Competition among schools and educational quality: Tension between various objectives of educational policy[1]

Felipe Gajardo (fgajardo@fen.uchile.cl)
Universidad de Chile. Diagonal Paraguay 257, Santiago, Chile.

Nicolás Grau (ngrau@fen.uchile.cl)
Economics Department, Universidad de Chile and COES - Centre for Social Conflict and Cohesion Studies. Diagonal Paraguay 257, Santiago, Chile.

Abstract

Using Chilean data for fourth grade students, this research studies the effect of competition among schools on the results of standardized tests, academic self-esteem and motivation, the climate within the school, civic participation, and healthy lifestyle habits. To address the potential bias due to the endogeneity of the competition among schools, an instrumental variable approach is implemented, using instruments associated with the size of each "educational market." The results show that an increase of one standard deviation in competition among schools generates a moderate increase in standardized test results (0.06 standard deviations) and a more significant decrease in the other indicators of quality (between 0.02 and 0.16 standard deviations). Therefore, the results suggest a tension in the school between various objectives of educational policy, in which pressure to improve standardized test scores resulting from competition among schools could produce an undesired effect of deterioration in other dimensions of quality.

Keywords: School quality; voucher system; standardized tests.

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1. Introduction

There is a rich discussion regarding the relevance of market incentives in the field of educational policies.[2] Since Friedman published his seminal work in 1962, promoters of these policies have argued that competition for enrollment among schools, and for subsidies when there is a voucher system, would put pressure on schools to make an effort to improve their educational quality. The Chilean case has attracted special interest because, since the early 1980s, the country has maintained an educational system in which, by design, market dynamics play a key role in the assurance of educational quality.[3]

As we present in the next section, the literature on Chile and other countries does not have a consensus regarding the effects of school competition on educational achievement. However, all of these studies define educational quality in terms of standardized test results. Although some studies have considered the effects on other aspects such as school segregation (Hsieh and Urquiola, 2006) or the increase in school coverage (Bravo et al., 2010), the literature with a quantitative focus has not addressed the effect of market dynamics on other aspects of educational quality and the possible tension between these aspects and standardized tests.

The goal of this article is to contribute towards filling this gap. Specifically, we address the effect of competition among schools, measured as the percentage of schools in each district that are subsidized private schools,[4] on a wide range of educational quality indicators. As in the literature that focuses on the impact of competition on standardized tests, our empirical strategy addresses the potential bias in the estimates due to the endogeneity of the level of competition among schools, using a set of instrumental variables that are related to the size of the potential demand that the schools face in each district. Failing to correct for this endogeneity could lead us to confuse the

[2] For a good summary of this discussion in the economic literature, see Epple et al. (2017). See also Masino and Niño-Zarazúa (2016), who identify policy interventions that improve education quality and student learning in developing countries. From an normative point of view, Brando (2017) argues against market mechanisms improving the education of the least advantaged.

[3] McEwan and Carney (2000); Hsieh and Urquiola (2003, 2006); Gallego (2002, 2006); and Auguste and Valenzuela, (2005).

[4] Given this definition, which is the standard practice in the literature, it would be possible to rephrase the goal of this paper as estimating the effect of school privatization on different measures of school quality.

effect of competition on all these aspects of educational quality with the effect of unobserved variables — such as parent involvement — on those measurements.

Having a broader and more diverse approach to defining educational quality is especially important when the various measurements of educational quality are not highly correlated with one another. Otherwise, there would be no issue with focusing our analysis on one aspect of quality, as the current literature does. Table 1 shows the correlation between the various measures of educational quality that we use in this article. As we can see, although all of these indicators present a positive correlation, standardized tests overall (in the case of Chile, the SIMCE tests) have a high correlation and a minor correlation with other measures, particularly with healthy lifestyle habits and civic participation. Given these correlation levels, educational policy should anticipate that, if its incentives are mainly focused on improved standardized test performance, this will not necessarily imply improvements in the other indicators. In fact, as we will show in this article, there is evidence that the improvements on those tests may come at a cost for the other aspects of educational quality.

Table 1. Statistical correlation between SIMCE results and other quality indicators

	Self-esteem and motivation	School climate	Citizen Participation	Healthy lifestyle habits	Mathematics SIMCE	Language SIMCE
Self-esteem and motivation	1					
School climate	0.29	1				
Citizen Participation	0.26	0.59	1			
Healthy lifestyle habits	0.25	0.38	0.41	1		
Mathematics SIMCE	0.24	0.26	0.11	0.05	1	
Language SIMCE	0.23	0.26	0.1	0.04	0.69	1

Source: Generated by the authors based on 2013 SIMCE results and data from the 2013 Quality and Context of Education Survey given to fourth grade students, and their teachers, parents, and guardians.

Our empirical strategy is implemented using census data for Chilean fourth grade students in 2013. The results of our estimates, which combine simple linear regressions and least square estimates in two stages, show a clear difference between the impact of competition based on standardized tests and the impact of competition on other measurements of educational quality. In the case of our most reliable estimates (using instrumental variable approach), an increase in competition by

one standard deviation could increase SIMCE results by 0.06 of a standard deviation, which is consistent with the literature. However, the results also show that competition reduces all other quality indicators: the academic self-esteem and school motivation indicators decrease by 0.02 of a standard deviation, the school climate indicator by 0.1 of a standard deviation, the civic participation indicators by between 0.06 and 0.09 of a standard deviation, and the healthy lifestyle habit indicator by between 0.08 and 0.16 of a standard deviation.

The main contribution of this article is that, to the best of our knowledge, it is the first quantitative study of the impact of competition among schools on aspects of educational quality outside of standardized tests. It is worth noting that the research is conducted in the Chilean context, which represents a case study that is extremely interesting because it implemented market logic in the educational field three decades ago. Our results are consistent with the qualitative evidence available for Chile, which also find a tension between improving standardized tests and promoting more comprehensive student development (Falabella and Opazo, 2014).

This article is structured as follows. Section 2 reviews the literature. Section 3 offers a discussion of the role of standardized tests and their impact on the incentives faced by schools. In Section 4, we describe our database. Section 5 develops the empirical strategy implemented in this study. In Section 6, we discuss the main results of this research. In Section 7, we show that the results are consistent across different specifications, and finally, in Section 8, we present our conclusions.

2. Literature Review

This paper is related to different strands in the academic literature. To start with, our paper is closely related to the literature that studies the effect of school competition on standardized test scores. In fact, our empirical strategy is based on the instrumental variable approach commonly used in that literature. In this context, our contribution consists of considering other measures of school quality that could be affected by school competition.

Regarding this literature and specifically for the case of Chile, there are articles that state that competition does not have an effect other than zero (McEwan and Carnoy, 2000; Hsieh and Urquiola, 2003, 2006). Others state that it would have a statistically significant and positive effect of moderate magnitudes (Gallego, 2002, 2006; Auguste and Valenzuela, 2005). Regarding evidence for other countries, Bettinger (2011) is noteworthy, reviewing comparative evidence

among Colombia, Chile and Sweden, concluding that there is mixed evidence that strongly depends on the institutional specificities of each nation. For the case of Colombia, it is worth noting a few articles (Angrist et al. 2002, 2006) that identify a positive effect on standardized tests from the implementation of a voucher program focused on an at-risk sector of Colombian students (around 10% of enrollment).

Overall, as Epple et al. (2017) emphasize, this literature is characterized by mixed evidence, which explain why they argue that the evidence to date is not sufficient to warrant recommending that vouchers (i.e. school competition) be adopted on a widespread basis.

About statistical methodology, the main challenge of these studies is the endogenous nature of competition. To solve that problem the literature takes advantage of experiments, quasiexperiments, instrumental variables and panel data. Since the Chilean voucher system was implemented nationwide and simultaneously, studies addressing it only consider the last two strategies to deal with endogeneity. In particular, they consider the following instrumental variables: the (logarithm of) total enrollment of the district (Gallego, 2002); the (logarithm of) total population of the district (Hsieh and Urquiola, 2003), and the urbanization rate of the district (Auguste and Valenzuela, 2005; Gallego, 2002; Hsieh and Urquiola, 2003). In Section 5 we discuss the soundness of these instruments. Our paper uses all of them. As a robustness check and following Hsieh and Urquiola (2003), we also estimate panel data model. As opposed of them, due to data limitations, we do so by estimating a short panel model, using districts as the unit of analysis.

Depending on the period of study and certain methodological tradeoffs, the models estimated in this literature have considered different units of analysis: students (Gallego, 2006); schools (McEwan and Carnoy, 2000; Gallego, 2002); and districts (Hsieh and Urquiola, 2003; Auguste and Valenzuela, 2005). While using individual or school data is better for controlling for potential confounder factors, using districts as the unit of analysis has the advantage of better dealing with the sorting of students across schools, a relevant feature in the Chilean case. Regarding this methodological discussion, we take an agnostic approach and consider all three units of analysis in the estimation of our model.

Secondly, our paper is related to the literature that discusses the nature of school quality. In this regard, Tikly and M. Barrett (2011) provide a useful starting point for re-conceptualizing education quality and how it can be evaluated.

The Education Quality Agency of Chile proposed a set of quality indicators: academic self-esteem and school motivation, school climate, civic participation, healthy lifestyle habits, retention and drop-out rates, professional technical training, and non-gender discrimination. The first four are personal and social development indicators. They focus on aspects other than the standardized test results and complement the way in which educational quality has been measured in Chile. In this paper, we focus on these personal and social development indicators.

Regarding academic self-esteem and motivation, (Milicic, 2001) shows that when a student has positive self-esteem, he is comfortable with themselves, is optimistic when completing tasks, and accepts successes and failures. There is also evidence that suggests that students with a higher level of motivation and commitment to their education learn more than those with a purely practical commitment, i.e. those who follow the rules and complete assignments without having any real interest in them (OECD, 2010).

Furthermore, studies show that active involvement in the learning process increases when the subject feels competent, that is, when she is confident about her abilities and has high expectations of self-efficacy, values the tasks, is motivated, and feels responsible for the learning objectives (Durlak et al., 2011). As such, school behavior cannot be understood without understanding the students' perceptions of themselves, specifically their perceptions of their own academic competency (Esnaola, 2008).

School climate is the community members' perception of interpersonal relations and the general functioning of the institution (National School Climate Center, 2012). The evidence shows that a good climate is positive for student wellbeing and as the foundation for the development of social capital and opportunities for understanding among various members of society (OPECH, 2006).

In the case of civic participation, Gutmann (1999) emphasizes that by progressively exercising their rights and responsibilities, students have the opportunity to learn from and respect others and share responsibility for the cooperative climate that helps form democratic life.

About healthy lifestyle habits, various scholars have indicated that an active life is related to more efficient learning (Trudeau and Shepard, 2008). There is also evidence that healthy lifestyles are related to lower absenteeism and drop-out rates, lower frequency of disruptive behavior, and a greater sensation of academic self-efficacy (Story et al., 2009).

In sum, the contribution of our paper can be understood as the combination of these two literatures: the studies of the effect of competition on school quality with the studies that conceptualize school quality beyond standardized test scores.

3. The Chilean school system: Incentives and the role of standardized tests

The Chilean school system has a structure in which market dynamics play a preponderant role in the promotion of educational quality (Bellei and Vanni, 2015). In theory, this promotion would be ensured by the on-demand funding system (vouchers), to the extent that parents decide their children's schools based on the quality of each entity. As a form of reinforcing this accountability based on the market, a set of institutions and public policies have been developed in Chile to ensure that certain minimum quality standards are met.

In Chile, both the market dynamics and quality control mechanisms, conducted through various State institutions, have given special importance to a limited and controversial definition of educational quality, namely the standardized test in the form of the SIMCE.[5] In the case of the market dynamics, this is explained by factors such as the importance of these tests in the public imaginary, as a result of press coverage and schools' marketing strategies, which determines that the SIMCE plays a role in parents' decisions. In the case of quality control mechanisms, the results of the standardized tests have a direct impact on the schools because there is a set of public policies that assign rewards and sanctions mainly based on those tests. For example, the SNED program gives greater weight to the SIMCE results when it identifies high performing schools compared to institutions with similar characteristics, which in turn determines the amount of the monetary compensation that is granted to teachers (Contreras and Rau, 2012).

[5] Standardized tests have been used for quite some time in the Chilean school system. The School Performance Assessment Program (PER) was created in 1982, when a standardized test became available to assess school performance. The Educational Quality Measurement System (SIMCE), the standardized test that is still used in Chile today, was introduced in 1988.

In this way, either based on parents' decisions and their resulting impact on school funding or through the direct action of public policy, Chilean schools are pressured to improve standardized test results, even when this comes at the cost of other notions of educational quality which do not have the same weight in the incentives structure that schools and their communities confront.

Because of this system of incentives, some schools have developed bad practices. For example, a Ministry of Education's report mentions undesired practices deployed by schools such as curriculum reduction privileging disciplines that are assessed; a predilection for assessment practices that are coherent with the SIMCE format; the concentration of the best teachers at the testing level; and discrimination against students through the selection of those that perform well and social segmentation of the education system (Ministry of Education, 2003). Furthermore, a qualitative study of seven Chilean schools conducted by Falabella and Opazo found evidence of schools using resources from Quality Assurance Policies, mainly to meet the requirements that the State sets in order to improve their SIMCE results (Falabella and Opazo, 2014).

With the creation of the Education Quality Agency in 2011,[6] Chile made a concrete effort to study educational quality beyond the standardized test result aspect. As we described in the previous sections, this institution proposed eight indicators for quality. However, while these indicators have already been implemented, their impact on public policy decisions is limited to a weight of up to 33% of the results that the Education Quality Agency uses to rate schools. In other words, decisions to allocate resources in order to improve educational quality continue to be mainly based on the measurement of levels of achievement of the SIMCE standardized test and gives less weight to the considerable richness of other quality indicators. In fact, a school can lose its official recognition if it fails to meet the Learning Standards for four years and is classified as a school with inefficient performance. However, performance on other quality indicators cannot be used, as SNAC Law Article 31 states, as the basis for this decision.

From the perspective of micro-economics, the model of problems of agency with multiple tasks (Dewatripont, Jewit and Tirole, 2000) allows one to interpret the conflict of incentives that a school faces between only improving performance on standardized tests and other areas. If someone who

[6] The National Quality Assurance System (SNAC) for Preschool, Elementary and Secondary Education was installed in 2011. It seeks to implement a series of indicators called "other educational quality indicators" that measure aspects other than standardized test results (Ministry of Education, 2014).

is interested in promoting quality -the principal- only considers standardized test results to allocate resources such as the SNED, the schools –the agent- will confront explicit incentives that will make it prefer to act negligently, by dedicating the largest number of hours to preparing students for a standardized test rather than spending that time on improving other aspects of educational quality. As Dewatripont, Jewit and Tirole (2000) note, faced with the power of the incentives that the principal grants, the agent will leave aside tasks that provide less compensation, which in this case are the other aspects of educational quality.

The multiple tasks model and the cases of bad practices employed by schools shed light on a possible tension between the results of standardized tests and other quality indicators. Section 5 addresses the identification strategy that this study uses to find empirical evidence of the effect of competition on the SIMCE results and other quality indicators and verify the existence of the aforementioned tension.

4. Data

This article draws on various sources of information. To measure student performance on standardized tests, the 2013 SIMCE results are used for both mathematics and language. The SIMCE is a census-style standardized test that is taken at various grade levels. In this study we focus on the test taken by fourth grade students. [7]

To build the other quality indicators, the 2013 Educational Context and Quality Questionnaires are used. This survey is conducted by the Education Quality Agency during the week that students throughout the country take the SIMCE tests. The survey consists of a series of questions that allow for self-reporting by students, parents and guardians, and teachers. The questionnaires allow researchers to build the academic self-esteem and motivation, academic climate, civic participation and healthy lifestyle habits indicators.[8] This source also provides socio-economic data on the students' families.

The construction of the competition measurement at the district level is based on data from the Official Directory of Schools, published in 2013 by the Ministry of Education. The directory

[7] We also consider the data from 2016 when we estimate a panel model.
[8] The details about how these indicator were built can be found in the online appendix.

provides data on the type of school (public, private subsidized or paid private). This information is then compared to the Education Context and Quality questionnaire data to obtain the proportion of enrollment of students who attend each school.

The construction of the instrumental variables of this article require different sources of information. For facts on urban development, data from the aforementioned directory was used. For facts on the district population, data from the National Statistics Institute was used.

Table 2: Descriptive statistics of key variables

Variable	Mean	St. Dev.	Min	Max
SIMCE mathematics	255.28	50.8	82	395
SIMCE language	264.25	49.5	115	378
Years of education of fathers of grade 4 students	12.75	4.28	0	21
Years of education of mothers of grade 4 students	12.94	3.58	0	21
Household income logarithm	12.73	0.95	10.81	14.73
Competition (percentage of private subsidized school enrollment of total Grade 4 enrollment for the district)	0.54	0.20	0	0.97
District enrollment of Grade 4 students	1,836.86	1508.13	1	5.983
District population	171,334	143,852	199	594,244
Urbanization rate	0.89	0.17	0	1
Academic self-esteem and motivation indicator	70.43	13.79	0	100
School climate indicator	75.39	12.28	8.5	99.86
Civic participation indicator	74.79	16.30	0	100
Healthy lifestyle habit indicator	66.32	15.13	0	100

Source: Developed by the authors based on 2013 SIMCE data, the Official Directory of Schools for 2013, Educational Quality and Context Questionnaires for 2013 and the National Statistics Institute.

Table 2 presents descriptive statistics on the variables utilized. The SIMCE data present a standard deviation of approximately 50 points. Average years of education of the fourth grade students' parents is around 12 years, with a standard deviation of 4.28 for the fathers and 3.58 for the mothers. The mean of the household income algorithm is 12.73. The competition variable has a mean of 0.54. This means that, on average, 54% of the schools in a district are subsidized private schools. The standard deviation of this variable is 0.2. Regarding instrumental variables, the mean of the district enrollment of fourth grade students is 1,836 students, with a district population of 171,334 inhabitants. The percentage of schools located in urban areas is 89%.

5. Empirical strategy

As we have stated, the main challenge of the studies that have examined the effect of competition among schools on standardized tests is the endogenous nature of competition. This endogeneity is because the opening of a school is a decision that is influenced by the characteristics of the students, parents and existing schools in the area, among other things. The problem of identification emerges because some of these characteristics may not be observed by the researcher and could affect the entry of new schools and students' academic performance at the same time.

In order to address this econometric challenge, in addition to OLS –a method whose validity is based on the fact that we observe key variables that simultaneously determine the entry of new schools and student academic performance-, a model is implemented that uses instrumental variables to estimate the effect of competition on various measures of educational quality. That empirical strategy can be described by the following two equations, which are estimated in two stages:

$$y_i^{sd} = \beta C_k^{sd} + \gamma X_i + \varepsilon_i \qquad (1)$$

$$C_k^{sd} = \delta Z_k + \theta X_k + \epsilon_k \qquad (2)$$

Where y_i^{sd} is an indicator of the quality for the school that student i attends, and may be the SIMCE score or another educational quality indicator; C_i^{sd} is the variable of competition among schools,

measured as the percentage of private subsidized schools over the total enrollment for district k;[9] X_i is a vector of control variables which includes the parents' education; the logarithm of household income; socio-economic characteristics of the student's school, such as average years of education of parents and guardians and the logarithm of average household income; socio-economic characteristics of the district such as average years of education of families in the district and the logarithm of the average household income; and the school type. Additionally, Z_k represents one of the instrumental variables for district k (or an index combining them). Our instruments are commonly used in the literature: total enrollment of the district (IV 1), logarithm of the district population (IV 2), and the urbanization rate (IV 3). Finally, ε_i and ϵ_k are unobserved variables of each equation.

In the context of this model, the problem of identification in the case of OLS emerges because the correlation between ε_i and ϵ_k implies that $E[\varepsilon_i \,|C_k^{sd}, X_i] \neq 0$. At the same time, the identification of the local causal effect of competition on different measures of quality is ensured when estimating with instrumental variables to the extent that $\delta \neq 0$ (condition of relevance) and $E[\varepsilon_i|X_i, Z_k] = 0$ (condition of exogeneity).[10] While the first condition is easy to verify and we review it in the results section, the latter cannot be tested directly.

Although the condition of relevance can be verified directly, it is useful to discuss the mechanisms by which the correlation between the instruments and level of competition in each district operates. In this regard, as Gallego (2002) has indicated, this relationship develops because the smaller areas in terms of potential students –due to a low number of students or because the geographic area limits their mobility-, the entry of potential competitors is low. This is what explains the relevance of the instruments that are related to the population size of the district and those related to the level of urban development.

In regard to the second condition, it is reasonable to think that the population size of the district or level of urban development do not directly affect the quality of the schools conditioned upon the socio-economic characteristics of the district, but that they only have a role through their indirect

[9] The measurement of competition is commonly used in the literature. Some authors have introduced slight variations, such as Gallego (2006), who uses the ratio of subsidized private schools over public schools. However, overall, the measurement is maintained.

[10] On the notion of the local causal effect and assumptions of identification, see Imbens and Angrist (1994).

impact via the increase in inter-school competition.[11] Supporting this assumption is the fact that the amount of resources per student allocated to improving educational quality does not depend on the size of the market but mainly on the central government or socio-economic level of the district. In the same way, teacher salaries and their clear impact on school quality are not related to the size of the market, because their salary is reasonably similar regardless of where they teach (Auguste and Valenzuela, 2005).

One possible additional problem of the empirical strategy comes from the fact that although they face some restrictions, parents choose where their child will study. This generates a significant sorting process, which leads to a correlation of the characteristics (observable and unobservable) of the students with the characteristics (observable and unobservable) of the schools. However, given that elementary students will probably study in the schools in the districts where they live (over 70% do so), using districts as a unit of analysis allows us to avoid the problem of selection bias associated with the parents' decision. By contrast, the specifications that use students or schools as a unit of analysis do not address this problem. In this way, although the specifications whose unit of analysis presents a lower level of aggregation (students or schools) allow the richness of the data to be better utilized, controlling for a series of characteristics of the individuals or the schools, those specifications run the risk of being biased given the non-random assignment of students in the various schools.

All in all, possible critiques of our empirical strategy should note that what is innovative about our work is the study of the impact of competition among schools on educational quality indicators other than standardized tests, but that we do this without innovating on empirical strategies which, for the case of Chile, have been used to measure the impact of competition on standardized tests. On the one hand, the selection of instrumental variables follows the literature, as we discussed in Section 2. On the other hand, the models are estimated considering the various units of analysis that the literature has developed to study the effect of competition on SIMCE performance: students (i) (Gallego, 2006); schools (j) (McEwan and Carnoy, 2000; Gallego, 2002); and districts (k) (Hsieh and Urquiola, 2003; Auguste and Valenzuela, 2005).

[11] That said, our instruments might not satisfy the exclusion restriction since having more students enrolled might also change school composition in characteristics that we do not observe as econometricians.

In view of the above, a set of models is estimated that differ only in the dependent variable and unit of analysis used. Dependent variables include SIMCE results (simple average of the mathematics and language tests), the four personal development and social development indicators, separately, and the simple average of the four. All of these add up to six models, and four different units of analysis are used in each, yielding 24 models.[12]

As we will see in the next section, the main result of this article is very robust for the various specifications. This confirms the adequacy of our empirical strategy, given the diversity of instruments and units of analysis of the specifications.

6. Results

Our main results are presented in Tables 3 to 8. In each of these tables, the first row presents the point estimate and the standard error for the OLS estimation, and each column considers a different unit of analysis. In rows 2 to 5, these tables present the point estimates and the standard errors for the IV estimations: one row for each of the instrumental variables considered. Finally, row 5 presents the point estimate and the standard error for the IV estimation, considering the three instruments in the same model. It should be clear that each estimation includes many other covariates, but to present a clear summary, we only show the results for the parameters of interest. However, we specify the set of covariates that are included in each specification in these tables.

The results of the OLS estimates show a clear difference between the impact of competition on standardized tests and the other measures of educational quality. As Table 3 shows, for various levels of aggregation, competition does not show statistically significant effects on standardized tests, presenting negative and positive point estimates. On the contrary, as Tables 4-8 show, the OLS estimates of the impact of competition on other quality indicators generally reveal negative and statistically significant values, particularly for specifications with lower levels of aggregation (students and schools) with specific estimates between 0 and -0.05 standard deviations.

For a similar sample but a decade before, Gallego (2002) finds that without correcting for endogeneity, the effect of a standard deviation of competition reduces the SIMCE results by 0.02

[12] The fourth unit of analysis considers the districts, but also covers 35 districts of Greater Santiago in a single market. This strategy is in keeping with the work conducted by Hsieh and Urquiola (2003) and Auguste and Valenzuela (2005).

and 0.04 standard deviations. These results are maintained in Gallego (2006) and are aligned with those presented by Auguste and Valenzuela (2005).

Regarding the estimates that use instrumental variables, it is pertinent to study the results of the first stage to discuss the explanatory capacity of the instruments and thus avoid the problem of weak instruments. In this regard, Table 9 allows one to review the relevance of the instruments by presenting the Fischer test of the first stage for each one of them. As one can observe, when we use students or schools as the unit of analysis, all the instruments present test F over the values set by Stock and Yogo (2005), and certainly over 10 (a threshold commonly considered in the literature). If we instead focus on the district as the unit of analysis, in its two specifications, only total student enrollment and district population present test F in values that allow us to trust the second stages of those estimates.

In this way, the instrumental variables used in this article which are related to "market size" meet the relevancy requirement as instrumental variables, though the urbanization ratio has a test F that is low for the highest level of district aggregation. Although they analyze different years (separated by more than a decade), it is useful to compare these results to the 2005 study by Auguste and Valenzuela. The outcomes coincide in part with those found by said authors, who determined that the VI District population works as a relevant instrumental variable. Regarding the urbanization ratio instrument, the authors agree that this would be a weak instrument when the district aggregation level is used, but we disagree with them when student and school aggregation level is used, given that this does meet the relevance requirement.

Because of this, the effect that the increase in competition has on educational quality is studied below, using our three instrumental variables: total enrollment in the district, district population and urbanization rate, when students and schools are used as a unit of analysis; and only the first two when districts are used, given that in that case the urbanization rate loses its relevance.

Table 3 provides information regarding the effect that the increase of competition would have on SIMCE scores. In this regard, and in line with the literature that has focused on the case of Chile (Gallego, 2002; 2006; Auguste and Valenzuela, 2005), there are positive and small effects of competition on standardized tests. Specifically, one can observe that an increase of one standard deviation in the level of district competition generates an increase of 0.06 standard deviations in

the SIMCE. This is very stable for the various specifications and their respective units of analysis.[13]

These estimates suggest that if the districts moved from their current average of 54% of the total enrollment of students attending private subsidized schools to 75%, this would cause an increase of approximately 0.05 to 0.06 standard deviations (2.5 to 3 points) on the SIMCE test.

As we stated above, these results are in line with the literature, though lower in magnitude. Gallego (2002) found that an increase of one standard deviation in competition increases the SIMCE results at the school level between 0.03 and 0.18 standard deviations. In a later study conducted at the student level, Gallego (2006) found results pointing in the same direction, reporting magnitudes that range from 0.13 to 0.17 standard deviations. Auguste and Valenzuela (2005) found that at the district level an increase in competition of one standard deviation increases standardized test scores by 0.1 standard deviations. Using a different strategy, Contreras and Macias (2002) reported that an increase of one standard deviation on the Herfindhal Hirschmann index increases the results by 0.08 and 0.17 standard deviations.

As the literature has emphasized, it is reasonable to expect that the OLS estimations have an attenuation bias in respect to IV estimations. The intuition is the following: if you are a private investor and you are deciding where to place a new school, it is natural to choose a location where the incumbents are not doing well in what is valued, namely standardized test scores. Thus, it is reasonable to have more school competition in places where the schools' performance in standardized test scores historically was poor. Therefore, to the extent that our IV estimations solve this endogeneity problem, it is natural to have the IV estimation showing positive effects, while the OLS estimation is showing non-significant and negative effects.[14]

Regarding the effect of competition on the other educational quality indicators, our various specifications clearly show a negative and statistically significant impact of competition on

[13] The value of the parameters estimated for control variables was not included due to space constraints, but those tables can be requested from the authors.

[14] In the case of the other measures of school quality, the OLS and the IV estimates do not show different signs (presented below). Since it is not clear to what extent those measures are considered by parents when choosing a school (we only know that press does not put any attention on them), it is more difficult to have a clear prediction about the differences between these two empirical strategies.

educational quality, measured through these indicators. At the same time, the magnitudes of said outcomes are generally greater than those found for the case of impact on standardized tests.

Tables 4-7 show the impact of competition on various quality measurements. If we focus on the specification that considers the three instruments, we observe that (1) an increase of one standard deviation in competition would reduce the academic self-esteem and motivation indicator by 0.02 standard deviations, considering students and schools as units of analysis and (2) an increase of one standard deviation in competition would reduce the school climate indicator by 0.1 standard deviations, using students and schools as units of analysis. In both cases, the effect is not statistically significant if the unit of analysis is the district. We also observe that (3) an increase of one standard deviation in competition would reduce the participation and civic indicator by between 0.06 and 0.09 standard deviations, using students, schools and districts as units of analysis. Finally, (4) an increase of one standard deviation in competition would reduce the healthy lifestyle habits indicator by between 0.08 and 0.16 standard deviations and would be statistically significant for all units of aggregation.

These results show that all personal and social development indicators would suffer a negative effect if competition were to increase by one standard deviation. The healthy lifestyle habits indicator would have the greatest impact followed by school climate, civic participation, and academic self-esteem and motivation.

Table 8 shows that if we take a simple average of the four indicators, a one standard deviation increase in competition would have a negative and statistically significant effect of between 0.06 and 0.13 standard deviations on that aggregate indicator, which would summarize the quality measurements other than standardized tests considered in this study.

Given that competition is a phenomenon that is mainly developed in urban areas (Gallego, 2002; Auguste and Valenzuela, 2005), Table 10 presents a summary of the same estimates discussed above only for urban populations. The results support the existence of a positive and statistically positive and moderate effect of competition on the SIMCE as well as a negative and statistically significant effect on the other quality indicators. In fact, in this case, the effects found at the aggregate level for districts are statistically significant, which suggests that the inclusion of rural districts in the analysis makes the effect of competition dissipate.

7. Robustness Analysis

To study the robustness of our results to other specifications, we build a short panel data set at the school level, using the same sources of information considered when estimating our main specification, but now including the 2013 and 2016 4th grade data. In particular, we estimate

$$y_{st}^{sd} = \beta C_{st}^{sd} + \gamma X_{st} + \delta_s + \mu_t + \varepsilon_{st}\,, \qquad (3)$$

where y_{st}^{sd} is an indicator of the quality for school s at time t (2013 or 2016); C_{st}^{sd} is a measure of competition at time t, for the school's district; X_{st} is a vector of control variables that measure the education and income levels of the families whose child attend school s; μ_t is the year fixed effects; and δ_s is the school fixed effects. In this context, we are able to identify the value of β, to the extent that all the relevant unobserved variables, which are correlated with school competition and explain school quality, are not varying over time.

As Table 11 shows, the results of this exercise are in line with our main empirical result, but due to the short nature of the panel, the estimates are less precise. Concretely, the impact of competition on standardized test scores has different signs depending on the controls we include (always close to zero and not statistical significant), and the effect of competition on the other measures of school quality are negative. In the cases of school climate and healthy lifestyle habits they are statistically significant but with similar but smaller magnitudes respect to the cross-sectional analysis.

The lack of statistical significance in this case is mainly a limitation of the data, it is reasonable to expect that the level of competition does not have enough variation over three years, which is the longest panel data set that we can build.[15] This is also the reason why our main empirical strategy is based on cross sectional data, and its identification relies on the existence of instrumental variables as opposed to using a panel to control for fixed effects. That said, it is remarkable that although we do not have enough statistical power in our panel data estimations, the point estimates are very much in line with our main results.

[15] Before 2013 we do not have all the questions in the SIMCE surveys in other to build our alternative measures of school quality.

As another robustness analysis, in the Appendix we present the results of estimating our main empirical specification now considering students who were attending 10th grade in 2013. As can be seen in Table 12, we have the similar results as in the case of 4th grade estimations. In particular, it is also the case that the effect of school competition is positive on school quality when it is measured as standardized test scores, but this effect is negative and statistically significant for the other measures of school quality considered.[16]

8. Conclusions

It is necessary to evaluate the impact of public policies in education from a broader perspective that is not restricted to the results of standardized tests. This study provides inputs for this, analyzing the effect of competition among schools on educational quality indicators other than standardized tests. It is important to note that the analysis is conducted using data for Chile, a country that stands out on the world stage for having a market-based educational system, with 90% of the schools financed using vouchers, which has been in place for over 30 years.

We established a set of educational quality indicators, including academic self-esteem and motivation; school climate; civic participation; and healthy lifestyle habits. OLS and Two-Stage Least Squares were used to measure the effect of competition on standardized tests and on the other quality indicators described above. To correct for endogeneity between the level of competition and the outcome variables, we used three instrumental variables that are commonly used in the literature on the impact of competition on standardized tests, namely, total enrollment in the district, (a logarithm of) district population, and the urbanization rate. In addition, models were estimated using various levels of aggregation: students, school and district. The latter was used to ensure the robustness of the results for the sorting dynamics within each district.

The results show that an increase of one standard deviation in competition (using all the instrumental variables) raises SIMCE results at the student, school and district levels, by 0.05 to 0.06 of a standard deviation. However, this increase in competition also implies a reduction in all

[16] In this case we only present a summary of our results. The same tables that we presented in the case of 4th grade students are available from the authors upon request. Since in this case (10th grade), in contrast to 4th grade, a high proportion of the students do not attend a school located in the district where they live, we do not estimate the model using the districts. The school climate measure could not be built in this case, because of data limitations.

of the other quality indicators: 0.02 of a standard deviation in the academic self-esteem and motivation indicator; 0.10 of a standard deviation in the school climate indicator; 0.06 to 0.09 of a standard deviation in the civic participation indicator; and 0.08 to 0.16 of a standard deviation on the healthy lifestyle habits indicator.

The results of this article suggest that competition among schools for students (and, through them, for funding) could generate a certain level of tension in schools between improving their standardized test results and focusing on other aspects of educational quality.[17] This tension is particularly relevant in contexts such as Chile, in which all public policies and public debate, including articles in the news, revolve around the results of the schools on those standardized tests.

Should competition and a system of incentives based on standardized test scores be avoided altogether? Even though our results empirically show another negative aspect of the Chilean voucher system, which would indicate yes, a proper answer to that question requires a more comprehensive evaluation of the system, which is beyond of the scope of this paper. Our contribution is more modest, namely, we present quantitative evidence of a drawback of the Chilean educational system that have not been addressed. By doing so, we contribute a simple message: if all the incentives that schools face are related to standardized test scores, schools will naturally neglect other aspects of school quality to their detriment.

That said, it is important to acknowledge that we do not have the data to study the effect of school competition on the long run values of these variables. Thus, we cannot rule out that increased standardized test scores have a positive impact on the other school quality measures in the long run. In other words, we cannot rule out that the tension among different measures of school quality documented in this paper is a short run phenomenon.

[17] Another possible tension is described by Cuesta et al. (2016), who document how pressure to obtain better scores on standardized tests in Chile can cause some schools to seek out ways to prevent students with low performance from attending class on the day that the tests are given. Moreover, Elacqua (2012) and Mizala and Torche (2012) study the relantioship between the Chilean voucher system and students' segregation across schools.

References

Angrist, J., Bloom, E., King, E., and Kremer, M. (2002). Vouchers for Private Schooling in Colombia: Evidence from a Randomized Natural Experiment. American Economic Review. 92, 1535–1558.

Angrist, J., Bettinger, E., and Kremer., M. (2006) Long-Term Educational Consequences of Secondary School Vouchers: Evidence from Administrative Records in Colombia. American Economic Review. 96, 847–862.

Auguste, S. and Valenzuela J., (2005). Do students benefits from school competition? Evidence from Chile. Working paper.

Bellei C. and Vanni X. (2015). The evolution of educational policy in Chile, 1980-2014. In Education in South America, Schwartzman (editor), Bloomsbury Publishing.

Bettinger, E. (2011). Educational Vouchers in International Contexts. Handbook of the Economics of Education, Vol 4. Chapter seven.

Brando, N. (2017) Between equality and freedom of choice: Educational opportunities for the least advantaged. International Journal of Educational Development. 53, 71-79.

Bravo, D., Mukhopadhyay, S. and Todd, P. E. (2010), Effects of school reform on education and labor market performance: Evidence from Chile's universal voucher system. Quantitative Economics. 1, 47–95.

Contreras D. and Macias V. (2002). Competencia y resultados educacionales. Working paper, Universidad de Chile.

Contreras D. and Rau, T. (2012). Tournament Incentives for Teachers: Evidence from a Scaled-Up Intervention in Chile, Economic Development and Cultural Change. 61 (1), 219-246.

Cuesta J., González, F. and Larroulet, C. (2016) Distorted Quality Signals in School Markets. Working paper.

Dewatripont M., Jewitt I., and Tirole J. (2000). Multitask agency problems: Focus and task clustering. European Economic Review. 44, 869-877.

Durlak, J. Weissberg, R. Schellinger, K. Dymnicki, A. and Taylor, R. (2011) The Impact of Enhancing Students' Social and Emotional Learning: A Meta-Analysis of School-Based Universal Interventions. Child Development. 82 (1), 405–432.

Elacqua, G. (2012) The impact of school choice and public policy on segregation: Evidence from Chile. International Journal of Educational Development. 32 (3), 444-453.

Epple D., Romano R., and Urquiola M. (2017). School Vouchers: A survey of the economic literature. Journal of Economic Literature, 55 (2), 441–492

Esnaola, I. (2008). El autoconcepto: perspectivas de investigación. Revista de Psicodidáctica. 13 (1), 179-194.

Falabella and Opazo (2014). Sistema de Aseguramiento de la Calidad y procesos de mejoramiento: una mirada desde la gestión educativa. Centro de Investigación y Desarrollo de la Educación. Universidad Alberto Hurtado.

Friedman, M. (1962) Capitalism and Freedom, University of Chicago press.

Gallego F., (2002). Competencia y Resultados Educativos: Teoría y Evidencia para Chile. Documento de Trabajo N°150, Banco Central de Chile.

Gallego F., (2006). Voucher-School Competition Incentives, and Outcomes: Evidence from Chile. Working paper.

Gutmann, A. (1999) Democratic Education. With a new preface and epilogue. Princeton University press. Princeton, New Jersey.

Hsieh C., and Urquiola M., (2003). When schools compete, How do they compete? An assessment of Chile's nationwide school voucher program. NBER Working Paper 10008.

Hsieh C., and Urquiola M., (2006). The effects of generalized school choice on achievement and stratification: Evidence from Chile's voucher program. Journal of Public Economics. 90, 1477-1503.

Imbens, G., and Angrist, J. (1994). Identification and Estimation of Local Average Treatment Effects. Econometrica. 62 (2), 467-475.

Masino, S., and Niño-Zarazúa, M. (2016) What works to improve the quality of student learning in developing countries? International Journal of Educational Development. 48, 53-65.

McEwan, P. J., and Carnoy, M. (2000). The effectiveness and efficiency of private schools in Chile's voucher system. Educational Evaluation and Policy Analysis, 22, 213–239.

Ministry of Education (2003). Evaluación de Aprendizajes para una Educación de Calidad. Comisión para el Desarrollo y Uso del Sistema de Medición de la Calidad de la Educación.

Ministry of Education (2014). Fundamentos. Otros Indicadores de Calidad Educativa. Unidad de Currículum y Evaluación. Ministerio de Educación. Santiago, Chile.

Milicic, N. (2001). Creo en ti: La construcción de la autoestima en el contexto escolar. Editorial LOM.

Mizala, A., and Torche, F. (2012) Bringing the schools back in: The stratification of educational achievement in the Chilean voucher system. International Journal of Educational Development. 32 (1), 132-144.

National School Climate Center (2012) School Climate. (http://www.schoolclimate.org/climate/, Accessed: 23 June 2015).

OECD (2010). PISA 2009 Results: What Makes a School Successful? Resources, Policies and Practices (Volume IV), OECD Publishing.

OPECH (2006). SIMCE: Balance Crítico y Proyecciones Imprescindibles. Documento de Trabajo 1 del Observatorio Chileno de Políticas Educativas, Universidad de Chile.

Stock J., and Yoko M. (2005). Testing for Weak Instruments in Linear IV Regression. Identification and inference for econometric models: Essays in honor of Thomas Rothenberg.

Story, M., Nanney, M. and Schwartz, M. (2009). Schools and Obesity Prevention. The Milbank Quarterly, 87 (1): 71-100.

Tikly, L., and M. Barrett, A. (2011) Social justice, capabilities and the quality of education in low income countries. International Journal of Educational Development. 31 (1), 3-14.

Trudeau, F. and Shepard, R. (2008). Physical education, school physical activity, school sports and academic performance. International Journal of Behavioral Nutrition and Physical Activity, 5 (10), 1-12.

Appendix

A. Estimation results

Table 3: Effect of School Competition on SIMCE Results (4th grade)

Dependent variable: SIMCE (average of mathematics and Language), in standard deviation				
	Students	Schools	Districts	Grouped Districts
School Competition (OLS)	-0.004	-0.005	0.007	-0.007
	(0.01)	(0.01)	(0.01)	(0.01)
School Competition (IV 1)	0.06**	0.06*	0.08**	0.02**
	(0.03)	(0.03)	(0.04)	(0.07)
School Competition (IV 2)	0.06***	0.06***	0.06**	-0.06
	(0.02)	(0.02)	(0.03)	(0.04)
School Competition (IV 3)	0.05	0.05	0.06	0.12
	(0.04)	(0.04)	(0.06)	(0.10)
School Competition (All IV)	0.05***	0.05***	0.06**	-0.003
	(0.02)	(0.02)	(0.03)	(0.03)
Controls				
Parents' Education	Yes	No	No	No
Household Income Log.	Yes	No	No	No
Parents' Education Est.	Yes	Yes	No	No
Household Income Log. Est.	Yes	Yes	No	No
Parents' Education District	Yes	Yes	Yes	Yes
Household Income Log. District	Yes	Yes	Yes	Yes
School Type	Yes	Yes	No	No
Zone	Yes	Yes	Yes	Yes
N	167,489	7,170	338	303
R-Squared	0.14	0.47	0.65	0.39

Notes: This table summarizes the results of a set of estimations with SIMCE scores (average of mathematics and language) as a dependent variable. It presents OLS and IV estimations, considering three instrumental variables: the logarithm of total district enrollment (IV 1), the logarithm of district population (IV 2), and the rate of urbanization (IV 3). We estimate models including one IV and also have a model including all three. Each column accounts for a specific unit of analysis (students, schools, districts, and grouped districts). In the last column the 35 districts of the Santiago Metropolitan Area are grouped into a single market. Standard errors are listed in parentheses; *, ** and *** indicate the level of significance at 10%, 5% and 1% respectively. Standard errors are clustered at the school level when the unit of analysis is students or schools. When the unit of analysis is districts, the standard errors are robust.

Table 4: Effect of School Competition on Academic Self-esteem and Motivation (4th grade)

Dependent variable: academic self-esteem and motivation, in standard deviation				
	Students	Schools	Districts	Grouped Districts
School Competition (OLS)	-0.02***	-0.01**	-0.02**	-0.008
	(0.01)	(0.01)	(0.01)	(0.01)
School Competition (IV 1)	-0.06***	-0.06***	-0.05***	-0.04*
	(0.02)	(0.02)	(0.02)	(0.03)
School Competition (IV 2)	-0.03**	-0.02**	-0.03	-0.02
	(0.01)	(0.02)	(0.02)	(0.02)
School Competition (IV 3)	-0.02	-0.02	-0.02	0.05
	(0.03)	(0.03)	(0.03)	(0.13)
School Competition (All IV)	-0.02**	-0.02*	-0.02	0.001
	(0.01)	(0.01)	(0.02)	(0.01)
Controls				
Parents' Education	Yes	No	No	No
Household Income Log.	Yes	No	No	No
Parents' Education Est.	Yes	Yes	No	No
Household Income Log. Est.	Yes	Yes	No	No
Parents' Education District	Yes	Yes	Yes	Yes
Household Income Log. District	Yes	Yes	Yes	Yes
School Type	Yes	Yes	No	No
Zone	Yes	Yes	Yes	Yes
N	167,489	7,170	338	303
R-Squared	0.01	0.04	0.11	0.05

Notes: This table summarizes the results of a set of estimations with academic self-esteem and motivation as a dependent variable. It presents OLS and IV estimations, considering three instrumental variables: the logarithm of total district enrollment (IV 1), the logarithm of district population (IV 2), and the rate of urbanization (IV 3). We estimate models including one IV and have a model including all three. Each column accounts for a specific unit of analysis (students, schools, districts, and grouped districts). In the last column the 35 districts of the Santiago Metropolitan Area are grouped into a single market. Standard errors are listed in parentheses; *, ** and *** indicate the level of significance at 10%, 5% and 1% respectively. Standard errors are clustered at the school level when the unit of analysis is students or schools. When the unit of analysis is districts, the standard errors are robust.

Table 5: Effect of School Competition on School Climate (4th grade)

Dependent variable: School climate, in standard deviation				
	Students	Schools	Districts	Grouped Districts
Competition (OLS)	-0.05***	-0.04***	-0.01	0.01
	(0.01)	(0.01)	(0.01)	(0.01)
Competition (IV 1)	-0.17***	-0.16***	-0.11***	-0.13**
	(0.04)	(0.04)	(0.05)	(0.05)
Competition (IV 2)	-0.09***	-0.08***	-0.05	-0.07*
	(0.02)	(0.02)	(0.03)	(0.04)
Competition (IV 3)	-0.11**	-0.12***	-0.06	0.05
	(0.05)	(0.05)	(0.05)	(0.08)
Competition (All IV)	-0.10***	-0.10***	-0.03	-0.02
	(0.02)	(0.02)	(0.03)	(0.03)
Controls				
Parents' Education	Yes	No	No	No
Household Income Log.	Yes	No	No	No
Parents' Education Est.	Yes	Yes	No	No
Household Income Log. Est.	Yes	Yes	No	No
Parents' Education District	Yes	Yes	Yes	Yes
Household Income Log. District	Yes	Yes	Yes	Yes
School Type	Yes	Yes	No	No
Zone	Yes	Yes	Yes	Yes
N Students	167,489	7,170	338	303
R-Squared	0.08	0.29	0.27	0.19

Notes: This table summarizes the results of a set of estimations with school climate as a dependent variable. It presents OLS and IV estimations, considering three instrumental variables: the logarithm of total district enrollment (IV 1), the logarithm of district population (IV 2), and the rate of urbanization (IV 3). We estimate models including one IV and have a model including all three. Each column accounts for a specific unit of analysis (students, schools, districts, and grouped districts). In the last column the 35 districts of the Santiago Metropolitan Area are grouped into a single market. Standard errors are listed in parentheses; *, ** and *** indicate the level of significance at 10%, 5% and 1% respectively. Standard errors are clustered at the school level when the unit of analysis is students or schools. When the unit of analysis is districts, the standard errors are robust.

Table 6: Effect of School Competition on Civic Participation (4th grade)

Dependent variable: Civic participation, in standard deviation				
	Students	Schools	Districts	Grouped Districts
School Competition (OLS)	-0.03***	-0.02***	-0.02*	-0.003
	(0.01)	(0.01)	(0.01)	(0.01)
School Competition (IV 1)	-0.10***	-0.09***	-0.07***	-0.07**
	(0.03)	(0.03)	(0.03)	(0.03)
School Competition (IV 2)	-0.09***	-0.08***	-0.07***	-0.07***
	(0.02)	(0.02)	(0.02)	(0.02)
School Competition (IV 3)	-0.07**	-0.07**	-0.06	0.001
	(0.03)	(0.03)	(0.04)	(0.06)
School Competition (All IV)	-0.09***	-0.09***	-0.07***	-0.06***
	(0.02)	(0.02)	(0.02)	(0.02)
Controls				
Parents' Education	Yes	No	No	No
Household Income Log.	Yes	No	No	No
Parents' Education Est.	Yes	Yes	No	No
Household Income Log. Est.	Yes	Yes	No	No
Parents' Education District	Yes	Yes	Yes	Yes
Household Income Log. District	Yes	Yes	Yes	Yes
School Type	Yes	Yes	No	No
Zone	Yes	Yes	Yes	Yes
N students	167.489	7.170	338	303
R-Squared	0.02	0.14	0.04	0.03

Notes: This table summarizes the results of a set of estimations with civic participation as a dependent variable. It presents OLS and IV estimations, considering three instrumental variables: the logarithm of total district enrollment (IV 1), the logarithm of district population (IV 2), and the rate of urbanization (IV 3). We estimate models including one IV and have a model including all three. Each column accounts for a specific unit of analysis (students, schools, districts, and grouped districts). In the last column the 35 districts of the Santiago Metropolitan Area are grouped into a single market. Standard errors are listed in parentheses; *, ** and *** indicate the level of significance at 10%, 5% and 1% respectively. Standard errors are clustered at the school level when the unit of analysis is students or schools. When the unit of analysis is districts, the standard errors are robust.

Table 7: Effect of School Competition on Healthy Lifestyle Habits (4th grade)

Dependent variable: Healthy lifestyle habits in St. Dev.				
	Students	School	Districts	Grouped Districts
School Competition (OLS)	-0.04***	-0.03***	-0.03**	-0.002
	(0.01)	(0.01)	(0.01)	(0.01)
School Competition (IV 1)	-0.17***	-0.16***	-0.15***	-0.02
	(0.03)	(0.03)	(0.03)	(0.03)
School Competition (IV 2)	-0.15***	-0.15***	-0.14***	-0.05*
	(0.02)	(0.02)	(0.03)	(0.03)
School Competition (IV 3)	-0.16***	-0.16***	-0.15**	-0.06
	(0.04)	(0.04)	(0.05)	(0.07)
School Competition (All IV)	-0.16***	-0.16***	-0.14***	-0.08**
	(0.02)	(0.02)	(0.03)	(0.03)
Controls				
Parents' Education	Yes	No	No	No
Household Income Log.	Yes	No	No	No
Parents' Education Est.	Yes	Yes	No	No
Household Income Log. Est.	Yes	Yes	No	No
Parents' Education District	Yes	Yes	Yes	Yes
Household Income Log. District	Yes	Yes	Yes	Yes
School Type	Yes	Yes	No	No
Zone	Yes	Yes	Yes	Yes
N	167,489	7,170	338	303
R-Squared	0.01	0.03	0.05	0.03

Notes: This table summarizes the results of a set of estimations with healthy lifestyle habits as a dependent variable. It presents OLS and IV estimations, considering three instrumental variables: the logarithm of total district enrollment (IV 1), the logarithm of district population (IV 2), and the rate of urbanization (IV 3). We estimate models including one IV and have a model including all three. Each column accounts for a specific unit of analysis (students, schools, districts, and grouped districts). In the last column the 35 districts of the Santiago Metropolitan Area are grouped into a single market. Standard errors are listed in parentheses; *, ** and *** indicate the level of significance at 10%, 5% and 1% respectively. Standard errors are clustered at the school level when the unit of analysis is students or schools. When the unit of analysis is districts, the standard errors are robust.

Table 8: Effect of School Competition on "Other School Quality Measures" (4th grade)

Dependent variable: Simple average of "other" quality indicators in St. Dev.				
	Students	School	District	Grouped Districts
School Competition (OLS)	-0.05***	-0.03***	-0.03**	-0.001
	(0.01)	(0.01)	(0.01)	(0.01)
School Competition (IV 1)	-0.17***	-0.16***	-0.13***	-0.09*
	(0.03)	(0.03)	(0.04)	(0.04)
School Competition (IV 2)	-0.13***	-0.12***	-0.10***	-0.07**
	(0.02)	(0.02)	(0.03)	(0.03)
School Competition (IV 3)	-0.13***	-0.13***	-0.10*	0.01
	(0.04)	(0.04)	(0.05)	(0.06)
School Competition (All IV)	-0.13***	-0.13***	-0.09***	-0.06**
	(0.02)	(0.02)	(0.02)	(0.03)
Controls				
Parents' education	Yes	No	No	No
Household Income Log.	Yes	No	No	No
Est. Parents' Education	Yes	Yes	No	No
Log. Est. Parents' Education	Yes	Yes	No	No
Parents' Education District	Yes	Yes	Yes	Yes
Household Income Log. District	Yes	Yes	Yes	Yes
School Type	Yes	Yes	No	No
Zone	Yes	Yes	Yes	Yes
N students	167,489	7,170	338	303
R-squared	0.03	0.15	0.11	0.03

Notes: This table summarizes the results of a set of estimations with a simple average of the "other" school quality measures as a dependent variable. It presents OLS and IV estimations, considering three instrumental variables: the logarithm of total district enrollment (IV 1), the logarithm of district population (IV 2), and the rate of urbanization (IV 3). We estimate models including one IV and have a model including all three. Each column accounts for a specific unit of analysis (students, schools, districts, and grouped districts). In the last column the 35 districts of the Santiago Metropolitan Area are grouped into a single market. Standard errors are listed in parentheses; *, ** and *** indicate the level of significance at 10%, 5% and 1% respectively. Standard errors are clustered at the school level when the unit of analysis is students or schools. When the unit of analysis is districts, the standard errors are robust.

Table 9: Effect of instrumental variables on school competition (First Stage, IV estimations)

Dependent Variable: School competition, in standard deviation				
Instrumental Variable	Students	Schools	Districts	Grouped Districts
(Log) Total student enrollment (IV 1)	0.40***	0.39***	0.42***	0.19***
	(0.03)	(0.03)	(0.05)	(0.05)
	[400.3]	[400.9]	[24.2]	[17.8]
(Log.) District population (IV 2)	0.42***	0.43***	0.45***	0.19***
	(0.03)	(0.03)	(0.03)	(0.03)
	[785.2]	[805.4]	[65.85]	[29.1]
Urbanization Rate (IV 3)	1.41***	1.40***	1.46***	1.01***
	(0.02)	(0.02)	(0.02)	(0.02)
	[99.3]	[99.4]	[8.4]	[3.6]
Controls				
Parents' Education	Yes	No	No	No
Household Income Log.	Yes	No	No	No
Parents' Education Est.	Yes	Yes	No	No
Household Income Log. Est.	Yes	Yes	No	No
Parents' Education District	Yes	Yes	Yes	Yes
Household Income Log. District	Yes	Yes	Yes	Yes
School Type	Yes	Yes	Yes	Yes
N	167,489	7,170	338	303
R-Squared	0.14	0.46	0.64	0.37

Notes: This table summarizes the results of the first stage estimations of our instrumental variable regressions (4th grade). The dependent variable is school competition at the district level, and the independent variables of interest are: the logarithm of total district enrollment (IV 1), the logarithm of district population (IV 2), and the rate of urbanization (IV 3). Grouped districts includes 35 districts from the Santiago Metropolitan Area into a single market. F tests for the significance of the instrumental variable is in brackets. Standard errors are listed in parentheses; *, ** and *** indicate the level of significance at 10%, 5% and 1% respectively. Standard errors are clustered at the school level when the unit of analysis is students or schools. When the unit of analysis is districts, the standard errors are robust.

Table 10: Effect of School Competition on all the School Quality Measures, urban areas (4th grade)

	SIMCE	Self-esteem, Academic Motivation	School Climate	Civic Participation	Healthy Lifestyle Habits	Other Quality Indicators (Average)
Students (N= 167,489)						
School Competition (OLS)	-0.004	-0.02***	-0.06***	-0.04***	-0.04***	-0.05***
	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)
School Competition (All IV)	0.05**	-0.04***	-0.10***	-0.11***	-0.18***	-0.15***
	(0.02)	(0.01)	(0.03)	(0.02)	(0.02)	(0.02)
Schools (N= 7,170)						
School Competition (OLS)	-0.004	-0.02***	-0.06***	-0.04	-0.04***	-0.05***
	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)
School Competition (All IV)	0.05***	-0.04***	-0.09***	-0.10***	-0.18***	-0.14***
	(0.02)	(0.01)	(0.03)	(0.02)	(0.02)	(0.002)
Districts (N= 313)						
School Competition (OLS)	0.009	-0.02***	-0.01	-0.02*	-0.04**	-0.03**
	(0.01)	(0.01)	(0.01)	(0.01)	(0.02)	(0.01)
School Competition (All IV)	-0.06**	-0.04**	-0.06**	-0.08***	-0.16***	-0.12***
	(0.03)	(0.02)	(0.03)	(0.03)	(0.03)	(0.03)
Grouped Districts (N= 279)						
School Competition (OLS)	-0.008	-0.01	0.007	-0.002	0.00	-0.002
	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)
School Competition (All IV)	-0.04	-0.02	-0.05	-0.08***	-0.08**	-0.08**
	(0.04)	(0.02)	(0.04)	(0.02)	(0.03)	(0.03)

Notes: This table summarizes the results of the effect of school competition on all the school quality measures considered in this paper, using different unit of analysis: students, schools, districts, and grouped districts. The sample is restricted to urban areas. From these estimations, the table only presents the point estimates and standard errors (in parenthesis) associated with school competition. Although their estimated parameters are not presented in these regression, we also control for parental education and income, as well as other school characteristics. Standard errors are clustered at school level when the unit of analysis is students or schools. When the unit of analysis is districts, the standard errors are robust. *, ** and *** indicate the level of significance at 10%, 5% and 1% respectively.

Table 11: Effect of School Competition on school quality measures, panel estimation

	SIMCE	Self-esteem, Academic Motivation	School climate	Civic participation	Healthy lifestyle Habits
School Competition	0.002	-0.001	-0.064*	-0.016	-0.106**
	(0.034)	(0.03)	(0.038)	(0.031)	(0.037)
Controls					
Year and school fixed effects	Yes	Yes	Yes	Yes	Yes
Parents' education	No	No	No	No	No
Household Income Log.	No	No	No	No	No
N: schools * years	13,100	13,083	12,801	13,088	13,086
R-squared	0.55	0.54	0.57	0.62	0.47
School Competition	-0.03	-0.003	-0.068*	-0.021	-0.097**
	(0.164)	(0.029)	(0.037)	(0.03)	(0.037)
Controls					
Year and school fixed effects	Yes	Yes	Yes	Yes	Yes
Parents' education	Yes	Yes	Yes	Yes	Yes
Household Income Log.	Yes	Yes	Yes	Yes	Yes
N: schools * years	13,100	13,083	12,801	13,088	13,086
R-squared	0.55	0.54	0.57	0.62	0.48

Notes: This table shows the estimation of a linear panel data model, with two periods: 2013 and 2016. The estimation is at school level. Robust standard errors are listed in parentheses. *, ** and *** indicate the level of significance at 10%, 5% and 1%, respectively.

Table 12: Effect of School Competition on all the School Quality Measures (10th grade)

	SIMCE	Self-esteem, Academic Motivation	Civic Participation	Healthy Lifestyle Habits	Other Quality Indicators (Average)
Students (N= 130,624)					
School Competition (OLS)	-0.04**	-0.04***	-0.05***	-0.07***	-0.08***
	(0.02)	(0.004)	(0.004)	(0.004)	(0.004)
School Competition (IV 1)	0.17***	0.003	-0.09***	-0.20***	-0.15***
	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)
School Competition (IV 2)	0.13**	-0.01	-0.10***	-0.21***	-0.16***
	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)
Schools (N= 2,634)					
School Competition (All IV)	-0.02	-0.03***	-0.04***	-0.05***	-0.12***
	(0.01)	(0.01)	(0.01)	(0.01)	(0.03)
School Competition (IV 1)	0.07**	-0.06***	-0.12***	-0.18***	-0.35***
	(0.03)	(0.02)	(0.03)	(0.04)	(0.07)
School Competition (IV 2)	0.04	-0.08***	-0.13***	-0.21***	-0.41***
	(0.04)	(0.02)	(0.03)	(0.04)	(0.08)

Notes: This table summarizes the results of the effect of school competition on all the school quality measures considered in this paper, using students and schools as unit of analysis. It presents OLS and IV estimations, considering the logarithm of total district enrollment (IV 1) and the logarithm of district population (IV 2) as instrumental variables. From these estimations, the table only presents the point estimates and standard errors (in parenthesis) associated with school competition. Although their estimated parameters are not presented in these regression, we also control for parental education and income, as well as other school characteristics. Standard errors are clustered at school level. *, ** and *** indicate the level of significance at 10%, 5% and 1% respectively.