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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), around one-fifth of the current stock of schools. At the same time 3,770 new schools entered the school system, mostly private-voucher schools. Given this significant school turnover we estimate the potential "productivity gains" associated to market's creative destruction dynamics by studying its impact on students' standardized achievement tests. We find that, at the municipality level, school turnover predicts changes in school performance -after controlling for students' socioeconomic status- only for low population municipalities, while it has no effect for high population municipalities. Moreover, we find a negative impact on school performance if turnover is associated with a significant school replacement. 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 characteristics, we identify a causal effect of school closures on grade retention and school dropouts. School exit is associated with a 60 per cent increase in the probability of grade repetition in 5th grade and a 79 per cent increase in the probability of school dropout in tenth grade.

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.[1]

This paper explores different aspects of school entry and exit in Chile, where a nationwide school voucher program was introduced in 1981, creating a dynamic educational market. For the period 1994-2012, we first estimate the potential ”productivity benefits” associated to market's creative destruction dynamics by studying the impact of school turnover on standardized achievement tests. Then, we estimate the potential educational costs of this dynamics in terms of disruption and harm to students. Specifically, we attempt to identify the causal effect of school closure on grade repetition and high-school dropout rates.

The Chilean case is interesting for several reasons; first, the country has a very liberalized school market that has been in place for more than 30 years without relevant changes. Second, we have new data on school entry and exit that allow us to control by individual students' characteristics, both in the productivity and cost analysis; previous studies on Chile did not have access to individual-level data (Hsieh and Urquiola, 2006). Third, recent evidence has shown that anticipated school closure has potentially important pedagogic and social costs (Engberg et al 2012; de la Torre and Gwynne 2009; Kirshner 2009). In our case, since

[1] In fact, there are studies that focus on the impact a school closure can have in neighborhood social cohesion (Witten et al, 2001) and the development of local societies (Egelund and Laustsen, 2006).

closures are unanticipated, the costs of adaptation are potentially larger as parents may not be prepared for the change, and the choice set of new schools could be more constrained, since schools tend to have fewer slots in grades different from the entry points into most schools (pre-K, first grade and ninth grade). Fourth, in the last decade many districts in the United States have decided to close schools due to declining enrollment, competition from charter schools, or chronically low levels of academic performance, however, there is scant research on the effect school closures have on student outcomes.[2]

Moreover, this 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.

In this paper we construct a rich panel database of Chilean schools for the period 1992-2012, with school basic characteristics and detailed educational and socio-demographic information for every student.

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 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 2,822 exists and 4,647 entries). Nearly half of exiting schools was public and the remainder private.

[2]Nonetheless, there is a related literature on the effects of student mobility that consistently finds adverse effects of mobility on student outcomes (Hanushek et al 2004, Booket et al 2007, Xu et al 2009, Ozek 2009). Moreover, Hanushek et al 2004 also find that school mobility involves a negative externality, reducing achievement of all students in the receiving schools.

The annual ”destruction rate” for public schools and private-voucher schools was around 1.1 percent 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. This turnover rate (around 3 percent) is similar to the average turnover rate of middle-sized firms industries. The schools that exit the school market 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 336 students for the schools that did not close; closing schools have students with lower socioeconomic status (SES), charge lower add-on fees and relative to the rural/urban distribution, the share of rural exits is higher. In addition, we found that school creation during the period was mainly an urban phenomenon driven by private-voucher schools in areas of urban expansion.

While schools that exit have lower average scores in standardized achievement tests than those who survive, this difference seems to be strongly associated to 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 only predicts changes in school performance for low population municipalities that account for 16 percent of the Chilean population; it has no effect for high population municipalities where market forces are expected to be more relevant. Moreover, we find a negative impact on school performance if turnover is associated with a significant school replacement.

In order to estimate the potential educational costs of schools' exit, we attempt to identify the causal effect of school closure on grade repetition and high school dropout rates. Our identification strategy compares grade repetition of students who switch to a different school after the closure of their school, with similar students attending the same class in the receiving school. We find 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 school closure on high-school dropout rates is large, increasing the 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. The Consortium on Chicago School Research (de la Torre and Gwynne, 2009) compares the learning trajectories (as measured by math and reading test scores) of students ages eight and older who were displaced by school closing in Chicago, to a group of students in similar schools that did not close. The authors found a negative effect on student achievement in the year the closings were announced, but did not find positive nor negative effects once students were enrolled in their new schools. The learning outcomes of displaced students depended on the characteristics of receiving schools. However, only 6 percent of students transferred to schools that had test scores in the top quartile of the district, while most students transferred to schools that were academically weak, suggesting that the school closure policy failed to place students in substantially better schools.

A second Chicago study by SRI International, examined the Renaissance 2010 initiative which had the goal of closing 60-70 schools and opening 100 new smaller schools by 2010. This study used a matching strategy to examine two cohorts of students from closed schools attending 23 newly created schools and found that students generally performed at the same levels as matched comparison students (Young et al 2009). Supplementing this research a case study was performed in a high school that was closed in a western city; the author found that transferring students to new schools disrupted their relationship with teachers. Also, differing academic norms, routines and expectations in the new schools produced adverse learning effects (Kirshner, 2009).

Engberg et al (2012), adds to this literature addressing the non-random sorting of student out of closed schools into new schools, and examining a school closure plan in a mid-sized urban district, that explicitly sough to move students from low value-added schools, which would be closed, to high value-added schools. They analyze the rate of absences and students' academic performance after the reassignment. They found that the transition to new schools can have an adverse effect on attendance and achievement gains for students from closed schools, but these effects can be minimized when students move to higher-performing schools. The negative effect on attendance vanishes after the first year following closure, but the negative effect on achievement appears to persist, unless students are transferred to substantially higher performing schools. The analysis also shows no detectable adverse effects on either the attendance or the achievement of students in schools receiving students from closed schools. The authors argue that their results do not necessarily support school closures as a means of improving students' achievement, mainly because significantly improving studentsÕ academic performance would require transferring them to schools that are substantially higher achieving than the closing schools.

The rest of the paper proceeds as follows. Section 2 briefly describes the Chilean school system. Section 3 presents our measures of entry and exit, the data, and 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. Section 7 concludes.

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-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 establishing their own admission and expulsion policies. (iii) Private unsubsidized schools are also independent, but receive no public funding.

In 1994, private institutions accounted for about 36.4 percent of all schools, and private voucher schools alone for about 26.9 percent. In 2012 private institutions accounted for about 55.2 percent of all schools, and private voucher schools alone for about 49.7 percent. In terms of enrollment, in 1994 private schools accounted for 40.7 percent of total enrollment, and private-voucher schools for 31.8 percent. While in 2012 private schools accounted for 60.5 percent and private-voucher schools for 53.2 percent of enrollment.

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 ("add-on" fees), 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.[3] 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 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. In contrast to other systems, private schools are not required to inform their closure to the MoE, hence, the official registry of closures is incomplete. Additionally, some non voucher schools have become voucher schools over time. Each of these changes could be associated with ID changes that might mistakenly be considered as an exit and entry. To properly identify exits and entries, we conducted a procedure in three stages. In the first stage, the changes in the listings yield a set of potential entries and exits. In the second stage, 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. In the third stage, we use the individual panel with official administrative data available for each student since the year 2002 to filter candidates of the previous stages by tracking groups of students in new and closing schools. Finally, prior to 2002, we checked one-by-one all the names and addresses of the non-voucher private schools that closed between

[3]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.

1997 and 2001. The details of the procedure can be found in the Appendix.

In addition to the sources of information described above 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. Moreover, from parent surveys that are carried out during the SIMCE process we obtain more information about students, for instance their mother's and father's education, and their opinion about schools' characteristics. (2) The administrative panel data from 2004 to 2013 on all students in the country from the Ministry of Education. This panel includes the school attended every year, the grade (and whether they repeat the grade), the attendance rate, and some basic demographic information. (3) Schools' IVE: a school-level measure of the students' socioeconomic vulnerability, calculated by the MoE in order to allocate school meals. (4) 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 or entry 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 or exit 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.[4]

[4]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.

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 number of school closures does not seem to be slowing down. 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 schools that entered the system during this period was 4,647, that is, 245 schools 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 [5]; 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).[6]

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

[6]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 with 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 Chile, 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 is 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 private-voucher 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, the closure of schools 10 to 15 per year between 1990 and 1999, most of them rural, was also controversial (Egelund and Laustsen 2006).

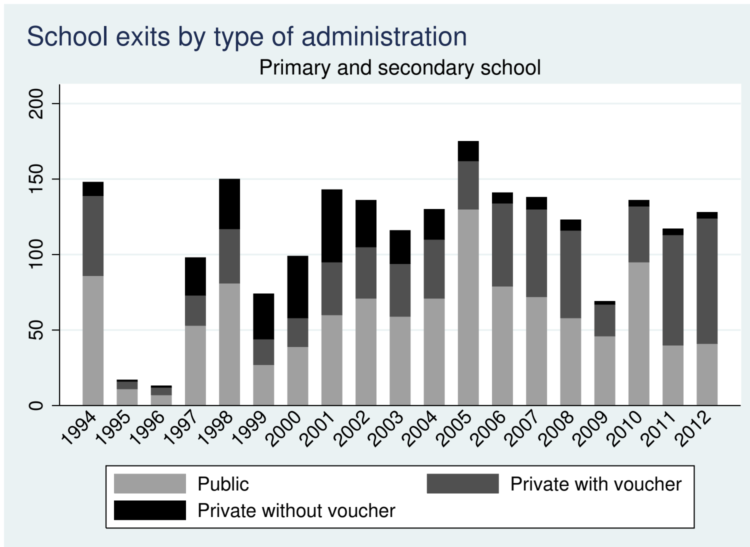

Figure 1: Annual Exit by Type of Administration (Primary and Secondary)

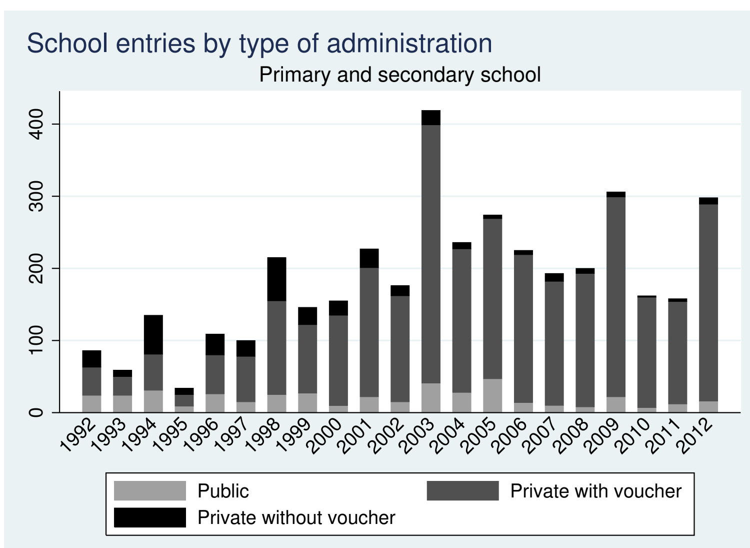

Figure 2: Annual Entry by Type of Administration (Primary and Secondary)

4 Stylized Facts

We highlight some of the main stylized facts regarding the school entry, exit and turnover dynamics in Chile between 1994 and 2012:

1. Schools that closed were relatively small, they had significantly lower levels of enrollment than the system's average.
2. The socio-economic status of students in schools that closed is significantly lower than the system's average.
3. There was more school closure in rural areas areas. Entry was heavily concentrated in urban areas.
4. School turnover, entry and exit is strongly associated with market size and demographic patterns.
5. The rates of turnover and entry between 2000 and 2012 are positively associated with urbanization, population increase and the share of private/voucher schools in 2000; and are negatively associated with the number of schools per capita, poverty, inequality in 2000 and poverty increase during the period.
6. The rate of exit is hardly explained by market characteristics, demographic and socioeconomic variables, and is quite uniform across municipalities of different population.

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 1, almost half of the schools that closed were in the first quintile of the enrollment distribution.

Table 1: 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 economically viable given the considerable fixed costs of school provision. In systems with regulated entry and exit, enrollment is a common factor education administrators take into account when closing or merging schools. 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 have more impact on low-socioeconomic status (SES) students. 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 2: 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 2 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. [7]

Table 3 illustrates the Rural/Urban distribution of schools and turnover.

Table 3: 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

[7] 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).

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%).

Both the shear creation and destruction of schools was strongly associated with market size and population growth. 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. Table 4 shows the OLS association between school turnover and a number of explanatory variables at the communal level for the 2000-2012. We report the same exercise for entry and exit separately. Controls include measures of market size -the total number of schools and population in the year 2000-, socioeconomic and demographic factors such as population growth, the level of urbanization, poverty and inequality at the beginning of the period, and poverty decrease during this period. In the case of turnover and exit,we find a positive association with measures of market size and population increase. These variables alone explain between 83% and 86% of the total variation across municipalities. Inequality and poverty are negatively associated with turnover and entry. For school exits we find a positive association between the total number of schools and a negative conditional association with population. These factors alone explain 75 percent of the variation, the impact of socioeconomic determinants seems small. Urbanization is positively associated with turnover, entry and exit.

Table 4: Determinants of Communal School Turnover, Entry and Exit

	(1) Turnover	(2) Turnover	(3) Entry	(4) Entry	(5) Exit	(6) Exit
Number of Schools	0.343***	0.406***	0.136***	0.190***	0.208***	0.217***
	(0.0334)	(0.0369)	(0.0285)	(0.0335)	(0.0152)	(0.0118)
Population	10.37***	6.277***	11.42***	8.124***	-1.050*	-1.847***
	(1.576)	(2.011)	(1.363)	(1.732)	(0.582)	(0.620)
Population Increase	0.0884***	0.101***	0.0968***	0.107***	-0.00845*	-0.00538
	(0.0159)	(0.0167)	(0.0141)	(0.0149)	(0.00447)	(0.00539)
Urbanization		8.693***		7.563***		1.130
		(1.817)		(1.634)		(0.855)
Poverty		-5.567***		-4.268***		-1.299*
		(1.238)		(0.922)		(0.708)
Interquartile Range		-2.840***		-2.888***		0.0479
		(0.834)		(0.884)		(0.314)
Poverty Decrease		-2.802***		-1.835***		-0.967
		(1.033)		(0.692)		(0.657)
Constant	-1.618***	-1.491	-0.834*	-0.341	-0.784***	-1.151**
	(0.513)	(0.961)	(0.456)	(0.886)	(0.227)	(0.519)
Observations	336	280	336	280	336	280
Adjusted R^2	0.863	0.876	0.833	0.853	0.752	0.749

Robust standard errors in parentheses

* p<.10, ** p<.05, *** p<.01

In the vein of the innovation literature, we use measures of market dynamics normalized by the market size to estimate the impact of school creation and destruction on school performance. Specifically, we use the rates of school turnover, entry and exit for the period 2000-20012. The turnover rate for the period is simply total school turnover between 2000 and 2012 divided by the number of schools at the beginning of the period, and similarly for entry and exit rates.

Table 5 illustrates the stark differences of market dynamics across municipalities with different levels of population and urbanization. The first column corresponds to all municipalities while the second one is for the Metropolitan Region (MR). The region contains the capital city of Santiago and concentrates near to seven million inhabitants -40% of the country's total population. Relative to the national average, the share of private voucher schools in 2000 and the entry rate are almost doubled in the MR. In contrast, exit rates are very similar. The next three columns splits municipalities into three groups according to their population (2002 Census). In 2002, 211 municipalities -almost two-thirds- had less than 25,000 inhabitants, displaying entry, turnover and Private Voucher School participation considerably lower than the national average. Overall, the low population group concentrates 16 percent of the total population. The middle group of 40 municipalities, has figures close to the national averages. Interestingly, most of the population is either in low population or high population municipalities, with statistics that differ significantly with national averages. The third group, the high population group, comprises municipalities in the highest quartile of the population distribution. It includes all municipalities in the RM and those corresponding to the main urban centers of the country. Overall, the high population group concentrates 75% of the total population. We observe that exit rates are quite similar across these groups, while the share of private-voucher schools, entry rate and urbanization all increase with communal population levels.

Finally, table 6 reports OLS estimates of the relationship between our measures of market dynamics -turnover, entry, and exit rates- and market, demographic and socioeconomic factors. These variables have no explanatory power for exit rates, which is consistent with the lack of variation of the exit rate across municipalities (see table 5). For turnover and entry rates, we find a positive (conditional) association with the share of private-voucher schools

Table 5: Communal Heterogeneity of Market Dynamics

			Communal Population		
	All	Met. Region	< 25,000	25,000-45,000	> 45,000
Communal Average					
Urbanization	45.0%	82.7%	29.0%	41.6%	86.2%
Municipal Share (2000)	73.7%	44.6%	84.9%	72.4%	46.6%
Private Voucher Share (2000)	22.3%	41.4%	14.3%	25.1%	40.9%
Turnover Rate	0.40	0.69	0.32	0.46	0.59
Entry Rate	0.26	0.51	0.18	0.31	0.43
Exit Rate	0.15	0.18	0.15	0.14	0.16
Total Population (millions)	15.24	6.06	2.39	1.31	11.44
Number of Municipalities	339	52	214	40	85

Share of municipal and private voucher schools are for the year 2000.

Turnover, Entry, Exit and Replacement for the period 2000-2012.

at the beginning of the period, Urbanization, Population increase and the Metropolitan Region dummy. We also obtain a negative conditional correlation with schools per inhabitant, poverty and inequality.

Table 6: Determinants of Communal Turnover, Entry and Exit Rates

	(1) Turnover Rate	(2) Entry Rate	(3) Exit Rate
Schools/1000 inhab.	-0.0489***	-0.0437***	-0.00513
	(0.0138)	(0.0163)	(0.00943)
Share Private Voucher	0.233***	0.184***	0.0484
	(0.0727)	(0.0618)	(0.0428)
Population	-0.0732**	-0.0653**	-0.00791
	(0.0352)	(0.0332)	(0.0112)
Population Increase	0.00213***	0.00220***	-0.0000731
	(0.000592)	(0.000554)	(0.0000946)
Urbanization	0.270***	0.288***	-0.0186
	(0.0760)	(0.0722)	(0.0383)
Poverty	-0.143***	-0.122***	-0.0211
	(0.0357)	(0.0270)	(0.0253)
Interquartile Range	-0.0521***	-0.0496***	-0.00249
	(0.0152)	(0.0143)	(0.00813)
Poverty Decrease	-0.0776**	-0.0604***	-0.0171
	(0.0312)	(0.0224)	(0.0221)
Metropolitan Region	0.164**	0.139**	0.0255
	(0.0714)	(0.0609)	(0.0213)
Constant	0.388***	0.221***	0.167***
	(0.0491)	(0.0463)	(0.0266)
Observations	280	280	280
Adjusted R^2	0.437	0.497	-0.014

Robust standard errors in parentheses

* p<.10, ** p<.05, *** p<.01

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.

5 Market Turnout and Standardized Test Results

We investigate the association between the creation and destruction of schools and school performance. We start by analyzing whether market turnover predicts improvements in students' achievement. To this end we use math and language test scores in a national standardized test (Sistema de Medicion de la Calidad de la Educacion, SIMCE in Spanish), administered by the Ministry of Education to fourth graders.

5.1 Changes in Schools' Contribution to Test Results and Market Dynamics

In principle, the performance in tests results is explained by students' socioeconomic background, school quality and environmental variables such as local crime. Market turnover should affect the contribution of the school to students' academic performance measured through test results. To isolate the contribution of schools, we normalize test scores and control for parents' education. Using a large panel of individual students data for the period 2000-2012 we run the following OLS regression:

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

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.

Using the predicted scores we calculate the residual test score of student i at time t as $\hat{R}_{i,s,t} = SIMCE_{i,s,t} - \hat{\alpha} * \text{Parents Education}_{i,t}$. Next, for each school s, we construct a residual score $R_{s,2001}$ around 2001 by averaging the individual residual scores for each school in years 2000-2002.[8] We interpret these numbers as indicators of each school's contribution to

[8] SIMCE scores are normalized each year and can be consistently compared across time.

students' achievement around that time.[9] A similar number is obtained for 2011, averaging the individual residual scores for each school in years 2010-2012.

Our aim is to study the association between school turnover in a local market and the schools' productivity in the same local market. As a first approximation, we use each municipality as a local market and calculate the turnover rate in each municipality during the 2002-2012 period.[10] Let $R_{m,t}$ be the average residual score in municipality m for the year $t = 2001, 2011$. Therefore, the schools' contribution in each municipality between 2001 and 2011 is $\Delta ResSIMCE_m = R_{m,2012} - R_{m,2000}$.[11] The average of this variable is 0.008 and its standard deviation is 0.976.

Figures 3 and 4 illustrate the bivariate relationship between the change of residual SIMCE and the turnover in two different sub-samples of communes, low population communes with less than 25,000 inhabitants and high population communes, with 45,000 or more inhabitants. Figure 3 shows a positive association between SIMCE test score improvements and market turnout in low population communes. The graph for large-population communes, suggests a weak relationship, if any.

[9]This definition of school quality does not eliminate peer effects. Something that should be considered in the analysis of the results.

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

[11]In principle, it would be interesting to calculate a school level improvement $R_{s,2011} - R_{s,2001}$ rather than at the municipality level. However, this is only possible for schools that remain in the system throughout the entire period, it is not possible to construct such a measure for schools that exit or enter during the period.

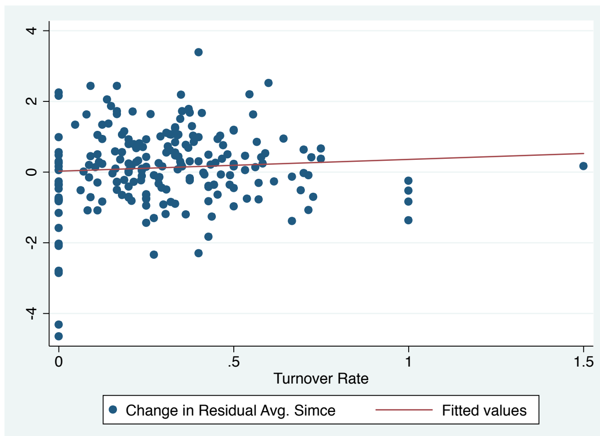

Figure 3: Change of Residual SIMCE 2000-2012 and Turnout Rate, Commune Population $\leq 25,000$

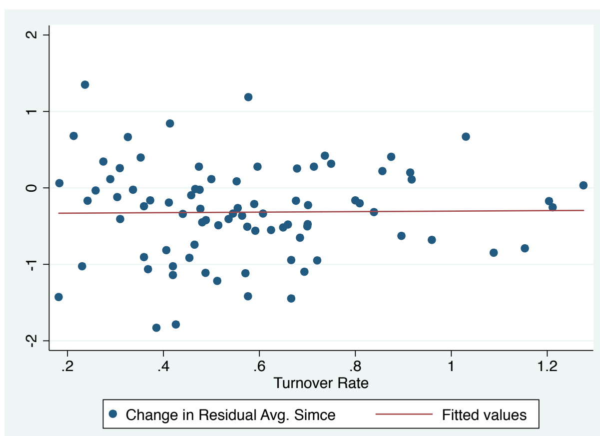

Figure 4: Change of Residual SIMCE 2000-2012 and Turnout Rate, Commune Population $> 45,000$

To further investigate this relationship, we estimate a linear model of the form

$$\Delta ResSIMCE_m = \beta_1 * Dynamics_m + \beta_2 * X_m + \varepsilon_m$$

where $Dynamics_m$ is either the rate of turnover, entry or exit in a municipality m, and X_m is a vector of socioeconomic and demographic controls. We include communal poverty, inequality (measured as the interquartile income range), urbanization in the year 2000 and poverty decrease between 2000 and 2012, calculated using the National Socioeconomic Characterization Survey.[12] We also consider the communal change in crime reports to the police between 2001 and 2012, from official records. A complete table of descriptive statistics for the independent and dependent variables is in the Appendix. The results are presented in table 7.

Our specification resembles Hsieh and Urquiola (2006). Their focus is similar to ours, as they are interested in the impact of market competition -specifically choice availability- on standardized test scores. Their main specification is a regression of communal changes in SIMCE scores on a measure of the change in local competition and socioeconomic controls very similar to ours. They measure local competition as the enrollment participation of the private-voucher sector. In principle, this difference in test scores against difference in local competition approach controls for municipality fixed effects. They also instrument changes in local competition with changes in population and urbanization. Nonetheless, we have some differences with Hsieh and Urquiola (2006), they are: First, we look at a different period 2000-2012 vs 1986-1996. Second, we have a larger set of municipalities as the SIMCE test in our period of study is applied universally every year. In fact, with the exemption of insular low population communes such as Easter Island, Antartica, and a few other small communes, we consider all communes which allows us to explore heterogeneous effects across municipalities. Third, we have a different dependent variable. We take advantage of administrative individual data available for the 2000-2012 period and instead of changes in test scores we consider residual changes in SIMCE test scores, that is, we try to isolate the contribution of the school from the student social and cultural capital. Fourth, in our case, we are interested

[12]The results are qualitatively unchanged if we use other controls such as per capita income, communal growth rate, educational attainment and education interquartile range that are closely correlated with the ones we present here.

in market dynamics. Although there is no immediate connection between the private market share and turnover variables, since most of the school entry in the Chilean case is precisely associated to private voucher school -something that Hsieh and Urquiola document extensively for their period of study- , market entry is correlated with the change in the share of private enrollment. Hence, the results related to entry might be partially interpreted as an extension of the results of Hsieh and Urquiola (2006) to our period. Since turnover and exit could be associated to a decrease in choice, our measures of market dynamics yield different information. Finally, we have added crime rate changes as a control variable, which may account for some environmental factors that potentially affect school demand, attendance and also the risks and costs faced by a school entrepreneur.

Table 7: Change in Residual Scores and Market Dynamics, Math/Language Average

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	$\Delta Simce$	$\Delta Simce$	$\Delta Simce$	$\Delta Simce$	$\Delta Simce$	$\Delta Simce$	$\Delta Simce$	$\Delta Simce$
Urbanization	-1.067***	-0.940***	-0.974***	-0.946***	-0.889***	-0.896***	-0.977***	-0.944***
	(0.198)	(0.171)	(0.209)	(0.171)	(0.205)	(0.152)	(0.209)	(0.170)
Poverty	0.375**	0.229*	0.341*	0.231*	0.333*	0.203	0.359*	0.231*
	(0.186)	(0.135)	(0.188)	(0.135)	(0.182)	(0.130)	(0.188)	(0.135)
Interquartile Range	-0.204***	-0.153***	-0.218***	-0.152***	-0.227***	-0.161***	-0.215***	-0.152***
	(0.0654)	(0.0346)	(0.0683)	(0.0348)	(0.0646)	(0.0334)	(0.0661)	(0.0347)
Poverty Decrease	0.234	0.122	0.216	0.123	0.220	0.113	0.232	0.123
	(0.161)	(0.113)	(0.160)	(0.112)	(0.160)	(0.111)	(0.161)	(0.113)
Change in Crime	-10.15**	-11.57***	-11.52**	-11.43***	-11.75**	-12.42***	-10.71**	-11.48***
	(4.686)	(4.329)	(4.842)	(4.396)	(4.793)	(3.764)	(4.831)	(4.356)
Metropolitan Region	0.376***	0.318***	0.420***	0.316***	0.420***	0.330***	0.388***	0.316***
	(0.0984)	(0.103)	(0.0933)	(0.101)	(0.103)	(0.100)	(0.102)	(0.101)
Turnover Rate	0.410**	0.114						
	(0.163)	(0.178)						
Entry Rate			0.205	0.124			0.200	0.123
			(0.181)	(0.184)			(0.186)	(0.182)
Exit Rate					1.131**	0.0852	1.127**	0.0550
					(0.525)	(0.503)	(0.528)	(0.502)
Constant	0.585***	0.681***	0.688***	0.695***	0.540***	0.720***	0.505***	0.687***
	(0.163)	(0.140)	(0.157)	(0.130)	(0.161)	(0.137)	(0.169)	(0.150)
Population Weights	NO	YES	NO	YES	NO	YES	NO	YES
Observations	280	280	280	280	280	280	280	280
Adjusted R^2	0.209	0.367	0.200	0.367	0.216	0.366	0.215	0.365

Robust standard errors in parentheses

* p<.10, ** p<.05, *** p<.01

The first two columns of Table 7 use the turnover rate as our measure of market dynamics. In contrast to column (1), column (2) weighs observations by population. Columns (3)-(6) show the results using entry and exit rates separately, with and without population weights. The final two columns use entry and exit rates jointly.

The results show significant differences between the estimates with and without weights. In the absence of weights, the relationship between changes in the school contribution to standardized tests and turnover is positive and statistically significant and seems to be especially driven by exit rather than entry rates. In contrast, with population weights all measures of market dynamics have no effect whatsoever.[13] The differences introduced by population weights are not surprising once we ponder the stark differences across low and high population communes shown in Table 5. Indeed, since two thirds of municipalities are small and concentrate 16% of the population while the highest population quintile of municipalities concentrates 75% of the population, regressions without weights reflect mostly low population communes while those with weights reflect the reality of high population school markets. As emphasized previously, turnover rates and the participation of private-voucher schools are much higher in high population areas. These results confirm the significant differences between low and high population markets, which we further investigate.

5.2 Heterogeneous Effects

To explore this heterogeneity we split the sample in two groups, the Low Population group consisting of municipalities with less than 25,000 inhabitants in the year 2002, and the High Population group with those having 45,000 inhabitants or more. A table with summary statistics of each subsample for the dependent and independent variables of interest is in the Appendix. The first three columns in Table 8 show the results for the Low Population group and the next three columns the results for the High Population one. In the Low Population group we find a significant positive association between the turnover rate and changes in residual SIMCE scores, and the effect seems to be especially driven by exit. While we caution about a causal interpretation of the results, the effect seems sizable: an increase

[13] The same conclusion follows if we use the total number of schools in each municipality as weights rather than population.

of the turnover rate by one standard deviation is associated with an increase in test scores of 12 percent of a standard deviation. In contrast, for the High Population group we find no significant effect. If anything, column (6) shows a negative relationship between changes in residual scores and the school exit rate. Overall, the weak importance of entry in our regressions is consistent with the findings of Hsieh and Urquiola (2006) for the 1986-1996 period.

In the Appendix we show that these results are not driven by the fact that the number of municipalities is smaller in the High Population sample, nor the fact that we have omitted the 40 municipalities with populations between 25,000 and 45,000. If the sample is split in two equally-sized groups and all municipalities are considered, the results are qualitatively identical.

Our final results of this section explore one of the mechanisms that could partially explain the heterogeneity. We hypothesize that in markets with more intense dynamics, there could also be more mis-coordination. Indeed, while entries and closures may be justified for demographic, efficiency and achievement purposes, in all OECD countries the accommodation of the school supply is usually planned in advance after analyzing school performance and demand trends and the ability of existing schools to incorporate new students. In contrast, in the "pure" Chilean market system, these adjustments are entirely deregulated and decentralized. In municipalities that experience important population increases or social improvements many entrepreneurs may enter and simply replace other schools without offering better quality or superior resource management. We introduce an imperfect measure of this replacement - the part of turnover that 'nets out'- given by the overlap between entry and exit in a particular market in a time window. In a locality with more entry than exit, exits can be interpreted as a replacement of previously existing schools; similarly, with more exit than entry, entry can be interpreted as a replacement of some of the exiting schools. Replacement could be associated with market mis-coordination.

We use a High Replacement dummy that takes the value 1 for municipalities with a Replacement/Turnover ratio above the median and 0, otherwise. In the estimates reported in Table 9 we interact this variable with the turnover rate. Columns (1) and (2) present estimates for the entire sample with and without population weights, respectively. Column (3) considers

Table 8: Heterogeneous Effects by Population Lelvels

	(1) Low Pop.	(2) Low Pop.	(3) Low Pop.	(4) High Pop.	(5) High Pop.	(6) High Pop.
Urbanization	-1.228***	-1.056**	-0.911**	-0.692*	-0.712**	-0.678**
	(0.413)	(0.414)	(0.437)	(0.353)	(0.353)	(0.331)
Poverty	0.298	0.248	0.252	0.706***	0.737***	0.709***
	(0.294)	(0.294)	(0.293)	(0.213)	(0.218)	(0.211)
Interquartile Range	-0.833***	-0.909***	-0.784**	-0.131***	-0.125***	-0.118**
	(0.314)	(0.325)	(0.318)	(0.0444)	(0.0449)	(0.0453)
Poverty Decrease	0.323	0.293	0.275	0.167	0.178	0.134
	(0.273)	(0.271)	(0.273)	(0.144)	(0.145)	(0.134)
Change in Crime	-5.616	-7.636	-6.518	-12.34**	-11.55**	-11.81**
	(10.61)	(10.81)	(10.72)	(5.366)	(5.491)	(4.768)
Metropolitan Region	0.185	0.323	0.299	0.372***	0.365***	0.373***
	(0.252)	(0.232)	(0.267)	(0.115)	(0.115)	(0.113)
Turnover Rate	0.868**			-0.0238		
	(0.350)			(0.240)		
Entry Rate		0.697*			0.0815	
		(0.376)			(0.243)	
Exit Rate			1.113*			-1.129
			(0.647)			(0.764)
Constant	1.084***	1.290***	1.060***	0.460	0.408	0.580**
	(0.274)	(0.276)	(0.278)	(0.301)	(0.304)	(0.276)
Observations	159	159	159	82	82	82
Adjusted R^2	0.160	0.144	0.150	0.368	0.369	0.388

Robust standard errors in parentheses

* p<.10, ** p<.05, *** p<.01

the subsample of municipalities with population lower than 25,000 inhabitants. Column (4) considers municipalities of 45,000 or more inhabitants. We find that the interaction is consistently and negatively associated with changes in residual SIMCE scores. This negative association is statistically significant in High Population communes, which are also those that exhibit considerably higher turnover rates and specifically entry rates over this period.

Thus, we can conclude that school entry does not matter to explain the contribution of the school to students' achievement results (changes in residual SIMCE scores). While turnover and school exit matter only in the low population group of municipalities, which represent only 16 percent of the national population. It is not clear that this result is driven by market forces vis a vis declining population; in fact, school closures have been common in rural areas in many countries due to demographic changes (Egelund and Laustsen, 2006).

In the high population group of municipalities turnover and exit have no effect on school contribution to students' learning. Moreover, we find that there is a negative impact if turnover is associated with a high school replacement, that we interpret as a mis-coordination. This latter effect is more relevant in high-density population zones as the Metropolitan Region and Regional capital cities.

Table 9: Heterogeneous Effects and Market Replacement

	(1) All	(2) All	(3) Low Pop.	(4) High Pop.
Urbanization	-1.086***	-0.895***	-1.298***	-0.524
	(0.192)	(0.170)	(0.388)	(0.353)
Poverty	0.351*	0.221	0.317	0.700***
	(0.186)	(0.137)	(0.306)	(0.210)
Interquartile Range	-0.203***	-0.145***	-0.776***	-0.118**
	(0.0657)	(0.0346)	(0.296)	(0.0490)
Poverty Decrease	0.224	0.129	0.331	0.202
	(0.164)	(0.114)	(0.282)	(0.127)
Change in Crime	-9.853**	-11.02**	-5.215	-11.77**
	(4.805)	(4.530)	(11.01)	(5.474)
Metropolitan Region	0.362***	0.282***	0.221	0.298**
	(0.0968)	(0.101)	(0.246)	(0.114)
High Replacement	0.261	0.190	0.251	0.366
	(0.183)	(0.174)	(0.279)	(0.262)
Turnover Rate	0.554***	0.192	1.236**	0.118
	(0.202)	(0.199)	(0.625)	(0.258)
Turnover Rate*High Repl.	-0.428	-0.541*	-0.614	-1.016**
	(0.277)	(0.283)	(0.679)	(0.416)
Constant	0.496***	0.635***	0.917***	0.317
	(0.188)	(0.158)	(0.313)	(0.309)
Population Weights	NO	YES	NO	NO
Observations	280	280	159	82
Adjusted R^2	0.209	0.377	0.154	0.414

Robust standard errors in parentheses
* p<.10, ** p<.05, *** p<.01

6 School Closures, Academic Success and Dropouts

As we have documented, high turnover and wide-spread school closures -even in expanding areas- is a stylized fact of the Chilean market-based school system. This section studies two potentially adverse effects of school closure on educational attainment. Namely, we aim to quantify the causal effect of school closure on grade retention and high-school dropout.[14] In the case of grade retention, we also study the characteristics, of the schools that receive the dislocated students, that attenuate the impact of schools' closures on grade retention.

6.1 Grade Retention

Using individual data, we estimate the effect of primary school closure on the probability of grade retention in fifth grade, controlling for a large set of individual and school variables. In particular, we compare the probability of grade repetition in the fifth grade for 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 achievement test information and student individual data, namely, 2005 and 2007-2011.

In Table 19 of the Appendix we present descriptive statistics of our dependent and independent variables. We refer to students whose schools closed the year they enrolled in the fourth grade as *dislocated students* and those whose schools did not close as *non-dislocated students*. As expected, these two groups are quite different. In fact, dislocated students not only have higher grade retention rates, but also lower performance, higher rates of previous grade retention,[15] and parents with lower educational attainment. All these variables are included as controls in our estimations. Since the same student may have different grade retention probabilities in different schools, we also control for fifth grade school's fixed effect.[16]

In light of the previous literature, it is reasonable to decompose the total effect of school closure on grade retention into 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

[14]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).

[15]This is approximated using age. It is a binary variable that takes 1 if the student is at least one year older that expected and zero otherwise.

[16]In Chile all schools are required to have the same repetition rules. For example, a student repeats a grade if she has two or more subjects below a mark threshold (4.0 in a mark scale from 1 to 7). But schools may have different standards to grade students and different policies to support low achievement students.

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.[17] 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:[18]

$$Rep_{ijt} = \beta_0 + \beta_1 SClosed_{it-1} + \beta_2 X_{it-1} + \beta_3 Z_i + \theta_j + \eta_t + \varepsilon_{ijt}, \tag{1}$$

and

$$Rep_{ijt} = \beta_0 + \beta_1 SClosed_{it-1} + \beta_2 X_{it-1} + \beta_3 Z_i + \theta_j + \eta_t + \varepsilon_{ijt}, \quad \forall i \ s.t. \ j(i,t) \neq j(i,t-1). \tag{2}$$

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; X includes language and math test score, GPA, and attendance rate; Z includes gender, dummies for parents' education, and age; 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. 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, and beyond socioeconomic controls, we also control for three relevant measures of students ability and knowledge (just one year before fifth grade), their GPA, that is school specific, their standardized test scores -a measure comparable across schools-, and whether they have repeated a grade before. Finally, we control for the attendance rate, which can be interpreted as a measure of the student and parents' commitment and motivation. Given our controls it is hard to think of relevant omitted variables that could bias the results.

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

[18] We estimate linear probability models to allow for school fixed effects.

The results are shown in Table 10, where columns (1) and (2) present the results from equation 1, with and without controlling for socioeconomic and previous grade retention variables, and columns (3) and (4) present the results relative to equation 2. Specifically, we find that school closure increases the probability of grade retention by 3.5 percentage points, a statistically significant effect. Since grade repetition rates are around 5%, this means that the effect of school closure represents an increase of 70% in the probability of grade repetition. When we restrict our attention to the students who switch schools at the end of fourth grade (columns (3) and (4)), the size of the effect is 3 percentage points, which is equivalent to a 60 percent increase of the probability of retention.

Given our data we can also study the school characteristics of a "receiving school" that could attenuate the impact of a previous school closure on grade retention. To do so, we run a probit regression of grade retention, considering only the dislocated students. In addition to individual characteristics, we include a set of school characteristics as regressors. In particular, we consider school difficulty, defined as $\frac{\textit{Test score rank}}{\textit{Average GPA}}$,[19] and a set of indexes which describe the extent to which schools consider parents' opinion, the relationship between students and teachers, and the pedagogical support the school gives to low achievement students.[20]

Table 11 shows the results of this exercise. As expected, school difficulty increases the probability of grade retention. More interestingly, school support to low achievement students also seems to play a role in reducing the grade retention probability of dislocated students. The other indexes show effects with magnitudes that are not statistically significant.

6.2 Dropout rates

We now estimate the effect of secondary school closure on the probability of dropping out. We define a dropout as a student who is missing for at least two years from the student official registry of the MoE. Since we have data of standardized test scores in the tenth grade at an

[19]A similar concern was considered by Engberg et al (2012). They show that the negative effects of school closure on students can be minimized when students move to schools that are higher-performing (in value-added terms). Giving that we study the effect of school closure on grade retention instead of student performance, we study the attenuation effect of school difficulty instead of school quality.

[20]We build these indexes from the survey administered to parents when their children took the SIMCE test in 2005. For the variable describing the *Support to low achievement students*, we only consider the responses of parents whose child is bellow the median of the student performance distribution of her class.

individual level, we compare the dropout rates 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.[21]

In Table 20 of the Appendix we present descriptive statistics of our dependent and independent variables, for those students whose schools did not close at tenth grade and those whose schools closed. As in the case of grade retention, there are marked differences between groups. This highlights the need of a solid empirical strategy to estimate causal effects.

To estimate the effect of school closure, we run the following probit model, the marginal effects are reported below:

$$Pr(Drop_{it} = 1 | j(i, t-1) = j') \quad = \quad \Phi\left(\beta_0 + \beta_1 SClosed_{it-1} \beta_2 X_{it-1} + \beta_3 Z_i + \beta_4 S_{j'} + \eta_t\right)$$

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; X includes language test score and math test score, GPA, and attendance rate; Z includes gender, dummies for parents' education; and S includes a set of school characteristics as such the type of administration, the mean in the math and language test scores and the School Drop out rate at $t-1$;[22] and η is a time fixed effect.

Columns (1), (2), and (3) of Table 12 show the results of this probit regression including different sets of controls. When we include all the regressors, the effect of school closure on student dropout is a statistical significant increase of 0.44 percentage points. Since in this sample the dropout rate is around 1.4 percent per year, our estimate implies that school closure increases the probability of dropping out by a 31 percent.

One concern is that the result could be associated with unobserved characteristics of students who attend a school that will eventually close. To explore this, we run the same

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

[22]Given data restrictions (we just have student individual data since 2002), and to avoid using the same cohort twice, to calculate the school rate in $t-1$, we define a drop out as a student who is missing for at least one year from the student official registry of the MoE.

probit model, with the exact 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). These exercises are shown in columns (4), (5), and (6) of Table 12.

We highlight that in all cases the effects are similar in magnitude to the case with a less restricted control group and they are all statistically significant. In fact, the point-estimates are larger with the caution that the precision of our estimates is lower due to the large reduction in the sample size. Specifically, when we include all the regressors, we obtain a 1.1 percentage point increase in the probability of dropping out, a 79% increase. The relevance of this exercise, and its results, is that it rules out the possibility that the estimated impact is driven by the characteristics of student that attend a school that ultimately closes.

Table 10: Effect of school's exits on student grade retention

	All Students		Students Switching Schools	
	(1)	(2)	(3)	(4)
School exit	0.0393***	0.0351***	0.0349***	0.0305***
	(0.00576)	(0.00594)	(0.00666)	(0.00693)
Math test score	-0.0001***	-0.0001***	-0.0004***	-0.0003***
	(0.00001)	(0.00001)	(0.00002)	(0.00002)
Language test score	-0.0001***	-0.0001***	-0.0003***	-0.0003***
	(0.00001)	(0.00001)	(0.00002)	(0.00002)
GPA at 4th grade	-0.0721***	-0.0669***	-0.0535***	-0.0490***
	(0.00054)	(0.00056)	(0.00157)	(0.00162)
Attendance at 4th grade	-0.0008***	-0.0007***	-0.0001	-0.0001
	(0.00004)	(0.00004)	(0.00012)	(0.00012)
Female	-0.0128***	-0.0117***	-0.0205***	-0.0197***
	(0.00033)	(0.00034)	(0.00124)	(0.00127)
Mother with primary education		-0.0054***		-0.0141***
		(0.00086)		(0.00339)
Mother with incomplete secondary education		-0.0070***		-0.0117***
		(0.00082)		(0.00321)
Mother with complete secondary education		-0.0118***		-0.0258***
		(0.00076)		(0.00297)
Mother with tertiary education		-0.0130***		-0.0294***
		(0.00083)		(0.00315)
Father with primary education		-0.0019		-0.0050
		(0.00083)		(0.00335)
Father with incomplete secondary education		-0.0021		-0.0031
		(0.00081)		(0.00315)
Father with complete secondary education		-0.0052***		-0.0092***
		(0.00075)		(0.00292)
Father with tertiary education		-0.0055***		-0.0084***
		(0.00082)		(0.00311)
Constant	0.6141***	0.5693***	0.5558***	0.5302***
	(0.00467)	(0.00480)	(0.01312)	(0.01385)
Age effects	NO	YES	NO	YES
Year effects	YES	YES	YES	YES
N	1224286	1124160	128800	117404
adjusted R-squared	0.089	0.091	0.099	0.102

*: Significant at the 10 percent level. **: Significant at the 5 percent level.
***: Significant at the 1 percent level.

Table 11: Probability of grade retention for dislocated students (Probit marginal effects)

	(1)	(2)	(3)	(4)	(5)	(6)
Number of students	-0.00020*	-0.00026**	-0.00016	-0.00015	-0.00015	-0.00023
	(0.00017)	(0.00017)	(0.00018)	(0.00018)	(0.00018)	(0.00018)
Difficulty		0.000061**				0.000042**
		(0.0000239)				(0.0000266)
Opinion of parents is considered by the school Fraction who say *Satisfied*			0.0411 (0.04490)			0.0815 (0.05396)
Opinion of parents is considered by the school Fraction who say *Very satisfied*			-0.0072 (0.05978)			-0.0773 (0.08677)
Teachers and students have good relationship Fraction who say *Satisfied*				-0.0891 (0.09117)		-0.0576 (0.10054)
Teachers and students have good relationship Fraction who say *Very satisfied*				-0.0476 (0.06815)		0.0004 (0.07611)
Support to low achievement students Fraction who say *Satisfied*					-0.0692 (0.04759)	-0.0974* (0.05285)
Support to low achievement students Fraction who say *Very satisfied*					-0.0216 (0.04212)	-0.0279 (0.05288)
Socioeconomic Group 2	-0.0031	0.0009	-0.0030	-0.0014	-0.0029	0.0056
	(0.01563)	(0.01714)	(0.01697)	(0.01744)	(0.01699)	(0.01868)
Socioeconomic Group 3	0.0296*	0.0266*	0.0231	0.0220	0.0213	0.0267
	(0.02128)	(0.02215)	(0.02145)	(0.02153)	(0.02127)	(0.02263)
Socioeconomic Group 4	0.1048***	0.0809***	0.1500***	0.1517***	0.1473***	0.1416***
	(0.05186)	(0.05096)	(0.06967)	(0.07034)	(0.06891)	(0.07495)
Socioeconomic Group 5	0.0335	0.0147	Dropped	Dropped	Dropped	Dropped
	(0.04608)	(0.04090)				
Voucher-private School	-0.0088	-0.0098	0.0003	-0.0032	-0.0029	-0.0060
	0.01055)	(0.01065)	(0.01288)	(0.01735)	(0.01769)	(0.01731)
Non Voucher-private School	0.0784**	0.0832*	Dropped	Dropped	Dropped	Dropped
	(0.05563)	(0.06181)				
Rural	-0.0031	-0.0019	-0.0018	-0.0032	-0.0692	0.0000
	(0.01602)	(0.01738)	(0.01760)	(0.01735)	(0.04759)	(0.00003)
N	1721	1656	1398	1398	1391	1351
Pseudo R2	0.178	0.188	0.187	0.188	0.189	0.201

*: Significant at the 10 percent level. **: Significant at the 5 percent level. ***: Significant at the 1 percent level. All models control by education of the mother and father, gender, previous GPA and attendance rate, previous test scores in math and language, age (which is a proxy of previous grade retention), and years.

Table 12: Effect of school's exits on student dropouts (Probit marginal effects)

	All Students			Restricted control group		
	(1)	(2)	(3)	(4)	(5)	(6)
School exit	0.0146***	0.0143***	0.0044**	0.0162***	0.0174***	0.0111*
	(0.00417)	(0.00422)	(0.00278)	(0.00706)	(0.00759)	(0.00686)
Language test score	-0.0000***	-0.0000***	-0.0000***	-0.0002***	-0.0002***	-0.0002**
	(0.00000)	(0.00000)	(0.00000)	(0.00008)	(0.00008)	(0.00007)
Math test score	-0.0000***	-0.0000***	-0.0000***	-0.0000	-0.0001	0.0001
	(0.00000)	(0.00000)	(0.00000)	(0.00008)	(0.00007)	(0.00007)
GPA at 12th grade	-0.0078***	-0.0070***	-0.0067***	-0.0176***	-0.0121**	-0.0167***
	(0.00018)	(0.00017)	(0.00017)	(0.00689)	(0.00651)	(0.00540)
Attendance at 12th grade	-0.0002***	-0.0002***	-0.0001***	-0.0005	-0.0008*	-0.0002
	0.00001)	(0.00001)	(0.00001)	(0.00042)	(0.00044)	(0.00034)
Female	0.0009***	0.0008***	0.0011***	0.0077	0.0063	0.0093*
	(0.00019)	(0.00019)	(0.00018)	(0.00666)	(0.00648)	(0.00581)
Education of parents						
Mother with primary education		-0.0018***	-0.0016***		-0.0024	-0.0027
		(0.00025)	(0.00024)		(0.00936)	(0.00751)
Mother with incomplete secondary education		-0.0026***	-0.0021***		-0.0184**	-0.0164***
		(0.00024)	(0.00023)		(0.00639)	(0.00502)
Mother with complete secondary education		-0.0040***	-0.0030***		-0.0154*	-0.0131*
		(0.00024)	(0.00024)		(0.00770)	(0.00620)
Mother with tertiary education		-0.0016***	-0.0008***		-0.0090	-0.0034
		(0.00029)	(0.00029)		(0.00966)	(0.00857)
Father with primary education		-0.0014***	-0.0012***		-0.0119	-0.0074
		(0.00027)	(0.00026)		(0.00819)	(0.00688)
Father with incomplete secondary education		-0.0023***	-0.0021***		0.0010	-0.0018
		(0.00025)	(0.00024)		(0.01139)	(0.00898)
Father with complete secondary education		-0.0036***	-0.0030***		0.0037	0.0067
		(0.00025)	(0.00024)		(0.01042)	(0.00956)
Father with tertiary education		-0.0011***	-0.0009***		0.0044	0.0003
		(0.00029)	(0.00028)		(0.01117)	(0.00908)
School Characteristics						
Voucher-private School			0.0002			-0.0167*
			(0.00019)			(0.01103)
Non Voucher-private School			0.0059***			0.0078
			(0.00095)			(0.01668)
School mean in Math test score			-0.00003***			-0.0005
			(0.000009)			(0.00026)
School mean in Language test score			-0.00001			0.0003
			(0.000012)			(0.00037)
School Drop out rate at $t-1$			0.0365***			0.0325
			(0.00151)			(0.03402)
N	682217	617476	585932	2361	2117	1770
Pseudo R2	0.129	0.138	0.153	0.095	0.119	0.165

*: Significant at the 10 percent level. **: Significant at the 5 percent level. ***: Significant at the 1 percent level.
All models include 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 students' 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%.

The impressive market turnover exhibited by the Chilean school system during this period has not brought significant benefits, at least as measured by quality indicators based on standardized achievement tests.

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 percent 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. For instance, school closure could be associated with educational achievement costs of displaced students, and 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 Measures of Entry and Exit

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 $t+2$).[23] 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.[24] 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.[25] 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 in the system for the years 2002-2013. It includes each student's school, GPA, attendance rate

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

[24]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.

[25]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.

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.[26]

Table 13: 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 13 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, especially when compared to the number reduction between the first and the second stage

[26]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.

(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.

Appendix B Additional tables for communal level regressions

B.1 Descriptive Statistics

Table 14: Descriptive statistics of communal level variables

	mean	sd
$\Delta Simce$	.0958125	.8714951
$\Delta Math$	.093164	.8631145
$\Delta Lang.$	.0940416	.8931871
Turnover Rate	.441238	.2894589
Entry Rate	.278062	.2669126
Exit Rate	.1631761	.1080014
Replacement/Turnover	.2600531	.1538665
Number of Schools	34.04797	28.44503
Schools/1000 inhab.	1.238289	.9716471
Share Private Voucher	.2533629	.2014695
Urbanization	.4806966	.3291187
Population	.5288537	.7389284
Population Increase	6.058749	42.64558
Poverty	.3357934	.4731408
Interquartile Range	1.101925	.7173104
Poverty Decrease	-.2435424	.4865837
Change in Crime	.0084768	.008244
Observations	271	

Table 15: Heterogeneous effects: Descriptive statistics for High and Low Population municipalities

Low Population ($\leq$ 25,000)		
	Mean	S.D.
Change in Res. SIMCE	0.249	1.057
Turnover Rate	0.332	0.234
Entry Rate	0.170	0.187
Exit Rate	0.162	0.128
Number of Communes	159	

High Population (>45,000)		
	Mean	S.D.
Change in Res. SIMCE	-0.261	0.585
Turnover Rate	0.597	0.275
Entry Rate	0.440	0.260
Exit Rate	0.157	0.071
Number of Communes	82	

B.2 Changes in Residual SIMCE and Turnover: Math and Language Scores

Table 16: Change in Residual Scores and Market Dynamics, Math

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	$\Delta Math$	$\Delta Math$	$\Delta Math$	$\Delta Math$	$\Delta Math$	$\Delta Math$	$\Delta Math$	$\Delta Math$
Urbanization	-0.807***	-0.762***	-0.732***	-0.775***	-0.616**	-0.705***	-0.735***	-0.777***
	(0.228)	(0.174)	(0.247)	(0.176)	(0.244)	(0.158)	(0.248)	(0.176)
Poverty	0.231	0.0795	0.202	0.0850	0.184	0.0427	0.219	0.0849
	(0.191)	(0.140)	(0.191)	(0.140)	(0.186)	(0.136)	(0.192)	(0.141)
Interquartile Range	-0.258***	-0.192***	-0.270***	-0.188***	-0.283***	-0.201***	-0.266***	-0.188***
	(0.0728)	(0.0392)	(0.0765)	(0.0395)	(0.0732)	(0.0381)	(0.0746)	(0.0395)
Poverty Decrease	0.120	0.0256	0.104	0.0274	0.103	0.0120	0.119	0.0272
	(0.165)	(0.119)	(0.163)	(0.119)	(0.163)	(0.117)	(0.164)	(0.119)
Change in Crime	-8.963*	-12.78***	-10.15**	-12.48***	-10.80**	-13.85***	-9.417*	-12.43***
	(4.856)	(4.469)	(5.037)	(4.594)	(5.000)	(3.835)	(5.038)	(4.593)
Metropolitan Region	0.459***	0.405***	0.498***	0.402***	0.512***	0.422***	0.469***	0.401***
	(0.105)	(0.102)	(0.0976)	(0.101)	(0.108)	(0.0987)	(0.107)	(0.100)
Turnover Rate	0.438**	0.154						
	(0.172)	(0.170)						
Entry Rate			0.273	0.183			0.268	0.185
			(0.177)	(0.176)			(0.186)	(0.175)
Exit Rate					1.023*	-0.0115	1.018*	-0.0570
					(0.590)	(0.495)	(0.593)	(0.499)
Constant	0.500***	0.653***	0.600***	0.667***	0.482***	0.724***	0.435**	0.675***
	(0.178)	(0.142)	(0.167)	(0.132)	(0.183)	(0.141)	(0.190)	(0.153)
Population Weights	NO	YES	NO	YES	NO	YES	NO	YES
Observations	280	280	280	280	280	280	280	280
Adjusted R^2	0.143	0.365	0.135	0.366	0.146	0.362	0.146	0.363

Robust standard errors in parentheses

* p<.10, ** p<.05, *** p<.01

Table 17: Change in Residual Scores and Market Dynamics, Language

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	$\Delta Lang.$	$\Delta Lang.$	$\Delta Lang.$	$\Delta Lang.$	$\Delta Lang.$	$\Delta Lang.$	$\Delta Lang.$	$\Delta Lang.$
Urbanization	-1.293***	-1.086***	-1.185***	-1.081***	-1.131***	-1.053***	-1.188***	-1.076***
	(0.179)	(0.164)	(0.188)	(0.164)	(0.183)	(0.147)	(0.185)	(0.162)
Poverty	0.513***	0.370***	0.476**	0.366***	0.478***	0.353***	0.495***	0.366***
	(0.184)	(0.131)	(0.186)	(0.131)	(0.180)	(0.126)	(0.185)	(0.131)
Interquartile Range	-0.122**	-0.0946***	-0.139**	-0.0949***	-0.143**	-0.102***	-0.135**	-0.0974***
	(0.0597)	(0.0296)	(0.0623)	(0.0298)	(0.0584)	(0.0286)	(0.0598)	(0.0296)
Poverty Decrease	0.350**	0.224**	0.331**	0.222**	0.340**	0.218**	0.348**	0.223**
	(0.161)	(0.109)	(0.160)	(0.109)	(0.159)	(0.108)	(0.160)	(0.109)
Change in Crime	-9.926**	-9.064**	-11.45**	-9.131**	-11.25**	-9.747***	-10.58**	-9.300**
	(4.735)	(3.927)	(4.900)	(3.934)	(4.787)	(3.458)	(4.844)	(3.859)
Metropolitan Region	0.261**	0.192*	0.310***	0.193**	0.296***	0.201**	0.276***	0.194**
	(0.102)	(0.0975)	(0.0985)	(0.0964)	(0.104)	(0.0973)	(0.105)	(0.0971)
Turnover Rate	0.375**	0.0792						
	(0.158)	(0.169)						
Entry Rate			0.134	0.0648			0.129	0.0582
			(0.183)	(0.178)			(0.184)	(0.174)
Exit Rate					1.214**	0.239	1.212**	0.224
					(0.487)	(0.480)	(0.489)	(0.477)
Constant	0.617***	0.666***	0.720***	0.682***	0.546***	0.666***	0.524***	0.650***
	(0.152)	(0.135)	(0.148)	(0.125)	(0.145)	(0.131)	(0.153)	(0.143)
Population Weights	NO	YES	NO	YES	NO	YES	NO	YES
Observations	280	280	280	280	280	280	280	280
Adjusted R^2	0.258	0.373	0.250	0.373	0.270	0.373	0.268	0.372

Robust standard errors in parentheses

* p<.10, ** p<.05, *** p<.01

B.3 Robustness of Heterogeneous Effects

The first two columns of table 18 split the sample into two groups. The first group is the one corresponding to municipalities with a population of 25,000 or less, that is, the same low-population group used in the main text. The second group is simply the rest of the sample, that is, we include municipalities with population between 25,000 and 45,000 in the high-population group. The second two columns split the sample in two equally-sized groups. As before, the point-estimate for the large population group (columns 2 and 4) are small and not statistically significant.

Table 18: Heterogeneous Effects: Robustness of Population Groups

	(1) Low Pop.	(2) High Pop.	(3) Low Pop.	(4) High Pop.
Urbanization	-1.228***	-0.825***	-1.176**	-0.908***
	(0.413)	(0.266)	(0.513)	(0.247)
Poverty	0.298	0.332*	0.244	0.337*
	(0.294)	(0.192)	(0.317)	(0.178)
Interquartile Range	-0.833***	-0.145***	-0.969***	-0.130***
	(0.314)	(0.0444)	(0.339)	(0.0441)
Poverty Decrease	0.323	0.121	0.269	0.182
	(0.273)	(0.150)	(0.300)	(0.146)
Change in Crime	-5.616	-10.70**	-0.737	-12.26**
	(10.61)	(5.112)	(12.26)	(4.737)
Metropolitan Region	0.185	0.389***	0.104	0.406***
	(0.252)	(0.107)	(0.278)	(0.104)
Turnover Rate	0.868**	0.169	0.845**	0.199
	(0.350)	(0.194)	(0.352)	(0.185)
Constant	1.084***	0.462*	1.182***	0.500**
	(0.274)	(0.242)	(0.284)	(0.215)
Observations	159	121	140	140
Adjusted R^2	0.160	0.298	0.148	0.303

Robust standard errors in parentheses
* p<.10, ** p<.05, *** p<.01

Appendix C Descriptive statistics: effect of school closure on grade retention and drop out rates

Table 19: Descriptive statistics for grade retention regressions

Variable	Mean Non Dislocated Students	Mean Dislocated Students	Difference	Test Statistic	P-Value
Grade retention	0.035	0.082	-0.047	-11.91	0.00
Math test score	253.1	231.7	21.4	18.79	0.00
Language test score	263.4	245.5	17.9	16.00	0.00
GPA at 4th grade	5.9	5.8	0.1	7.14	0.00
Attendance at 4th grade	94.1	94.3	-0.2	-1.59	0.11
Female	0.50	0.44	0.05	5.11	0.00
Mother with primary education	0.11	0.15	-0.03	-4.44	0.00
Mother with incomplete secondary education	0.16	0.16	-0.01	-0.64	0.52
Mother with complete secondary education	0.33	0.29	0.05	4.40	0.00
Mother with tertiary education	0.27	0.23	0.04	4.06	0.00
Father with primary education	0.12	0.14	-0.02	-2.21	0.03
Father with incomplete secondary education	0.16	0.18	-0.02	-2.64	0.01
Father with complete secondary education	0.32	0.30	0.02	2.22	0.03
Father with tertiary education	0.28	0.22	0.06	5.48	0.00
Older (proxy of previous repetition)	0.07	0.13	-0.07	-12.34	0.00

The Test statistic is z-statistic for proportions and t-statistic for continuous means (tested by unequal variance).

Table 20: Descriptive statistics for drop out regressions

Variable	Mean Non Dislocated Students	Mean Dislocated Students	Difference	Test Statistic	P-Value
Drop out	0.012	0.041	-0.028	-8.85	0.00
Math test score	251.1	216.0	35.1	23.00	0.00
Language test score	255.3	232.4	22.9	16.94	0.00
GPA at 10th grade	5.4	5.2	0.2	10.00	0.00
Attendance at 10th grade	92.2	90.4	1.8	6.35	0.00
School mean in Math test score	251.3	218.4	33.0	35.7	0.0
School mean in Language test score	255.6	234.2	21.4	30.4	0.0
School Drop out rate at $t-1$	0.043	0.109	-0.066	-23.11	0.00
Female	0.50	0.44	0.06	4.07	0.00
Mother with primary education	0.12	0.12	0.00	0.29	0.77
Mother with incomplete secondary	0.16	0.16	-0.01	-0.80	0.43
Mother with complete secondary education	0.29	0.25	0.04	2.60	0.01
Mother with tertiary education education	0.28	0.29	-0.01	-0.80	0.42
Father with primary education	0.12	0.10	0.02	2.02	0.04
Father with incomplete secondary education	0.15	0.13	0.02	1.46	0.14
Father with complete secondary education	0.28	0.25	0.02	1.72	0.09
Father with tertiary education	0.32	0.36	-0.04	-3.02	0.00
Voucher-private School	0.51	0.84	-0.33	-22.96	0.00
Non Voucher-private School	0.07	0.10	-0.02	-3.07	0.00

The Test statistic is z-statistic for proportions and t-statistic for continuous means (tested by unequal variance).