scores at fourth grade. Specifically, we compare the probability of grade repetition in the fifth grade of those students whose school closed in fourth grade with that of students whose school did not close. We use all the years for which we have standardized test information and student individual data, namely, 2005 and 2007-2011.

The total effect of school closure on grade retention can be decomposed in two effects. First, school closure forces a student to switch to a new school and this displacement is associated with adaptation costs. It is well known, that conditional on having the same ability, displaced students have a higher probability of grade repetition relative to those who do not switch to a different school.[16] Second, beyond the cost associated with any school switch, a displacement forced by school closure could be more disruptive than one caused by any other reason (e.g., parent preferences, planned geographic relocation).

To decompose these two effects, we consider two specifications. In particular, we the estimate the following two linear probability models:

$$Rep_{ijt} = \beta_0 + \beta_1 SClosed_{it-1} + \beta_2 ST^M_{it-1} + \beta_3 ST^S_{it-1} + \beta_4 GPA_{it-1} + \beta_4 AT_{it-1} + \theta_j + \eta_t + \varepsilon_{ijt},$$

and

$$Rep_{ijt} = \beta_0 + \beta_1 SClosed_{it-1} + \beta_2 ST^M_{it-1} + \beta_3 ST^S_{it-1} + \beta_4 GPA_{it-1} + \beta_4 AT_{it-1} + \theta_{j(i,t+1)} + \eta_t + \varepsilon_{ijt},$$
$$\forall i \ s.t. \ j(i,t) \neq j(i,t-1).$$

[15] Both are related. In fact, there is solid evidence that grade repetition causes student dropout, see for instance Jacob and Lefgren (2009); and Manacorda, M. (2012).

[16] See Hanushek et al. (2004).

The variable Rep_{ijt} takes the value one if individual i repeats fifth grade at school j at time t and zero otherwise; $SClosed$ stands for a school closure dummy; ST^x is the standardized test score of subject x (Math or Spanish); AT is the student's attendance rate; θ is fifth grade's school fixed effect; and η is time fixed effect. Finally, $j(i,t)$ represents the school attended by student i at time t.

Before turning to the results, we briefly discuss the merits of these specifications. As usual, our intention is to find the causal effect rather than a simple correlation. Since they include fixed effects for the fifth grade school, both specifications control for any feature of those schools that could drive the increase in the probability of grade retention, e.g., the school's difficulty. Moreover, we also control for two relevant measures of students ability and knowledge (just one year before fifth grade), their GPA, that is school specific, and their SIMCE score, a measure comparable across schools. Finally, we control for the attendance rate, which can be interpreted as a measure of student and parents' commitment. Given our controls it is hard to think of relevant omitted variables that could bias the results.

The results are shown in Table 5 and Table 6. Specifically, we find that school closure increases the probability of grade retention by 2,5 percentage points. Since grade repetition rates are around 5%, this means that the effect of school closure represents an increase of 50% in the probability of grade repetition. When we restrict our attention to the students who switch schools at the end of fourth grade, as we do in Table 6, the size of the effect is 1,8 percentage points, which is equivalent to an increase of 36% of probability of retention.

Table 5: Effect of school's exits on student grade retention

	Coeff	Std Err	P-value
School exit	0.02503	0.0049469	0.000
Simce Math	-0.00044	0.0000052	0.000
Simce Spanish	-0.00034	0.0000052	0.000
GPA	-0.00052	0.0000153	0.000
Attendance	-0.00216	0.0000388	0.000
Female	-0.02326	0.0003364	0.000
Constant	0.45450	0.0003364	0.000
N			1298375
adjusted R-squared			0.068

Note: It includes fixed effects for fifth grade school and for years.

Table 6: Effect of school's exits on student grade retention (all switching schools)

	Coeff	Std Err	P-value
School exit	0.01865	0.0056067	0.001
Simce Math	-0.00058	0.0000181	0.000
Simce Spanish	-0.00044	0.0000183	0.000
GPA	-0.00042	0.0000530	0.000
Attendance	-0.00152	0.0001088	0.000
Female	-0.03025	0.0012179	0.000
Constant	0.46305	0.0012179	0.000
N			138958
adjusted R-squared			0.091

Note: It includes fixed effects for fifth grade school and for years.

6.2 Dropout rates

We now estimate the effect of secondary school closure on the probability of dropping out. Since we data of standardized test scores in the tenth grade at an individual level, we compare the dropout rates the in tenth grade and thereafter, for students whose school closed in tenth grade relative to those whose school did not close that year-grade. We use all the years for which we have standardized test information and student individual data, namely, 2003,

2006, and 2008.[17]

We define a dropout as a student who is missing for at least two years from the student official registry of the MoE. To estimate the effect of school closure, we run the following probit model, the marginal effects are reported below:

$$Pr(Drop_{it} = 1) = \Phi\left(\beta_0 + \beta_1 SClosed_{it-1} + \beta_2 ST^M_{it-1} + \beta_3 ST^S_{it-1} + \beta_4 GPA_{it-1} + \beta_4 AT_{it-1} + \theta_j + \eta_t\right)$$

where $Drop_{it}$ takes a value one if individual i leaves the educational system at time t when he/she was attending tenth grade and zero, otherwise. As before $SClosed$ stands for a school closure dummy; ST^x is the standardized test score of subject x; AT is the student's attendance rate; θ is tenth grade school fixed effect; and η is a time fixed effect.

The main result is presented in Table 7. The effect of school closure on student dropout is an increase of 1.5 percentage points. In this sample the dropout rate is around 1.4% per year. Hence, our estimate implies that school closure more than doubles the probability of dropping out (a 107% increase).[18]

Table 7: Effect of school's exits on student dropouts

	Coeff	Std Err	P-value
School exit	0.01463	0.0041664	0.000
Simce Math	-0.00005	0.0000027	0.000
Simce Spanish	-0.00005	0.0000022	0.000
GPA	-0.00783	0.0001770	0.000
Attendance	-0.00018	0.0000092	0.000
Female	0.00089	0.0001921	0.000
Constant	-0.00472	0.0001921	0.000
N			682217
Pseudo R2			0.129

Note: It includes dummies for years 2003, 2006, and 2008.

To explore to what extent the result might be associated to unobserved characteristics of students who attend a school that will eventually close, we run the same probit model,

[17] We do not include in the main specification the year 2010 because, as made clear below, one of our specification would require the school exits of 2013.

[18] Table 14 in the Appendix shows the model's results if we include 2010. In that case the result is an effect of 1.1 percentage points, that is, a 79% increase in the probability of dropping out.

with the same covariates, changing the *control group* definition. In particular, in this case $SClosed_{it}$ takes a value of one if the school closes at time t, just as before, but it takes a value of zero if the school closed three periods ahead (otherwise assigning a missing value).

Table 8 shows, as expected, a more moderate effect. School closure is leads to an increase of 1.1 percentage points in the probability of dropping out, a 79% increase. This is still a large effect and, given the control group, we believe it is perhaps a more reliable estimate of the effect of school closure on high school dropout. The relevance of this exercise, and its result, is that it rules out the possibility that the estimated impact is driven by the student characteristics attending a school that ultimately closes.

Table 8: Effect of school's exits on student dropouts (**Restricted Control Group**)

	Coeff	Std Err	P-value
School exit	0.01735	0.0074052	0.019
Simce Math	-0.00023	0.0000773	0.003
Simce Spanish	-0.00003	0.0000814	0.719
GPA	-0.01689	0.0066841	0.012
Attendance	-0.00058	0.0004304	0.178
Female	0.00739	0.0064996	0.256
Constant	-0.01522	0.0064996	0.256
N			2361
Pseudo R2			0.103

Note: It includes dummies for years 2003, 2006, and 2008.

7 Conclusions

This paper studies the effects of school entry and exit in the Chilean market-oriented educational system, during the period 1994-2012. First we established the main stylized facts of school entry, exit and turnover during the period. Next, we estimate the potential "productivity gains" associated to market's creative destruction dynamics by studying the impact of school turnover on standardized achievement tests. Finally, we estimate the potential educational costs of this dynamics, trying to identify the causal effect of school closure on grade repetition and high school dropout rates.

The massive destruction and replacement of schools during the last two decades was a

distinctive characteristic of the market-based Chilean education system. Almost 15% of the schools that existed between 1992 and 2012 closed; a pattern of closures that does not seem to be declining over time. In fact, the turnover rate of the Chilean school system is quite similar to the average turnover rates found historically for middle and small-sized industries that range between 1% and 4%.

It is unclear if the impressive market turnover exhibited by the Chilean school system during this period has brought significant benefits, at least as measured by quality indicators based on standardized achievement tests. The contribution of the creative destruction process to quality improvement we measure is small.

By contrast, the costs of deregulated entry and exit seem substantial mainly in terms of educational attainment. Specifically, we find that school closure causes a 50% increase in the probability of grade repetition and a 79% increase in the probability of dropping out of high school. These costs come mostly from the disruptive effect associated with the lack of continuity in school provision.

Furthermore, there are other costs that we have not estimated. Hanushek et al (2007) have shown that school closure is not only associated with educational achievement costs of displaced students, but also with "mobility externalities", that is, disruption affecting students in the receiving schools.

A more detailed study on the cause of school creation and closure and the limited impact of school turnover on educational quality are relevant questions for future research.

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Appendix A Annual Market Entry and Exit by Type of School

Table 9: Annual entry by type of school 1994-2012

	Pre K + K-12			Primary and Secondary education (1-12)		
Year	Public	Voucher Private	Non voucher Private	Public	Voucher Private	Non voucher Private
1994	37	64	91	31	50	54
1995	9	19	26	9	16	9
1996	28	69	53	26	54	29
1997	16	71	30	15	63	22
1998	28	147	87	25	130	60
1999	29	114	58	27	95	24
2000	11	158	30	10	125	20
2001	27	233	41	22	179	26
2002	16	182	26	15	147	14
2003	43	415	39	41	358	20
2004	30	236	18	28	199	9
2005	48	257	16	47	222	5
2006	15	255	16	14	205	6
2007	11	224	18	10	172	11
2008	9	242	9	8	185	7
2009	22	325	12	22	277	7
2010	7	174	3	7	153	2
2011	12	151	5	12	142	4
2012	16	305	11	16	273	9
Total	414	3641	589	385	3045	338

Table 10: Annual creation rate by type of school 1994-2012

	Pre K + K-12			Primary and Secondary education (1-12)		
Year	Public	Voucher Private	Non voucher Private	Public	Voucher Private	Non voucher Private
1994	0.006	0.020	0.078	0.006	0.020	0.089
1995	0.001	0.007	0.025	0.001	0.006	0.013
1996	0.004	0.024	0.048	0.004	0.020	0.039
1997	0.003	0.024	0.027	0.002	0.023	0.028
1998	0.004	0.048	0.075	0.004	0.045	0.074
1999	0.005	0.036	0.049	0.004	0.032	0.030
2000	0.002	0.049	0.028	0.002	0.041	0.027
2001	0.004	0.065	0.036	0.004	0.055	0.036
2002	0.003	0.050	0.026	0.002	0.044	0.021
2003	0.007	0.102	0.042	0.007	0.095	0.032
2004	0.005	0.055	0.021	0.005	0.051	0.015
2005	0.008	0.056	0.021	0.008	0.052	0.010
2006	0.003	0.052	0.022	0.002	0.046	0.012
2007	0.002	0.044	0.025	0.002	0.037	0.023
2008	0.002	0.046	0.012	0.001	0.039	0.014
2009	0.004	0.059	0.018	0.004	0.055	0.015
2010	0.001	0.031	0.004	0.001	0.030	0.004
2011	0.002	0.026	0.008	0.002	0.027	0.008
2012	0.003	0.051	0.018	0.003	0.050	0.019
Average	0.004	0.044	0.031	0.003	0.040	0.027

Table 11: Annual exit by type of school 1994-2012

	Pre K + K-12			Primary and Secondary education (1-12)		
Year	Public	Voucher Private	Non voucher Private	Public	Voucher Private	Non voucher Private
1994	97	62	11	86	53	9
1995	13	5	1	11	5	1
1996	8	7	3	7	5	1
1997	53	27	52	53	20	25
1998	82	51	45	81	36	33
1999	30	25	52	27	17	30
2000	39	21	58	39	19	41
2001	85	110	145	60	35	48
2002	72	56	62	71	34	31
2003	61	53	49	59	35	22
2004	71	52	41	71	39	20
2005	133	41	33	130	32	13
2006	79	65	21	79	55	7
2007	72	70	23	72	58	8
2008	59	67	23	58	58	7
2009	48	35	8	46	21	2
2010	96	48	9	95	37	4
2011	40	86	6	40	73	4
2012	41	105	15	41	83	4
Total	1179	986	657	1126	715	310

Table 12: Annual destruction rate by type of school 1994-2012

	Pre K + K-12			Primary and Secondary education (1-12)		
Year	Public	Voucher Private	Non voucher Private	Public	Voucher Private	Non voucher Private
1994	0.015	0.020	0.009	0.016	0.022	0.015
1995	0.002	0.002	0.001	0.002	0.002	0.001
1996	0.001	0.002	0.003	0.001	0.002	0.001
1997	0.008	0.009	0.046	0.008	0.007	0.032
1998	0.013	0.017	0.039	0.013	0.012	0.040
1999	0.005	0.008	0.044	0.004	0.006	0.037
2000	0.006	0.007	0.054	0.006	0.006	0.056
2001	0.014	0.031	0.128	0.010	0.011	0.067
2002	0.012	0.015	0.063	0.012	0.010	0.046
2003	0.010	0.013	0.053	0.010	0.009	0.035
2004	0.012	0.012	0.048	0.012	0.010	0.033
2005	0.022	0.009	0.043	0.021	0.008	0.026
2006	0.013	0.013	0.029	0.013	0.012	0.014
2007	0.012	0.014	0.032	0.012	0.013	0.016
2008	0.010	0.013	0.032	0.010	0.012	0.014
2009	0.008	0.006	0.012	0.008	0.004	0.004
2010	0.017	0.008	0.013	0.017	0.007	0.008
2011	0.007	0.015	0.009	0.007	0.014	0.008
2012	0.007	0.018	0.024	0.007	0.015	0.009
Average	0.010	0.012	0.036	0.010	0.010	0.025

Appendix B School Contribution and Market Turnout

Table 13: Residual SIMCE and Market Turnout

	(1)	(2)
Turnover/Population 2012	0.897***	1.592***
	(0.195)	(0.574)
(Turnover/Population 2012)^2		-0.581
		(0.451)
Constant	-0.309***	-0.437***
	(0.0929)	(0.136)
Observations	339	339
R-squared	0.059	0.064

Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Appendix C School closure and high school dropout, control group

Table 14: Effect of school's exits on student dropouts

	Coeff	Std Err	P-value
School exit	0.01075	0.0030463	0.000
Simce Math	-0.00006	0.0000022	0.000
Simce Spanish	-0.00007	0.0000018	0.000
GPA	-0.00006	0.0000091	0.000
Attendance	-0.00038	0.0000062	0.000
Female	-0.00088	0.0001583	0.000
Constant	-0.00397	0.0001583	0.000
N			906629
Pseudo R2			0.113

Note: It includes dummies for years 2003, 2006, 2008 and 2010.