Education and Decentralization in Chile. A multilevel analysis

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Abstract

The Chilean education system is undergoing a dramatic reform. Since the early 80s, public schools have been administered by municipal governments, which also contribute to educational funding. A Law that was passed in 2017 establishes major changes on that model, one them being that schools will be removed from the municipal control and made dependent on 70 newly created educational districts. We hypothesize that fiscally autonomous municipalities should continue running schools, as students are likely to be worse off under the new administration scheme. This study uses a multilevel technique to examine the source of variation of individual standardized school tests taken to students in their fourth year at school. We take advantage of a survey applied on students and parents on a range of school specific matters. This data is combined with school level information on teachers, and contextual municipal data. The contribution of the municipal level in the educational outcome appears to be small, but significant. The clear relevance of student and school level variables calls for a focus on pre-school education and teachers' quality.

Keywords— Economics of Education, Fiscal Decentralization, Local Governments, Public Economics.

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I. Introduction

A long lasting debate exists about the main sources of variation in students' performance. Three types of factors should be mentioned. The first one is the family level, which is usually associated with a range of home characteristics. Second, there exists a contextual influence that hinges upon community aspects. Third, the school itself plays a major role, since teacher motivation and staff quality may have fundamental effects on students. While available resources to public education usually fall short of real needs, we hypothesize that their effect depends on the extent to which they can be used correctly. 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 (PPP schools), and the establishment of a "voucher per student" mechanism, which was meant to be complemented by voluntary contributions from the school holders. Municipal and PPP schools were assumed to compete with each other, leading to lower operation costs and a better national educational outcome. An extensive debate has taken place ever since regarding the extent to which the inter school competition and decentralization referred to above did produce the expected benefits. Alleged weaknesses of the model include its potential bias to produce segregation between schools, the lack of resources from some municipalities to co-funding education and the lack of enough students in some schools to reach a minimally acceptable teaching staff. To this must be added that PISA scores for Chilean 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.

A Law was passed in 2017, which returns existing municipal schools to the administration of 70 newly created school districts. While these new entities will be legally "independent", they will formally depend on the Ministry of Education. Despite the general bad performance of municipal schools in Chile, most of the empirical studies support the view that decentralization in general, and fiscal decentralization in particular enhance the quality of public education. This paper goes one step ahead by conducting a multilevel analysis of students' performance, in which individual results (first level analysis) in standardized national tests are explained by; i) Municipal Fiscal Autonomy (second level), and ii) School Management Characteristics (third level). This allows us to estimate the contribution of specific variables as well as above three separate levels to

individual students' outcome. We hypothesize that the municipal level plays a major role, which supports previous research on the matter and strengthens the argument that selective local governments have a satisfactory capacity to run public schools. Our data is made up of 345 municipalities and more than 5.000 individuals' surveys on parents that are hosted in specific schools. Reported estimations show contextual variables, this being mainly captured by the municipal fiscal autonomy, paly a minor role on students' performance. Nonetheless, our proxy for municipal fiscal autonomy is significant in explaining students´ scores.

The rest of this paper is organized as follows. Section II presents the literature. Section III summarizes the Chilean case. Section IV shows the empirical analysis and section V presents conclusions and policy implications.

II. The literature

The Role of Teachers

Among school level factors that might affect educational outcome, a strand of research highlights the importance of teachers' quality (Hanushek 1986, Rivkin et, al. 2005, Rockoff 2004, Sander and Dinand 2017). Regardless of whether that quality relates to academic degrees held by teachers themselves (Dee and Cohodes 2008), motivational factors underlying the specific school they work for and/or the type of contract they have (Andersen 2014), most teachers' quality characteristics are likely to be unobservable. This literature suggests that school level policies of personnel should be based on students' achievements, and it opens the question as to how in practice, teachers´ promotion should work. First, some agreed upon, achievement-based instrument should measure teachers' quality. Second, school principals and/or those in charge to decide on the staff should have enough leeway to reward well-performed teachers as well as penalize badly performed ones. Related evidence for Chile focuses on the so-called "National System of School Performance Assessment", which measures school performance based on the score attained in the SIMCE test (more of this below). A unique experience was first developed in 1996, thereby teachers of best performed schools were given an economic incentive. A study by Contreras and Rau (2012) finds a significant effect of said incentive program on school performance. Along similar lines, Letelier and Ormeño (2018) hypothesize that the existing

"teachers´ statute", which forces municipal stockholders to pay significant compensations to fire bad-performed teachers, makes it difficult to enforces positive (and negative) incentives on staff. Separate mention deserves the so called "peer effect", which predicts that student´s classmates play a major role in explaining individual academic performance. While this being is a sound but very difficult to test hypothesis, available empirical evidence shows this effect to be significant but modest relative to family background and teachers' quality (e.g. Gibbons and Telhaj 2016). Related evidence for Chile suggests that average mothers´ education within the class is a significant factor in students' achievement, this being evidence that external factors to individual students do affect their academic performance (McEwan 2003). Similarly, Mizala and Torche (2012) show that individual students' socio economic status matters less in PPP schools relative to public (municipal) ones in Chile. This can be interpreted as evidence of a significant contextual effect on students' performance, which is reinforced by the strong stratification of the Chilean educational system.

School Resources

A compulsory starting point on the matter is the well-known Coleman report (Coleman et. al. 1966), which was based on a comprehensive data set from the USA. As opposed to the view that more school resources matter, this study´s main conclusion was that individuals´ socio economic background was the most important explanatory variable of students´ academic performance (e.g. Hedges et. al. 2017). In particular, family income, parents' education, family structure and ethnicity are likely to be the most important factors. Said result and the subsequent development of new and richer data sets triggered a flourishing empirical literature intended to address this same question. A major contributor on the matter has been Hanushek, who developed a series of empirical studies that supported Coleman´s conclusions. In a comprehensive survey of available evidence, Hanushek (1996) concludes that no robust and consistent evidence exists that supports the hypothesis that more resources have a significant effect on educational achievements. A myriad of studies have contributed with further evidence to support this apparent paradox. For example Hakkinen et. al. (2003) uses a panel to estimate the effect of the reduction in school resources in Finland over the 1990s recession and find no relation between that episode and students´ academic performance. By using more up-to date evidence, Hanushek and Woessmann (2017) corroborate that finding, albeit they warn that more resources leading to small sized classes might be effective for low quality teachers only. A common explanation to above

evidence states that a number of relevant educational improving factors might be difficult to measure or even unobservable. This may include teachers' motivation (Ferguson 1991), parental effort (Houtenville 2008) and the like. Nonetheless, above evidence has been challenged in a series of studies. A referential one is that by Hedges and Greenwald (1996), who conclude that more resources leading to smaller class sizes and better teacher experience do affect educational performance positively. Similar conclusions were reached by Ferguson (1991), Wenglinsky (1997), Arias and Walker (2003), Kruger (2003), Heinesen (2010), Baker (2016), among others. Finally, some literature suggests that more expenditure improves academic performance at the primary level only, and/or that said improvement becomes apparent in the form of better future socioeconomic status of students (e.g. Nyhan and Alkadry 1999).

Various explanations to above paradox have been put forward. First, it might be argued that the lack of a unique and clearly established view on the matter hinges upon the complexity of the problem in question and the fact that information rooted on local stakeholders and educators themselves has not been properly considered in most studies (Hedges et. al. 2016). Second, there is the chance that most empirical studies report biased results that underestimate the class-size effect. This may occur because students' performance and expenditures may explain each other. Along this lines, Wößmann (2007) states that students are likely to be allocated to classes of different sizes on the basis of their performance, which may occur both between as well as within schools. As this entails a typical endogeneity bias, it sheds doubts on the lack of statistical significance of additional resources. As stated above, a third line of explanations hinges upon a set of unobserved factors that may affect students' performance. An important variable to look at is the extent to which more resources may indeed be spent on items leading to better quality education. Very often, more funding is used to improving teachers´ salaries, without this being related to more effort to raise academic standard. While well-payed teachers are likely to be a precondition to attain a better educational output, equal benefits for all teachers may have no effect of educational outcomes. On the one hand, teachers´ unions may lower staff turnover and standardize the workplace. One the other, some evidence suggests that unions facilitate teachers' rent- seeking (Cowen and trunk 2015), leading to lower students' attainment (Lott and Kenny 2013).

School Performance and Decentralization

The debate on how decentralization in general and fiscal decentralization in particular affects the quality of public education has seen a significantly revitalization since at least the early 90s. Theoretically, decentralization is generally good as it uses available information of people´s demands more efficiency (Von Hayek 1945), it adjusts public goods supply to the local community preferences (Oates 1972), it promotes horizontal competition among jurisdictions (Tiebout 1956) and strengthens government´s accountability (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 myriad of theoretical weaknesses of arguments above (Treisman 2007). Concerning educational in particular, political and fiscal decentralization are expected to make local authorities more responsive to the quality of the teaching staff, the type of education being provided and the required educational facilities. Among all government function, school education is one in which the local community is most likely to get involved.

Cross-country evidence generally shows that the degree of autonomy given to subnational governments (usually fiscal), has a significant positive effect on the expenditure made on education and/or the academic performance of public schools (e.g Falch and Fisher 2012). Country level evidence on the benefit of decentralization in education has been found in the cases of Switzerland (Barankay and Lockwood 2007), Phillipines (Behrman et al. 2003), Nigeria (Akpan 2011), Spain (Slinas and Solé-Ollé 2009), the United States (Akai et al. (2007), Argentina (Galiani and Schargrodsky 2002), Nicaragua (King and Osler 2000), Bolivia and Colombia (Faguet and Sánchez 2007), among other studies. Non-conclusive or even skeptical results of similar devolution experiences have been reported for Colombia (Melo 2012), Sweden (Ahlin and Mork 2008), Indonesia (Kristiansen and Pratikno 2006, Toi 2010, Muttaqin et al. 2015) , and China (Luo and Chen 2010, Wang et al. 2011). In light of above evidence, two relevant questions are in order. First, since the type of decentralization being examined might be fiscal, political or purely administrative, a question then follows as to what specific type is the most effective one. A study by Jeong et. al (2017) addresses this for Korea. While fiscal decentralization seems to improve students' performance, political decentralization does not. Second, even if fiscal decentralization matters, a relevant consideration hinges upon the type of

decisions that most likely affect students´ performance. Naper (2010) suggests that Norwegian school districts in which the hiring of teachers is decentralized are the best performed ones, which implies that ideally, school districts should have at least some administrative leeway on staff for decentralization to have an effect.

As far as the Chilean case is concerned, Letelier and Ormeño (2018) produce strong evidence that local fiscal autonomy improves municipal schools academic performance. This result is based on a panel of municipal level data, in which three alternative proxies of autonomy are taken to test. They are the share of expenditures under municipal control, the municipally funded share of educational expenditures and a factor component metrics that reflects the degree of municipal fiscal autonomy as a proxy of fiscal decentralization. In all cases, average standardized scores of tests on language and math tests appear to be sensitive to municipal fiscal autonomy. While the type of educational administrative functions being performed by municipal governments in Chile are the same in all jurisdictions, said result gives support to the view that more fiscally decentralized jurisdictions prioritize education as a major community target, and that this hinges upon the leeway that local governments have to decide on the way they use their money.

III. The Chilean case.

The Institutional Structure

By the beginning of the 80s, a unique but controversial system of funding and running schools was launched in Chile. This was based on three complementary pillars. One, public schools were to be run by municipal governments. Originally, they decided on both the teaching stuff, as well as on the maintenance and improvement of infrastructure. Since 1991, a legal reform severely curtailed municipal autonomy in this regard. Second, the funding system rested on a voucher per student model, which was assumed to boost competition across schools. Third, a parallel public funded administration model was established, thereby private stakeholders were allowed to participate in the educational market place in a similar way as municipal schools do. While these "subsidized private schools" (PPP) would receive the same type of voucher per student as municipal ones, its value would decline as the fee being charged by PPP schools raised. Above model is currently going through a process of dramatic reforms. For profit PPP schools were

banned in 2015[3] and existing public schools are planned to be removed from the municipal administration and made dependent on seventy newly created Educational Local Services. These will be deconcentrated jurisdictions from the central government, and as such, they will have no elected authorities but a Community Council formed by community representatives. A debate remains on whether all public schools should be made dependent on said districts, or whether well-performed ones should remain under municipal control.

As far as the teaching staff is concerned, the existing "Teachers´ Statute" establishes tight limits on municipal authorities. First, it defines country level "minimum wages" for teachers. Second, although municipal authorities may fire bad performed 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, this is clearly biased toward well-evaluated teachers, as badly evaluated ones are not easily removed from their job (e.g. Bonifaz 2011). Since the municipal government is assumed to play an administrative control on the school, the question then arises as to what type of relevant decisions may the municipal government take that have an impact on schools performance. As suggested above, the municipal leeway is rather low and it critically dependents on available resources.

IV Empirical Analysis

Data Summary

The data set used in this study is based on information from three sources (table 1). Frist, we take advantage from a survey conducted by the Ministry of Education (MINEDUC) on individual students and parents. Complementary data is taken from on line information provided my MINEDUC on school level characteristics, and municipal fiscal information produced by the Ministry of Interior Affairs (SINIM). Individual students´ academic performance ismeasured by their score at the SIMCE test (more of this below).

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

A data summary table is presented below (table 2). The data corresponds to information takes in 2013, as this was the last year in which the student and parents survey was applied. Individual level variables taken from that survey include; average parents scholarly (*Edupm*), interactive variable for the cases in which the adult in charge is the mother (*madre_ap*), a dummy for parents who "always explain" academic questions being asked by kids (*explica_siempre_pa*) a dummy for students who attended kinder level (*kinder*), and a dummy that captures the extent to which the teachers explain doubts from students (*explica_todos*). School level variables include a dummy for rural establishments (*rural*), one for teachers holding a master degree (*master*), one for teachers holding a second undergraduate degree (*otro_tit*), and the school ratio of non-teachers to teachers in the staff (*auxi_prof*). Three control variables account for the municipal contribution to education. Variable *ln_gasto_ed* stands for the scale effect of spending more and having a larger number of students. A proxy for municipal fiscal autonomy is included (*df1_pob*), which measures the freely disposable municipal revenues per head after the expenditure on personnel has been subtracted (Letelier and Ormeño 2018). Finally, under the assumption that that local fiscal autonomy has a higher impact when parents have a higher level of education, the interaction between *ln_gasto_ed* and *Edupm* was included (*edupm_df1pob*). Our dependent variable is the student´s score in the SIMCE test [4], which measures math and language skills. While this test is taken at different school levels, the reported score corresponds to individual students' attainment at the 4th degree level of primary school. Variable *Simce_mun* stands for the average of math and language, *ptje_mate4* is the math score and *ptje_lect4* is the language score.

As shown in table 1, a characteristic worth mentioning of the data is that individual level variables exhibit a substantially higher Coefficient of Variation (CV) relative to school level and municipal level variables, the only exception being the case of the municipal expenditure on education (*ln_gasto_ed stads*)[5]. This is particularly visible for the dependent variable, as it exhibits a CV equals or higher than 4,9 in the three measurements being used. Said behavior reflects huge differences across students and anticipates that most variation of individual test scores will be explained individual level data. Interestingly, this variation is equally high – or even higher, for variable *kinder* and *Edupm*. This provides prima facie evidence that students´ background is a major factor in explaining students' performance. Among municipal level variables (*df1_pob*, *edupm_df1pob*), variation is still important but small with regard to students' individual

[4] System of Educacional Quality Evaluation System (*Sistema de Medición de la Calidad de la Educación*)

[5] Since municipalities differ substantially in the number of students they attend, it comes to no wonder that *ln_gasto_ed stads* registers a high intermunicipal variation.

characteristics. Municipal governments differ substantially in their degree of fiscal autonomy, which is the result of them having different tax bases. This responds to the type of municipal residents as well as the concentration of commercial activities in local territory.

Main Results

Our main empirical finding is that the interclass correlation at the municipal level is generally low (less than 0.03), which suggests a relatively modest role of the municipal government (third level of analysis) on individual students performance. This same correlation is relatively higher for schools within the municipal level (ICC from 0.14 upward), which reveals a major role being played by the school community. Nonetheless, the way in which school level factors interact to produce an output is difficult to explore, as variables we observe are usually endogenous to the students' academic performance itself. First, our results show that the non-teachers to teachers' ratio – this being taken as a proxy of school well-functioning, reflects that badly administered schools have worse outcomes. It follows that close monitoring of students, well-motivated personnel and well-designed incentives for teachers to get involved with students´ attainments are important factors to look at. Consistent with this, it can be observed that teachers holding a master degree do better, as this is a significant variable in all estimations. While this should be taken as proxy of motivated teachers, the question remains as to why some schools exhibit good results as compared to others. Despite municipal ICC being small, regression results from tables 3 to 5 shows that municipal fiscal autonomy (*df1_pop*) is a significant variable in all cases (regression 4). However, this effect is particularly clear when said variable is interacted with average parents' education (*edupm_df1pob*), which reflects a stronger impact of the municipal fiscal capacity when this is combined with a more educated community. Note that both the Akaike Information Criterion (AIC) as well as the Bayesian information Criterion (BIC) show that estimations 4 and 5 in all tables rank better than remaining estimates, albeit they are not clearly distinguishable between each other. On the basis of above results, the question remains as to whether fiscal decentralization makes a difference on students´ performance. The significance of *df1_pop* in regression 4 and of *edupm_df1pob* (all tables) should be interpreted as evidence in support of that hypothesis. The fact that the school level appears to have a higher ICC within the municipal level should be interpreted in light of the fact that municipal government are the ones that can decide on teachers and non-teacher personnel. As stated above, the existing teachers' statute establishes a minimum salary for teachers and a significant

compensation in case a badly evaluated teacher is to be fired. It follows that only fiscally autonomous municipal governments are in a position to decide on staff, which strengthens the argument according to which only fiscally autonomous jurisdiction are in a precondition to have well-administered municipal schools. Above results confirm most of the available empirical evidence that supports the view that students´backgrpund characteristics are a fundamental factor in explaining academic attainment. Among specific factors being detected, the fact of whether the student attended a preschool level (*kinder*), appears to be a determinant factor. Further confirmation of it follows from the significant effect of parents´ educational level and parent´s willingness to help kids in answering academic doubts.

V. Conclusions and Policy recommendations.

Our empirical analysis shows that individual students' background as well as school level characteristics are major factors in explaining students' academic performance. Nonetheless, municipal fiscal autonomy appears to be a significant variable in all estimations, this effect being stronger in municipalities with a higher level of parents' average education. While the share of all variance being explained by the municipal level is small, the model in force since the early 80s in Chile concedes municipalities a potentially significant role in the administration of school personnel. Nonetheless, this role can be only exercised in case the municipal administration has enough fiscal autonomy to decide on teachers' removal and/or the establishment of wage related positive incentives. This implies that, while more expenditure in education matter, this has to be accompanied by some leeway to decide on staff. In line with the bulk of the existing literature, our estimations support the view according to which the most important factor in explaining students' performance is the individual student´s background, of which parents´ education and preschool education are relevant variables. Policy recommendations based on these findings suggest that more has to be done to further equalize municipal fiscal autonomy and to give them more leeway to administer school personnel. While a Law was passed in Chile, thereby all municipal schools are to be handed over to newly created educational districts, some think that selected municipalities should keep their schools, as a new administration scheme does not necessarily leads to a better outcome.

TABLES

Table 1: Data Summary

	Name of Variable	N	Mean	Std. Dev.	Coefficient of Variation	Max	Min
Individual Level	*Simce_mun*	209,570	260.419	47.284	5,5	378.785	101.615
	ptje_mate4~u	213,575	256.240	51.935	4,9	395.73	82.87
	ptje_lect4~u	213,111	263.916	50.804	5,2	378.17	118.42
	Edupm	187,437	12.793	3.290	3,9	20	1
	madre_ap	189,575	0.810	0.392	2,1	1	0
	explica_siempre_pa	238,985	0.603	0.489	1,2	1	0
	kinder	199,711	0.971	0.169	5,7	1	0
	explica_todos	241,398	2.528	0.744	3,4	3	0
School Level	*nin_tit*	236,672	0.00033	0.018	0,0	1	0
	otro_tit	236,672	0.0007	0.026	0,0	1	0
	master	238,599	0.062	0.241	0,3	1	0
	rural_rbd	245,764	0.115	0.319	0,4	1	0
	auxi_prof	238,840	0.118	0.117	1,0	1	0
Municipal Level	*ln_gasto_ed*	245,972	16.184	0.874	18,5	17.775	11.831
	df1_pob	245,980	168.169	141.971	1,2	3671.644	68.355
	edupm_df1pob	187,387	2,198.335	2,230.941	1,0	47731.37	78.39825

Table 2 Definition of Variables

Variable Name	Definition
Simce_mun	Student´s average SIMCE score (math and language).
ptje_mate4~u	Student´s average SIMCE score in math
ptje_lect4~u	Student´s average SIMCE score in language.
Edupm	It represents average parent´s education. Starting with the preschool level, it takes discrete numbers for every additional year of education. Number "17" represents incomplete tertiary education, number "18" reflects complete tertiary education, "19" is a master degree and "20" is a master degree.
madre_ap	Interactive variable for the case in which the student´s attorney is the mother.
explica_siempre_pa	A Dummy for the case in which parents always explain children what they do not understand at school.
kinder	A Dummy in case the student attended a preschool establishment.
explica_todos	It measures the extent to which the teacher explains until all students understand. Where "0" means never, "1" means few times, "2" means many times and "3" means always.
nin_tit	Dummy in case the teacher holds no university degree.
otro_tit	Dummy in case the teacher holds a second tertiary degree (other than the teacher degree)
master	Dummy in case the teacher holds a master degree.
rural_rbd	Dummy for rural schools
auxi_prof	Ration of non-teachers to teachers in the school staff.
ln_gasto_ed	Log of the municipal annual expenditure on education
df1_pob	Municipal Fiscal Autonomy. It is the total municipal revenues (*MR*) minus the expenditure on personnel (*GP*) over the local population (*POP*). $$df1\_pob = \frac{(MR - [GP])}{POB}$$
edupm_df1pob	Interaction variable; $edupm\_df1pop = (df1\_pop) \times (edupm)$

Table 3: Average SIMCE Score (*Simce_mun*)

VARIABLES	simce_mun (1)	simce_mun (2)	simce_mun (3)	simce_mun (4)	simce_mun (5)
edupm		2.917***	2.868***	2.865***	2.729***
		(0.0423)	(0.0430)	(0.0431)	(0.0685)
madre_ap		1.243***	1.328***	1.330***	1.332***
		(0.268)	(0.273)	(0.273)	(0.273)
explica_siempre_pa		0.183	0.196	0.196	0.197
		(0.216)	(0.219)	(0.219)	(0.219)
kinder		4.460***	4.357***	4.380***	4.351***
		(0.762)	(0.812)	(0.812)	(0.812)
explica_todos		0.873***	0.877***	0.879***	0.878***
		(0.146)	(0.148)	(0.148)	(0.148)
nin_tit		-35.23**	-34.84**	-34.95**	-34.81**
		(15.42)	(15.22)	(15.22)	(15.23)
otro_tit		-21.13***	-21.14***	-21.13***	-21.13***
		(6.372)	(6.360)	(6.360)	(6.361)
master		2.637***	2.624***	2.606***	2.598***
		(0.633)	(0.650)	(0.650)	(0.650)
rural_rbd			-2.279***	-2.281***	-2.242***
			(0.770)	(0.792)	(0.791)
auxi_prof			-10.13***	-10.21***	-10.19***
			(2.060)	(2.056)	(2.056)
ln_gasto_ed				0.409	0.314
				(0.635)	(0.629)
df1_pob				0.00935***	-0.00118
				(0.00302)	(0.00514)
edupm_df1pob					0.000860**
					(0.000337)
Constant	252.4***	212.9***	215.5***	207.3***	210.5***
	(0.621)	(1.046)	(1.204)	(10.12)	(10.10)
Observations	209,570	157,772	153,601	153,596	153,596
Number of groups	342	338	337	336	336
ICC					
Municipality	0.04	0.03	0.024	0.022	0.021
School/Municipality	0.26	0.20	0.19	0.19	0.19
AIC	2,162,606	1,624,391	1,581,901	1,581,844	1,581,840
BIC	2,162,647	1,624,511	1,582,041	1,582,004	1,582,009

Table 4 SIMCE score Math

VARIABLES	ptje_mate4b (1)	ptje_mate4b (2)	ptje_mate4b (3)	ptje_mate4b (4)	ptje_mate4b (5)
edupm		2.887***	2.817***	2.812***	2.697***
		(0.0463)	(0.0471)	(0.0471)	(0.0750)
madre_ap		1.441***	1.520***	1.524***	1.526***
		(0.293)	(0.298)	(0.298)	(0.298)
explica_siempre_pa		0.00741	0.00782	0.00669	0.00823
		(0.236)	(0.239)	(0.239)	(0.239)
kinder		6.410***	5.702***	5.718***	5.697***
		(0.835)	(0.888)	(0.888)	(0.888)
explica_todos		0.909***	0.917***	0.919***	0.919***
		(0.159)	(0.162)	(0.162)	(0.162)
nin_tit		-37.55**	-37.24**	-37.42**	-37.30**
		(17.41)	(17.13)	(17.13)	(17.14)
otro_tit		-19.28***	-19.52***	-19.53***	-19.53***
		(7.035)	(7.016)	(7.016)	(7.017)
master		2.762***	2.773***	2.746***	2.740***
		(0.697)	(0.716)	(0.716)	(0.716)
rural_rbd			-4.972***	-4.833***	-4.803***
			(0.866)	(0.890)	(0.889)
auxi_prof			-9.042***	-9.130***	-9.114***
			(2.311)	(2.307)	(2.306)
ln_gasto_ed				1.007	0.923
				(0.713)	(0.709)
df1_pob				0.0119***	0.00289
				(0.00339)	(0.00567)
edupm_df1pob					0.000733**
					(0.000369)
Constant	246.4***	205.8***	210.1***	192.2***	194.9***
	(0.715)	(1.155)	(1.328)	(11.38)	(11.38)
Observations	213,575	159,043	154,842	154,837	154,837
Number of groups	342	338	337	336	336
ICC					
Municipality	0.04	0.024	0.025	0.022	0.022
School/Municipality	0.27	0.21	0.20	0.20	0.20
AIC	2,242,894	1,667,142	1,623,452	1,623,391	1,623,389
BIC	2,242,935	1,667,262	1,623,591	1,623,550	1,623,558

Table 5 SIMCE score Language					
VARIABLES	ptje_lect4b (1)	ptje_lect4b (2)	ptje_lect4b (3)	ptje_lect4b (4)	ptje_lect4b (5)
edupm		3.052***	3.020***	3.017***	2.869***
		(0.0465)	(0.0475)	(0.0475)	(0.0752)
madre_ap		1.092***	1.190***	1.191***	1.193***
		(0.299)	(0.305)	(0.305)	(0.305)
explica_siempre_pa		0.426*	0.451*	0.450*	0.452*
		(0.241)	(0.245)	(0.245)	(0.245)
kinder		2.051**	2.679***	2.715***	2.678***
		(0.835)	(0.894)	(0.894)	(0.894)
explica_todos		0.928***	0.936***	0.938***	0.937***
		(0.162)	(0.165)	(0.165)	(0.165)
nin_tit		-33.37**	-32.98**	-33.04**	-32.89**
		(14.94)	(14.81)	(14.81)	(14.82)
otro_tit		-24.01***	-23.70***	-23.66***	-23.66***
		(6.792)	(6.784)	(6.785)	(6.786)
master		2.637***	2.624***	2.613***	2.601***
		(0.682)	(0.701)	(0.701)	(0.701)
rural_rbd			0.254	0.119	0.162
			(0.757)	(0.778)	(0.777)
auxi_prof			-11.87***	-11.95***	-11.94***
			(2.041)	(2.038)	(2.037)
ln_gasto_ed				-0.128	-0.228
				(0.594)	(0.589)
df1_pob				0.00749**	-0.00411
				(0.00292)	(0.00545)
edupm_df1pob					0.000935**
					(0.000369)
Constant	257.9***	218.6***	219.5***	220.1***	223.5***
	(0.564)	(1.118)	(1.277)	(9.489)	(9.490)
Observations	213,111	158,250	154,071	154,066	154,066
Number of groups	342	338	337	336	336
ICC					
Municipality	0.022	0.017	0.017	0.015	0.015
School/Municipality	0.20	0.14	0.14	0.14	0.14
AIC	2,244,540	1,663,333	1,619,957	1,619,903	1,619,898
BIC	2,2445,81	1,663,453	1,620,096	1,620,062	1,620,067

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