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EDICIONES COMPLUTENSE

A quest for Selective Decentralization. The case of Municipal Schools in Chile[1] [2]

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Abstract. Under the argument that the existing municipal administration of public schools in Chile is poor and inequitable, a law was passed in 2017 thereby all schools will be handed over to 70 centrally dependent Local Education Services (LES). We hypothesize that a significant number of schools would do better if they remain administered by the municipal level. Based upon a data base between 2014 and 2018, we show that students from schools in fiscally autonomous municipalities exhibit better results in standardized national tests, which supports a quest for a "selective decentralization" model, thereby only bad performed schools are made dependent on LES.
Keywords: Economics of Education; Fiscal Decentralization; Local Governments; Public Economics; Local Management.

[es] En busca de una descentralización selectiva. El caso de los colegios municipales en Chile

Resumen. Bajo el argumento de que la actual administración municipal de los colegios públicos en Chile es pobre e inequitativa, una ley fue promulgada en el 2017 en virtud de la cual tales colegios serían entregados a la administración de 70 nuevos Servicios Locales de educación (SLED) de dependencia centralizada. Nuestra hipótesis es que un significativo número de tales colegios tendrían mejor desempeño si permanecieran bajo la administración municipal. En base a datos entre 2014 y 2018, mostramos que los estudiantes provenientes de colegios dependientes de municipios fiscalmente más autónomos exhiben mejores resultados en las pruebas estandarizadas de nivel nacional, lo cual apoya la propuesta de un modelo de "descentralización selectiva", en virtud del cual solo los colegios de mal desempeño fuesen trasferidos a los SLEDs.
Palabras Claves: Economía de la Educación; Descentralización Fiscal; Gobiernos Locales; Economía Pública; Gestión local.

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1. Introduction

Over the early 80s, Chilean public schools were handed over to the municipal administration. This was accompanied by the creation of publicly funded private schools (from now on; "PPP schools"), and the establishment of a "voucher per student" funding mechanism, which was meant to be complemented by voluntary contributions from the school administrators (municipalities). Municipal and PPP schools were assumed to compete with each other, leading to lower operation costs and a better national educational outcome. Despite a poor average educational outcome[5], a number of well performed schools exists in selected municipalities. Contrary to policy recommendations from this study, a law was passed in 2017 which establishes an all-across-the-board devolution of existing municipal schools to the administration of 70 centrally dependent "Local Educational Services" (LES). While these new entities will be legally "autonomous", they will not have elected authorities and will formally depend on the Ministry of Education.

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[2] SIMCE scores used in this research were provided by the "Agency for the Quality of Education" (*Agencia de la Calidad de la Educación*).
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[5] PISA scores for Chile are among the lowest as compared with the OECD standard (OCDE 2016), which entails major challenges in the design as well as in the fiscal effort needed to improve education.

This paper explores the contribution of municipal fiscal autonomy to explain students' attainment in a standardized national test taken by the 4th grade primary students. It does so by estimating a hierarchical model that combines data between 2014 and 2018. Despite both families and schools being expected to explain a substantial share of individual scores, we hypothesize that the municipal leeway to decide on a range of educational issues is still a significant factor. Nonetheless, said leeway is very unevenly distributed across municipal governments as they differ substantially in their capacity to mobilize resources of their own, which leads to varied degrees of actual municipal fiscal decentralization (*FD*). This severely affects their capacity to decide on Hiring teachers, productivity bonuses and layoffs. Since nothing prevents newly established *LES* from facing similar restrictions, we hypothesize that schools in fiscally autonomous municipalities are likely to do better in the existing municipal administration as compared to their potential performance in a *LES*.

The remaining of this article presents separate sections for a review of the existing literature, the outline of the Chilean case, the establishment of hypotheses and expected results, the empirical analysis and main conclusions.

2. Literature

2.1. The General Debate

Students performance can be attributed to family background, school quality and the amount of resources being spent. Evidence from Spain suggests that individual and school variables altogether explain no less than 43% of the whole variance of the PISA score. Of said total, 39% is attributable to students' background (Mancebón et. al. 2012), and socioeconomic status (Coleman et. al. 1966, Hanushek 1996, McEwan 2003 Hakkinen et. al. 2003, Houtenville 2008, Mizala and Torche 2012, Hedges et. al. 2017). As for the school level, some evidence highlights the role being played by the quality of the teaching personnel (Hanushek 1986, Rivkin et, al. 2005, Rockoff 2004, Dee and Cohodes 2008, Sander and Dinand 2017), as well as their motivation and response to monetary incentives (Ferguson 1991, Contreras and Rau 2012, Andersen 2014).

While supporting evidence that more resources do improve education is extensive (Baker 2016), this effect appears to depend on the school degree in question (e.g. Nyhan and Alkadry 1999), the class size (Hedges and Greenwald 1996, Arias and Walker 2003) and the teachers' quality (Hanushek and Woessmann 2017), among other factors. As for as the Chilean case, Mizala and Torche (2017) show that resources spent on schools that concentrate a higher proportion of disadvantaged students have a stronger effect. A parallel strand of evidence finds no clear evidence on the relationship between resources and students' performance (Hanushek 1996, Hakkinen et. 2003). Possible explanations are the likelihood of biased estimations (Wößmann 2007) and the potential role of hard-to-observe variables (e. g. Ferguson 1991, Houtenville 2008, Hedges et. al. 2016, Cowen and trunk 2015, Lott and Kenny 2013).

2.2. The Effect of Decentralization

Among factors potentially responsible for the lack of a systematic causality between more resources being spent and students' performance at school, this study is focused on the degree of autonomy and local accountability held by those in charge of running schools. Giving more resources to non-autonomous and/or non-accountable school administration districts may hinder its potential benefits. This raises the question as to whether decentralization in general and *FD* in particular affects the quality of public education. Theoretically, it has been argued that decentralization uses available information on people's demands more efficiently (Von Hayek 1945), it adjusts public goods supply to local community preferences (Oates 1972), it promotes horizontal competition among jurisdictions (Tiebout 1956) and strengthens government's accountability (Escobar-Lemmon and Ross 2014, Lockwood 2015), among other benefits. Main counterarguments are the danger of elite capture (Bardhan and Mookherjee 2006), potential segregation of residents (Bonet 2006, Rodríguez-Pose and Ezcurra 2009), the lack of well-trained subnational governments' personnel (Prud'homme 1995) and a myriad of other weaknesses (Treisman 2007).

As opposed to other areas of government concern, the school educational output is highly visible to students' families. In this regard, the exercise of local democracy stands as a good accountability mechanism to penalize badly performed authorities and reward well performed ones (Hong 2017). But still, a relevant theoretical question is the extent to which local officers endowed with significant discretion would change their responsiveness to local demands just because statuary rules on the distribution of administrative competences are changed. If this were not the case (Kogan 2017), the coexistence of diverse local management environments and institutional contexts within the same country suggests that all-across-the board decentralization (centralization) solutions are no good.

Regarding the link between decentralization and education, four empirical debates can be identified. First, there is the school-quality debate. In this regard, a significant number of published papers shows that greater autonomy given to subnational governments (usually fiscal), leads to significant positive effect on the expenditure made on education, the access to school and the students' performance. While cross country evidence is abundant (e.g Falch and Fisher 2012, Lastra-Anadón and Mukherjee 2019), numerous country case studies provide further evi-

dence (Barankay and Lockwood 2007, Behrman et al. 2003, Akpan 2011, Slinas and Solé-Ollé 2009, Akai et al. 2007, Galiani and Schargrodsky 2002, Habibi et. al 2003, Galiani et. al. 2008, King and Osler 2000, Faguet and Sánchez 2007, 2014, Sanogo 2019). Non-conclusive or even skeptical results have also been reported (Melo 2012, Ahlin and Mork 2008, Kristiansen and Pratikno 2006, Toi 2010, Muttaqin et al. 2015, Muttaqin et al. 2015, Luo and Chen 2010, Wang et al. 2011). A second question hinges upon the specific type of the decentralization that matters the most. For example, a study by Jeong et. al (2017) about Korea suggests that *FD* seems to improve students' attainment, but political decentralization does not. Yet a third consideration refers to how more autonomous decisions taken at the local level do improve educational outcomes. A critical dimension of said autonomy is the extent to which the administration of the teaching personnel is also decentralized. For example, a study by Naper (2010) on the case of Norway shows that school districts in which the hiring of teachers is decentralized are the ones with the best performance.

A summary of the best rated empirical papers on the matter was presented by Channa and Faguet (2016). They conclude that generally, decentralization does not necessarily lead to a closer "preference matching" between local residents' characteristics and government expenditure. Nonetheless, a "high quality set" of papers seem to conclude that decentralization does have a positive effect on students' outcome, which is in line with previous evidence from Chile (Letelier and Ormeño 2018).

3. The case of Chile

Since the early 80s, three parallel administration models of publicly funded schools coexist in Chile. One is the direct municipal administration through a "Department of Municipal Education" (DAE). An alternative to that model is the "Municipal Corporation" (CORP), a private law entity headed by the mayor himself. Its potential advantage lies on the more flexible private-type labor contracts they can make and the less bureaucratic input acquisition process they are obliged to. Yet a third but rather rare model is represented by the so-called "Delegated Schools" (DEL), whereby a public school administration is delegated to a private foundation. Schools under these three models are subject to the same funding mechanism, to which the so-called "school holder" (usually de municipality) very often contributes through complementary voluntary resources.

For the year 2018, there were 8,261 schools in Chile, from which 6,628 (80.2%) are publicly funded. Within this last type, 5,288 (79.8%) are directly run by a DAE, 1,270 (19.2%) by a corporation and 70 (1.1%) by a delegated administration. A parallel publicly funded type of school was established, which allows private stakeholders to participate in a similar way as municipal schools do. These are the Private Subsidized Schools (PPP Schools).

As for the funding model, this rests on a voucher per student, which is shared by municipal and PPP schools alike[6]. Defenders of this mechanism argue that voucher-funded schools will compete with each other, leading to a better educational outcome. Two sources of inequality across schools can be identified. One originates in the fact that municipalities as a whole contribute with at least 15% of the entire municipal educational budget. Since this is a voluntary contribution and municipalities differ substantially in the fiscal effort they make, the actual expenditure per student exceeds the voucher based funding and it leads to significant differences on the expenditure per-student. The other source hinges upon the fact that schools also differ considerably in the number of students they host. Given that an important share of school costs are fixed, small (usually rural) establishments confront an important disadvantage.

As far as the quality of school management is concerned, two caveats are worth mentioning. First, children attending local schools in highly populated areas in which various large municipalities share a common urban zone, very often come from families that do not belong to the municipality that administers the school. This weakens the potential accountability over local authorities, as it diminishes the link between school quality and the local political constituency that elects the ruling mayor and councilors. Second, while transfers to municipal governments are based on a voucher per student scheme, schools themselves have no budget of their own, as the DEM [7] distributes the funding among schools on a discretionary basis. This makes schools unaccountable of the operating costs involved.

Nonetheless, the original model has gone through numerous reforms. An important one took place in 1991, when the municipal leeway to decide on the teaching personnel was severely curtailed. A special "teachers' statute" was set in place, thereby important restrictions were imposed on teachers' wages and layoffs. Another major breakthrough occurred in 2008, when a "preferential school voucher" was established for socially vulnerable students. As stated above, a more ambitious wave of reforms started in 2015, under the general goal of removing all schools from the municipal administration.

The flip side of the above critics is that a significant number of municipal schools do well as compared to non-municipal ones located in the same zone. In light of this, an all across the board reform of both the funding and/or the administration model

[6] PPP schools are allowed to charge. Nonetheless, they are given a lower voucher the higher the students' fee.

[7] Most municipal governments have a Department of Education (DEM) which is in charge of the schools. The alternative administrative structure consists in a "Corporation", which was originally held by 53 municipalities, thereby schools are administered by a private entity headed by the mayor (see, Letelier and Ormeño 2018).

entails the danger of leveling down the educational standard of well performing schools. Nonetheless, a dramatic transformation of the existing model is in progress. On the one hand, for profit PPP schools were banned in 2015[8]. Only non-for profit ones were allowed, which forced some of these schools to close down. On the other, by the end of 2017 the so-called Law of "New Public Education" was passed, thereby all existing public schools would be removed from the municipal administration and made dependent on seventy newly created "Local Educational Services" (LES) (*Servicios Locales de Educación*). These are meant to be deconcentrated jurisdictions from the central government, and as such, they have no elected authorities but a Community Council made by non-elected local representatives. Despite the fact that a public contest will be held to nominate the director of each LES - who will stay six years in office, most of the staff in charge is likely to be the same as the one originally hosted in former DEMs. Regarding LES funding, the bulk of the cost will continue to be filled by the existing per-student grant. The law establishes a complementary transfer to cover the administration cost of LES, to which must be added the voluntary contribution of municipalities that conform the LES plus other local public and private entities. Expectedly though, municipal governments will be less willing to continue cofounding local education, as it becomes clear from the fact that mayors who declare their conformity with the transference of schools, do so because of the release of municipal funds involved. By 2018, 252 municipal schools had been transferred to said new entities. Despite the fact that considers three waves of implementation until all public schools become de-municipalized in 2030, municipalities whose schools have not been made dependent on LES after this first wave, are allowed to request the postponement of the process.

4. Hypotheses and Expected Results.

The variable being explained is the students' score in a standardized national test. While this is far from being a comprehensive measurement of quality, it captures an important component of students' performance. As for the definition of *FD*, we follow Bahl (2005) in assuming this concept as having two dimensions. One refers to subnational governments' "fiscal power" to "deliver public services and infrastructure". Our measurement of said power is based on Schneider (2003) (section V). The other one is the "empowerment of the community" to drive those resources in line with local needs and demands. Needless to say, fiscal power can be taken to reflect the extent to which the jurisdiction in question is genuinely free to decide on its budget, and/or generate tax based resources of its own. Nonetheless, in the case of Chile, municipal governments have very little if any capacity to decide on local tax matters. The existing municipal revenue law is very restrictive on the leeway given to municipal authorities to decide on tax rates, tax bases and tax rebates. Since most of these parameters are centrally decided and homogenously applied to all municipal jurisdictions, there remains little room for local authorities to decide. To this should be added that the distribution of tax bases is very unevenly distributed across municipalities. An inter-municipal fiscal equalization mechanism exists[9], which redistributes a share of the tax revenues collected from the property tax, business licenses and car licenses. What does matter though, is the share of the budget that municipal governments have control over. We assume this corresponds to the share of municipal unavoidable expenses.

Concerning the hypotheses tested, it will be assumed that benefits from local authorities' accountability stands as the major benefit that decentralization may bring about in the case at hand. School performance is quite visible to the local constituency and families are usually engaged in the school community, which provides local voters with a powerful tool to reward well performing mayors and penalize badly performing ones. That said, municipalities in Chile face some restrictions that weaken said accountability. First, existing regulations on teachers' wages and general labor conditions severely restrict the municipal leeway to decide on the teaching staff. Second, although municipal authorities may fire badly performing teachers, it must pay them substantial severance payments, which makes it difficult for small and fiscally dependent municipalities to actually exercise this competence. A regular evaluation of the teaching personnel is made every four years. Nonetheless, badly evaluated ones can be hardly removed (e.g. Bonifaz 2011). Under the assumption that municipal governments have the political incentives and the local information to administer schools properly, aforementioned restrictions lead to our first hypothesis (Hypothesis 1) according to which more fiscally autonomous municipalities are expected to perform better in running schools.

Two considerations deserve special concern. One refers to the "empowerment of the community" – a component of Bahl's definition, which is not easily captured from the data. We will hypothesize (Hypothesis 2) that small rural communities, in which people know each other and local representatives are subject to close surveillance by residents, are more likely to enjoy better educational services. In said cases, the municipal government is more likely to be seen as the visible face of the State itself, as the school building is often an important meeting point for local residents. On the contrary, schools located in large urban areas (*conurbations*) where most students belong to families that do not reside in the municipal area and/

[8] Non-for profit PPP schools continue to exist and have 50% of all students attending publicly subsidized schools, either municipal private ones.

[9] This is the so called "Common Municipal Fund". See Letelier and Ormeño (2018).

or local authorities are unknown for most residents, are in a worse position to get benefited from a decentralized administration of schools. Yet a third factor worth looking at is the role of potential scale economies in school functioning. We should expect that costs per student are subject to significant economies of scale, as small schools would face higher costs per head to provide a similar quality of service (Hypothesis 3). Similarly, school holders (municipalities) that run more than one school at a time would generate further benefits, as this may bring about benefits from specialization (e. g. Bosworth 2002).

5. Empirical Analysis

5.1. The Empirical Model

Our empirical model takes advantage from a panel of 345 municipalities between 2014 and 2018, which is merged with 14,159 schools, 386,086 individual SIMCE score records for all years[10] and the corresponding parents' survey. A description of the data can be made by distinguishing three levels. They are the individual "student" level (Level 1: "*i*"), the "school" level (Level 2: "*s*") and the "municipal-year" level (Level 3: "*mt*"). This leads to the empirical model presented in Eq. 1, in which "*y*" is the student's score in math and language. In our case, this corresponds to the score at the 4th grade, as this is the only level for which the test has been taken consecutively over the 5 years of the sample[11]. Concerning our *FD* proxy, this will equal the share of total municipal (*TR*) revenues not being spent on "unavoidable items" (*UI*). Given the range of expense categories that stand as unavoidable, two alternative measurements are taken to test ($FD_{1,2}$). One includes the expenditure on personnel, garbage collection, street lightening and garden maintenance (*UI*). The second one adds to the former list the maintenance of traffic lights and traffic signaling (UI_2)[12].

The effect of individual (student) level variables (*IND*) is distinguished from the school variables (*SCH*), our proxy for fiscal decentralization (*FD*), a set of dummies for specific traits of schools and municipalities (*D*), and a set of interaction terms that capture the degree to which the effect of *FD* is sensitive to the school administration regime (see below). Since the data contains both longitudinal as well as cross sectional municipal level observations, we follow Fairborther (2014) in identifying two separate effects of *FD*. One stands for the effect of variations of *FD* over time (*mt*). This is measured by the Centered *FD* proxy (FD^C), which is estimated by the difference between the five years mean of *FD* ($\overline{FD}$) and its year value. The second effect comes from the cross country variation of $\overline{FD}_m$, as it captures the inter municipal variation of *FD*. Finally, "*time*" is a time trend from 1 (2014) to 5 (2018).

$$y_{is(mt)} = \beta_0 + \beta_1 IND_{is(mt)} + \beta_2 SCH_{s(mt)} + \beta_3 FD^C_{mt} + \beta_4 \overline{FD}_m + \beta_5 D + \beta_6 interact + \beta_7\, time + \mu_s + \mu_{mt} + \mu_{(mt)} M^e_i + \varepsilon_{is(mt)} \quad (Eq\ 1)$$

As for the random part of *Eq. 1*, this is comprised of two random coefficients (one for schools; μ_s and one for the municipal-year level; μ_{mt}), and a random effect ($\mu_m M^e_i$). Thus, we are assuming that the effect of mother's education (M^e_i) comprises a fixed coefficient plus a random component.

5.2 Data Summary

A data summary is presented in table 1. Our dependent variable is the individual score in the annual standardized test (SIMCE), which is complemented with a survey on family characteristics. We use the 4th grade of primary school score in math and language (*math_score* and *lang_score*). While the number of students who take the test ranges between 78,837 (2014) to 77,380 (2018), the number of parent's questionnaires being answered is slightly lower. It can be seen from our sample, that 73.6% of students have attended kinder. Regarding family income, the average is just above the 5th category out of 15. Mother's education is 13.5 out of 20 categories, which corresponds to having completed high school. As expected, the coefficient of variation suggests a higher variation of Family Income (0.67) relative to this same coefficient in the cases of students' test scores (0.19) and mother's education (0.25).

Regarding school level data, it may be observed that the number of children per school exhibits a significant dispersion (CV=0.8). Interestingly, some schools have just one student (the minimum), which in 2018 occurred in 75 establishments and 51 municipalities. Due to important school level economies of scale, a positive effect of the number of students on the SIMCE score is expected. A dummy for rural schools (11% of cases) is included under the assumption that many of the alleged benefits of decentralization might get stronger in small and isolated communities.

As far as municipal variables are concerned, the first one in the list is the number of educational establishments that each municipality administers (*N_Mun Schools*). We assume that municipalities that host a larger number of schools are likely to be more specialized in providing educational services. The so called DEM

[10] SIMCE: Education Quality System (Sistema de Medición de la Calidad de la Educación).

[11] While the SIMCE test is taken at the 2nd, 4th, 6th and 8th degrees, the only school level for which this is taken every year in our sample period is the 4th degree.

[12] $FD_{1,2} = \frac{TR - UE_{1,2}}{TR}$, where *TR* stands for total revenues and *UE* for unavoidable expenditures.

or the Municipal Corporation in charge (see above), is responsible for various specific functions concerning the teaching staff, the evaluation of students' performance and the allocation of available resources. In this regard, we should expect that important economies of scale may arise from having more schools in charge. A great dispersion of cases can be observed on this variable, as the CV equals 15.6. The competition from PPP schools is captured by the municipal average score of those schools. In case the municipality hosts no PPP schools, this variable is equal to 0.

Two municipal level *FD* proxies are taken to test. They are intended to capture the fiscal autonomy dimension of said variable, as they measure the difference between total municipal revenues and non-avoidable expenditures, as a share of all revenues. Two measurements of that variable result from two alternative definitions of non-avoidable expenditures. While in the first case (DF_1) the list includes personnel, garbage collection, street lighting and gardens maintenance, the second definition (DF_2) adds the expenditure on road signs and traffic lights to the list. Following the structure in *Eq 1* (above), the five years average (2014-2018) of both decentralization proxies are represented by $\overline{FD}_1$ and $\overline{FD}_2$. The variation of these variables ranges between 0.32 to 0.92 in the cases of DF_1 and DF_2. The corresponding CV is relatively low (0.16), which suggests a concentration of values around the mean (0.6).

Table 1. Data Summary

	Definition	Mean	Min	Máx	Coefficient of Variation	Source
Individual Variables						
math_score	Student's SIMCE score in math; 4th grade.	259.97	86.87	295.59	0.187	Min. of Education
lang_score	Student's SIMCE score in language; 4th grade.	267.42	115.47	405.96	0.194	Min. of Education
Gender	Dummy for women equals = 1. If man = 0.	0.487				Min. of Education
Kinder	The student attended kinder level (preschool level).	0.736				Min. of Education
Family Income	15 ranges of family income.	5.486	1	15	0.667	Min. of Education
Mother's Education	From "She did not study" (value 1) to "She holds a PhD" (value 20)	13.49	1	20	0.252	Min. of Education
School Variables						
D_Adel	Dunny for "Delegated Administration" School.	0.019				Min. of Education
D_Corp	Dunny for a school dependent on a Corporation.	0.325				Min. of Education
Rural School	Rural School	0.112				Min. of Education
N° Students	Number of students of the school	783.2	1	4,281	0.799	Min. of Education
Municipal and interaction Variables						
N° Mun Schools	Number of municipal schools	25.47	1	81	0.611	Min. of Education
SIMCE PPP Math	Average SIMCE score of PPP Schools (Math)	248.15	0	312	0.152	Min. of Education
SIMCE PPP Lang	Average SIMCE score of PPP Schools (Language)	258.75	0	343	0.167	Min. of Education
Conurbation	Dummy for municipalities that belong to a conurbation.	0.472				Wikipedia.
FD_1	Share of revenues not spent on avoidable items (Definition 1)	0.602	0.325	0.918	0.161	SINIM
FD_2	Share of revenues not spent on avoidable items (Definition 2)	0.599	0.325	0.918	0.162	SINIM
$\overline{FD}_1$	DF_1 five years average	0.602	0.397	0.837	0.146	SINIM
$\overline{FD}_2$	DF_2 five years average	0.599	0.397	0.837	0.145	SINIM

Source: SINIM: Municipal Information System (Ministry of Interior Affairs).

5.3 Main Results

From left to right in tables 2 and 3, estimations report a baseline specification (model 1: only random effects by level), and four complementary versions (models 2-5), in which additional covariates are included. Since we need a theoretically sound model, we consider models 4 and 5 for our analysis, in which the two alternative measurements of *FD* have been used and all relevant controls are considered.

Table 2: Math Score estimations

	Math_1	Math_2	Math_3	Math_4	Math_5
Individual Variables					
Gender		-0.005***	-0.005***	-0.006***	-0.006***
		(0.001)	(0.001)	(0.001)	(0.001)
Kinder		0.021***	0.017***	0.017***	0.017***
		(0.002)	(0.002)	(0.002)	(0.002)
L(Family Income)		0.026***	0.026***	0.026***	0.026***
		(0.001)	(0.001)	(0.001)	(0.001)
Mother´s Education		0.007***	0.007***	0.007***	0.007***
		(0.000)	(0.000)	(0.000)	(0.000)
School Variables					
D_Adel			-0.065	-0.740**	-0.746**
			(0.044)	(0.368)	(0.374)
D_Corp			-0.017***	-0.127***	-0.123***
			(0.004)	(0.033)	(0.033)
Rural School			0.026***	0.024***	0.024***
			(0.003)	(0.003)	(0.003)	
L(Nº Students)			0.016***	0.016***	0.016***
			(0.001)	(0.001)	(0.001)
Municipal and interaction Variables					
L(Nº Mun Schools)				0.006**	0.006**
				(0.002)	(0.002)
L(SIMCE_Sub)				0.275***	0.276***
				(0.021)	(0.021)
Conurbation				-0.026***	-0.025***
				(0.004)	(0.004)
$\widehat{FD_1}$				0.091**	
				(0.039)	
$\widehat{FD_1}$				0.057**	
				(0.024)	
$\widehat{FD_1}$ × *D_Adel*				1.239*	
				(0.685)	
$\widehat{FD_1}$ × *D_Corp*				0.167***	
				(0.050)	
$\widehat{FD_2}$					0.091**
					(0.039)
$\widehat{FD_2}$					0.059**
					(0.024)
$\widehat{FD_2}$ × *D_Adel*					1.256*
					(0.699)
$\widehat{FD_2}$ × *D_Corp*					0.161***
					(0.050)
TIME	0.006***	0.005***	0.006***	0.005***	0.005***
	(0.001)	(0.001)	(0.001)	(0.002)	(0.002)
CONST	5.458***	5.339***	5.254***	3.687***	3.683***
	(0.004)	(0.004)	(0.007)	(0.116)	(0.116)
Random Effect Parameters					
sd(cons): Municipal -year	0.042	0.044	0.044	0.037	0.037
sd(cons): School	0.082				
School- (Unstructured)					
Sd (*Mother´s Education)*		0.003	0.003	0.003	0.003
sd(cons)		0.095	0.095	0.094	0.094
Corr (*Mother´s Education*, cons)		-0.684	-0.698	-0.684	-0.684
sd(Residual)	0.184	0.181	0.181	0.181	0.181
Obs.	308,594	266,080	266,080	249,755	249,755
ICC (by level)					
Municipal-year	0.042	0.044	0.044	0.031	0.031
School	0.201	0.252	0.250	0.238	0.238
AIC	-147,148	-135,689	-135,932	-127,814	-127,814
BIC	-147,094	-135,574	-135,775	-127,585	-127,584
Log Likelihood	73,579	67,855	67,981	63,930	63,929

Standard errors are in parenthesis. Levels of significance: *** $p<0.01$, ** $p<0.05$, * $p<0.1$.
L: variable in Neperian Logarithm.
Source: Own estimations using SINIM and Ministry of Education.

Table 3. Language Score estimations

	Lang_1	Lang_2	Lang_3	Lang_4	Lang_5
Individual Variables					
Gender		0.046***	0.046***	0.045***	0.045***
		(0.001)	(0.001)	(0.001)	(0.001)
Kinder		0.004**	0.008***	0.008***	0.008***
		(0.002)	(0.002)	(0.002)	(0.002)
L(Family Income)		0.025***	0.025***	0.025***	0.025***
		(0.001)	(0.001)	(0.001)	(0.001)
Mother´s Education		0.007***	0.008***	0.008***	0.008***
		(0.000)	(0.000)	(0.000)	(0.000)
School Variables					
D_Adel			0.040	-0.578*	-0.584*
			(0.040)	(0.329)	(0.334)
D_Corp			-0.016***	-0.114***	-0.110***
			(0.003)	(0.027)	(0.027)
Rural School			0.023***	0.022***	0.022***
			(0.002)	(0.002)	(0.002)
L(Nº Students)			-0.003***	-0.001	-0.001
			(0.001)	(0.001)	(0.001)
Municipal and interaction Variables					
L(Nº Mun Schools)				0.011***	0.011***
				(0.002)	(0.002)
L(SIMCE_Sub)				0.114***	0.114***
				(0.024)	(0.024)
Conurbation				-0.025***	-0.024***
				(0.003)	(0.003)
$\overline{FD_3}$				0.034	
				(0.034)	
$\overline{FD_3}$				0.074***	
				(0.021)	
$\overline{FD_3}$ × *D_Adel*				1.134*	
				(0.612)	
$\overline{FD_3}$ × *D_Corp*				0.142***	
				(0.042)	
$\overline{FD_5}$					0.034
					(0.034)
$\overline{FD_5}$					0.076***
					(0.020)
$\overline{FD_5}$ × *D_Adel*					1.150*
					(0.624)
$\overline{FD_5}$ × *D_Corp*					0.138***
					(0.042)
TIME	0.006***	0.006***	0.006***	0.006***	0.006***
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
CONST	5.502***	5.324***	5.326***	4.610***	4.607***
	(0.003)	(0.004)	(0.006)	(0.133)	(0.133)
Random Effect Parameters					
sd(cons): Municipal - year	0.037	0.039	0.034	0.030	0.030
sd(cons): School	0.066				
School-Municipal-Year (Unstructured)					
Sd(*Mother´s Education*)		0.003	0.003	0.003	0.003
sd(cons)		0.076	0.076	0.076	0.076
corr(*Mother´s Education*, cons)		-0.668	-0.657	-0.652	-0.652
sd(Residual)	0.200	0.192	0.192	0.192	0.192
Obs.	307,498	264,413	264,413	243,536	243,536
ICC (by level)					
Municipal-year	0.031	0.034	0.026	0.026	0.026
School	0.128	0.167	0.159	0.154	0.154
AIC	-113,976	-108,952	-109,230	-100,203	-100,202
BIC	-113,923	-108,837	-109,073	-99,974	-99,974
Log Likelihood	56,993	54,487	54,630	50,124	50,123

Standard errors are in parenthesis. Levels of significance: *** $p<0.01$, ** $p<0.05$, * $p<0.1$.
L: variable in Neperian Logarithm.
Source: Own estimations using SINIM and Ministry of Education.

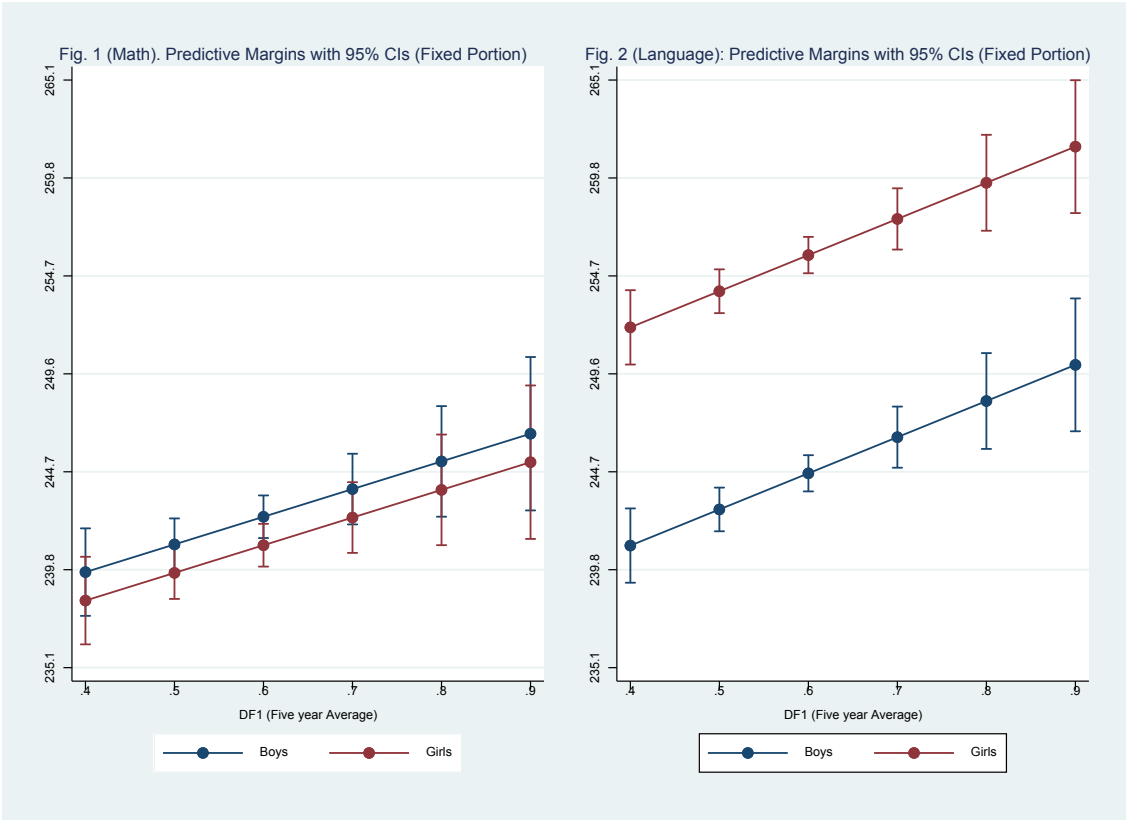
If we look at the Interclass Correlation Coefficient (ICC), this does not differ significantly across estimations. The municipal-year level shows a slight downward variation as we add groups of covariates (school and municipal levels). This shows a value close to 3% in regressions on the math test (Math_4 and Math_5). Interestingly, the contribution of the school level appears to be lower in language. By comparing the same estimations, we see that the ICC equals 0.24 in math (Math_4 and Math_5), and only

0.15 in language (Lang_4 and Lang_5). Since the ICC of the municipal-year level is about the same in both math and language for these same regressions, said result can be interpreted as evidence that schools appear to have a lower role in language as compared to math, which raises the relevance of family (mother's education) in the first case.

As far as specific variables are concerned, results suggest that girls perform worse in math than boys and vice versa. This is consistent with international comparisons on reading attainment, and it probably originates in the custom of parents to read more to girls than boys (UNESCO 2019). As for mother's education, this appears to have a very significant effect on scores. Said finding is not a surprise, since an important job access gap still exists in Chile, which makes most mothers stay at home[13]. The random component of mother's effect exhibits a strong negative correlation with the school level random coefficient (below -0.65), which can be interpreted as evidence of a decreasing role of family background as the school quality gets better. This finding has major policy implications, as it strengthens the need of high quality public education to improve opportunities among children with a poor family background. Similarly, the higher attainment of *Kinder* children provides further evidence on the need to prioritize preschool formal education. Once more, results show that the coefficient in math (0.017) is almost twice as high as the one for language (0.008), which reinforces the role of preschool education to develop math skills.

Concerning municipal level controls, it can be seen that *PPP* schools' score (*L_SIMCE_Sub*) do have an effect on municipal school students, that corporations and delegated schools appear to have a lower performance relative to DEM schools and that rural schools outperform non-rural ones. This last result is in line with the hypotheses that small communities are in a better position to surveil municipal authorities and enforce most benefits from decentralization. As it becomes clear from results, the contrary occurs among non-urban schools, which suggests that poor urban schools have a clear disadvantage. Decentralization (*FD*) is significant in both sets of regressions. As for math, the overtime effect (FD^C) as well as cross municipal effect ($\overline{FD}$) are significant. This last effect is stronger in reading than in math scores (0.074 v/s 0.057) and it contributes to improve delegated and corporation schools scores (interaction effects). Result shows very little change when using FD_2 as a proxy.

A graphic representation based on variations of DF_1 (*horizontal axis*) is presented in figures 1 and 2. They show a simulation of the fixed (non-random) part of estimations in Math_4 and Lang_4. Said simulation assumes the school is run by a *DAM* (*D_Adel = D_Corp =0*) and is not located in a rural zone (*Rural School = 0*). While the effect of $\overline{DF}_1$ is significant, it is rather small. A *FD* variation from 0.4 (lowest in the figure) to 0.9 (highest in the figure), leads to an increase of approximately 7 points in the math score and about 10 points in language.



[13] Evidence for the USA suggests that collage educated mothers spend more time with their children as compared to high school educated ones, which is likely to reinforce this same effect (Guryan et. al. 2008).

Results above suggest that, after controlling by a sound set of covariates, municipal schools' outcome is diverse. Among observable variables, this depends on the degree of municipal fiscal autonomy. One way of strengthening municipalities in this regard, is to give them more power to decide on taxes and tax bases. This is a traditional dimension of *FD*, which in the case of Chile, would require significant changes on the existing law that regulates local revenues. A second mechanism consists in strengthening the fiscal equalization model in force. Most likely, this requires some direct – and probably significant- contribution from the central government to the so called Common Municipal Fund, which operates as an inter-municipal redistribution fund. Since none of these two measurements are politically viable in the short run, a "selective" decentralization model is the best option to take. As opposed to an "all across the board" devolution of schools to the LES (as the existing law suggests), some well performing municipalities should be given the opportunity to keep their schools.

6. Conclusions

We show evidence that municipal fiscal autonomy in Chile has a positive effect on students' performance at school (Hypothesis 1), which is in line with former studies on the subject matter (Channa and Faguet 2016). Recommendable policy options include giving municipalities more leeway to decide on taxes and tax bases and a more generous inter municipal fiscal equalization fund. As opposed to other functions usually performed by the local level, educational services are relatively easy to monitor, which potentially makes them into a good area to decentralize. In such context, it comes to no wonder that public-private arrangements in the administration of public schools (corporation and delegated establishments), appear to have no significant advantages in the sample. In light of the reform being implemented in Chile, which devolves all municipal schools to the newly created LES, our results suggest that some schools might become worse off relative to the existing scenario. Given the uneven inter-municipal distribution of fiscal capacity in Chile, we conclude that a first best policy option hinges upon a "selective" decentralization model, thereby some municipal governments may keep the administration of public school.

We also provide evidence that rural municipalities perform better in standardized tests than urban ones. In contrast to the case of nonurban areas, said evidence conforms to Hypothesis 2 as it suggests that small communities where families know each other and the school is a relevant place for them to meet, are in a better position to make local authorities accountable for their actions. Our estimations also show that school management is subject to important economies of scale (Hypothesis 3), which expresses in relatively poor test scores in schools with a low number of students and municipalities that run very few schools.

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