Resource fungibility and the Flypaper Effect. The case of Public School education funding in Chile

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Abstract
We build upon a model by Zampelli (1986) to explore the impact of categorical grants to funding education spending in Chilean municipalities. Our main finding suggests that educational grants given to municipal governments are partially fungible and do not support the Flypaper Effect hypothesis. Relatively rich municipal governments are clearly able to return to residents some of the money they receive from grants. The elasticity of municipal educational expenditure with respect to educational grants ranges from 0.50 for relatively poor municipalities, to 0.37 for the wealthier ones. Since a reform is being implemented thereby public schools will be moved away from the municipal control, and made dependent on future specialized Local Educational Services, we hypothesize that said new administration model will give the central government a tighter control of the whole public expenditure on public schools.
Keywords: Grants categorical, public school funding, flypaper hypothesis, Chilean municipalities
JEL classification:

Fungibilidad de los recursos y el Flypaper Effect. El caso del financiamiento de la Educación por las Escuelas Públicas en Chile.

Resumen
Usamos el modelo de Zampelli (1986) para explorar el impacto de las transferencias condicionadas en el gasto en educación de las municipalidades de Chile. Nuestros principales resultados señalan que las transferencias en educación son parcialmente fungibles, y no encontramos evidencia del Flypaper Effect. Los municipios más ricos son capaces de traspasar a los residentes una parte de los fondos que reciben por concepto de transferencia. La elasticidad del gasto educativo municipal con respecto a las transferencias se encuentra en torno al 0.5 para municipios relativamente pobres, mientras que en torno al 0.37 para los más ricos. Dado que se está implementando una reforma en la cual las municipalidades dejaran de administrar los establecimientos educacionales, y dicha responsabilidad se asignará a Servicios Locales de Educación Pública, nuestra hipótesis es que, en este nuevo marco institucional, el gobierno central tendrá un control más estricto del gasto en las escuelas públicas.
Palabras clave: Transferencias en ayuda, Flypaper hipótesis, financiamiento en educación, escuelas públicas, municipios en Chile.
Clasificación JEL:

Introduction.

Beginning in 2018, existing "municipal Schools" in Chile embarked on a process of "de-municipalization", thereby these schools will be transferred to 70 newly created Local Educational Services. Among expected benefits from said reform, the fact of having unifunctional districts to administer public education is considered to be a potentially relevant change. We hypothesize that said reform will also restore the central government control over the public share of educational expenditures, as it avoids the so called "fungibility effect" that occurs in the context of a multifunctional municipal government.

This research is intended to measure the extent to which variations in the value of grants given to municipal governments to funding municipal schools in Chile are fully transferred into more education expenditures, as they may partially substitute local funds which are already being used for that purpose. Two opposing effects should be considered. On the one hand, the so called Flypaper Effect (FPE) predicts that fungible grants will expand local governments' expenditures beyond the preferences of the local median voter (MV). On the other, a "Fungibility Effect" (FE) may arise if this additional funding is at least partially diverted to items other than intended. Said effect is likely to be more significant if the recipient jurisdiction has a wider range of responsibilities to which this additional money could be diverted. In the Chilean case, three factors are worth mentioning. First, municipal governments have 6 exclusive functions and 12 nonexclusive ones, of which public school administration is one of them. Second; over 90% of municipal governments in Chile make voluntary contributions from their own budget to complement central government grants in aid for education, which can be easily reallocated. Third, all municipalities receive one non categorical equalization grant (Common Municipal Fund: FCM) plus a number of other categorical grants, all of which are at least partially fungible.

We take advantage from a municipal level yearly panel between 2011 to 2015 to estimate an empirical model based on Zampelli (1986). Since our estimations suggests that categorical grants to funding municipal schools are partially fungible, and find no evidence of a full "Flypaper Effect" (FPE), it follows that at least some of the central funding of municipal education is deviated either to private residents – via a lower municipal tax effort, or to municipal expenditures other than education.

The remaining of this paper is organized as follows. Section 2 addresses the theoretical and empirical debate on both the "Flypaper Effect" and the "Fungibility Effect". Section 3 describes the Chilean institutional framework. Section 4 presents the empirical model and section 5 examines the econometric results.

The current debate.

The Flypaper Effect.

By the beginning of the 80s, Chile underwent a radical reform at both the primary and secondary school education levels. Municipal governments were made responsible for the administration of public schools, which were to be funded by the sum of a "voucher per student" plus the financial support given by municipalities themselves. Municipal schools (MUN schools) were assumed to compete with each other and also with "public supported private schools" in a similar fashion as

they exist in Sweden, Spain and The Netherlands. Nonetheless, municipalities in Chile are very heterogeneous in their social, economic and/or political background, so that significant differences in their willingness to match central transfers are likely to exist. Most importantly, municipal response to an increase in the value of central government's grants may range from keeping their contribution unchanged to partially withdraw it. This being the case, the effect of marginal variations in the value of grants on the whole expenditure made on education would be less than expected by the national (donor) government. Currently, a reform is being implemented thereby existing municipal schools will be handed over to newly created "Local Educational Services", which are going to be specialized deconcentrated jurisdictions from the Ministry of Education (Letelier and Ormeño 2018).

The so called "Flypaper Effect" (FPE) has been the subject of an extensive theoretical and empirical debate since this anomaly was first identified (Henderson 1968, Gramlich 1969). The benchmark to look at is the fact that in a riskless world, the jurisdiction's source of income is assumed to have no effect on the optimal allocation of resources between private and public goods (Bailey and Connolly 1998). As opposed to that contention, the FPE poses the challenge of having to explain why, when a lump sum grant is given to a sub national jurisdiction, this rises local expenditures more than expected had the same money were given directly to the local median voter (MV). This may be expressed by saying that unconditional grants "stick were they hit" (Hines and Thaler 1995), which is usually an implicit target when it comes to categorical grants. Various theoretical explanations to the FPE have been presented (Hines and Thaler 1995, Bailey and Connolly 1998, Inman 2008). From the view point of the recipient government revenues, grants might be preferred to distortive taxes as a source of funding (Hamilton 1986), tax changes might face local institutional rigidity (Karnik 2005, Volden 2007, Brooks and Philips 2008) and high transaction costs (Quigley and Smolensky 1992) in the short run, and grants – as opposed to taxes- are likely to be perceived as a relatively certain source of revenue, which leads to a larger local expenditure response (Choi et. al. 2007, Véhg and Vuletin 2015, Besfamille 2015). Alternatively, it has been hypothesized that the FPE results from differences between he MV´s preferences and those of the local government (Le Maux 2009). This may be originated in grant-induced residents´ "fiscal illusion" (e.i Oates 1979), lobby being made by pressure groups combined with a lack of local political strength (Dougan and Kenyon 1988, Tovmo and Falch 2002), and bureaucrats' budget maximizing effort (Niskanen 1994) among other factors. Finally, a number of purely econometric explanations have highlighted the confusion between matching grants - which have a price effect on the targeted local public good, and lump-sum grants having only an income effect (Gramlich and Rubinfeld 1989, Oates 1979), the omission of variables in the estimations (Hamilton 1983, Hamilton 1986), and endogeneity problems resulting from grants being assigned as a function of sub national expenditures (e.i. Gordon 2004).

Most evidence for the USA predicts that - in line with the FPE, education grants have a significant inter jurisdiction income redistribution effect, albeit not a significant allocation effect to education (Goertz and Natriello 1999). However valid, this prediction appears to be subject to some time lag to occur as shown by Gordon (2004). A grant specific analysis of this question is provided by Fisher and Papke (2000), who observe that expectedly, the FPE differs across types of grants, being stronger for unrestricted grants without minimum tax rate, significant but lower in the case of categorical grants, and even lower when they are accompanied by tax rate expenditure requirements.

The Fungibility Effect.

A well-known weakness of fiscal decentralization refers to the potential effect of inter jurisdiction externalities, which may lead local governments' decisions to deviate from the social optimum. It has been stated that this is likely to be a more severe problem in the case of the so called "redistributive function" of the State (Oates 1972), as potential beneficiaries are likely to migrate across jurisdictions in search of the best location to settle down. Nonetheless, a relevant justification to delegate said functions onto local governments hinges upon the information benefits on residents' demands that lower tiers of governments may have. This delegation is usually twofold. On the one hand, local jurisdictions can be made responsible for the administration of the service in question, leaving its funding in the hands of the national level. Alternatively, local jurisdictions can be made responsible for both the administration and funding of the function in question, in which case decentralization of services is usually accompanied by some type of conditional grant. This conditionality is based on a principal-agent relationship between the donor and the recipient government, as it assumes that all the money being granted will be spent on a specific budget item. Interestingly, said prediction collides with the view that recipient jurisdictions are autonomous to decide how much they wish to spend on the delegated function. If the funding of the function in question is a shared responsibility between the donor and the recipient government, increases in the value of grants might be subject to the so called "fungibility effect" (eg Shah 2007), thereby the recipient jurisdiction lowers the self-funded share of the granted function to align the whole expenditure to its specific preferences.

Generally, we may expect that the more leeway to substitute the granted expenditure by another closely related expenditure, the more likely it is that the transfer at stake does not lead to an equal increase on the expenditure being granted. Said substitution may take either the form of lower public spending on local public goods and/or more private spending if grants induce local tax cuts.

Despite most of the empirical literature on the matter hinges upon the expenditure effect of the international aid given to developing country (eg Morrissey 2015), an equally intense debate exists on the extent to which similar grants given to sub national governments do have an impact on the specific expenditure being promoted. Evidence shows that fungible grants in aid might be diverted to uses other than intended ones, this being clearly the case of education. While the magnitude of this effect is likely to depend on the degree of grants conditionality (Gramlich 1977, Das et. al. 2005), the type of grant in aid (Oberg 1997) and/or the intensity of the potential goal conflict between the donor and recipient governments (Chubb 1985, Nicholson-Crotty 2004), empirical evidence generally support the fungibility hypotheses, this being particularly relevant in the case of educational grants (eg Garret 2001, Erekson et. al. 2002, Evans and Zhang 2007).

The Chilean case.

As opposed to most unitary countries, Chile is very centralized from both the fiscal as well as the political point of view (Galilea and Letelier 2011), which is represented in a myriad of fiscal and institutional factors. The country is divided into 16 "regions[1]" (intermedium level of government) and 345 municipalities (local level). Albeit the regional level has a government of its own since 1993[2], it was not until 2021 that regional governments were allowed have a freely elected governor. Concerning the municipal level, this stands for about 14% of the general government expenditures. Municipalities get their "permanent" funding through local taxes and service fee charges, to which must be added the net value of the so called Common Municipal Fund (FCM), which operates as a "Robin Hood" redistributing mechanism across municipalities (Letelier 2006, Ahmad et. al 2015). Categorical grants and a number of applicable capital grants are also available for municipal and regional governments to improve basic infrastructure.

Since the early 80s until the profound reforms implemented from 2015 onward (see below), municipalities were made responsible for running school level education and primary health centers[3]. Municipal school funding has been based on a voucher per student, which is given to municipalities upon pupil's attendance to classes (e.g. Aedo and Sapelli 2001, Epple 2017). Although a referential value of this voucher exists, this is timed by a factor equals to or above one depending on the rural- status of the school, and the type of education being provided. Currently, the Ministry of Education differentiates among "autonomous", "emerging" and "in recovery" schools by giving them case specific vouchers. Since 2008, a "Preferential Subsidy Law" was passed, thereby schools that concentrate a large number of socially deprived pupils are eligible to be given a supplement to the original voucher. A parallel model of publicly funded education exists in the form of private subsidized schools (PSP schools). Although they are voucher eligible in a similar way as MUN schools do, these private providers are allowed to partially charge for each student in return to a reduced voucher value. A third track of school suppliers is the one represented by fully paid private schools.

When it comes to funding MUN schools, two caveats are in order. First; students voucher stands as a conditional grant. Nevertheless, a rational response to transfers may lead grantee jurisdictions to budget reallocations of partially fungible funds (McGuire 1978, Zampelli 1986). A second feature to consider is that, according to the Chilean municipal Law, central government grants are assumed to match a municipal budget contribution, which involves a "price effect" along with an "income effect" (Inman 2008). Thus, an increase in the central government's grant per student does not necessarily lead to an equivalent expansion on educational expenditures. On the one hand, municipal governments can vary the locally funded share of the whole expenditure, which might partially neutralize variations in the value of categorical grants they receive. In our

[1] One more region was added in 2017.

[2] Up until 2020 – which includes our sample period, the regional government was headed by a centrally appointed "Intendent"

[3] Originally, municipalities were allowed to choose between direct administration of these services or delegate them to nonprofit private organizations called "corporations". Only 53 of them were established before the Constitutional Court decided in 1981 that delegated functions to municipalities could not be performed by private entities.

case, more than 94% of municipal governments contribute to education[4]. On the other, municipalities can give away a share of their regular tax revenues as a response to more generous grants being received (Letelier and Ormeño 2018). Nevertheless, the extent to which these adjustment channels are feasible in practice, very much depends on the particular municipal government we look upon.

Beginning in 2015, a process of new and significant reforms of above model was put in motion. A Law was passed in 2015, thereby PSP schools were obliged to get organized as non-for-profit organizations and parents' "co-payment" to MUN schools was banned[5]. A second Law was passed in 2017, which removes MUN schools from the municipal administration and makes them dependent on 70 newly created Local Educational Services (LES). Only the first Law is now under full operation, as a progressive implementation of the LES is expected to occur over time. From the view point of this research, a pending feature to be defined is the way in which LES are going to be funded. A major characteristic of the model in force until 2017 hinges upon the financial contribution to education made by municipalities themselves as it raises the question of whether, the combination of the FPE and FE referred to above, may generate a significant loss of central government's control on the actual amount of resources spent on education. Some evidence that an increase on the Common Municipal Fund (see above) leads to a proportionally lower decrease in local revenues (Bravo 2014), this being evidence of a partial FPE. Despite local tax rules are the same for all jurisdictions, the composition of tax bases differs significantly across municipalities and so does their leeway to reduce fiscal effort as a response to grants being received.

As far as the fungibility effect is concerned, three hypotheses can be put forward. First, following Morrissey (2015) we may hypothesize that municipal governments whose median voter's preferences are closer to the donor government are less likely to reduce its contribution as a reaction to more generous central level grants. Second, poor municipalities are expected to be less likely to exhibit a strong fungibility effect. They have a limited (or even null) capacity to make contributions to education and face a severe budget restriction to fulfill all municipal functions, some of which might be high up in the ranking of local residents demands. In this scenario, an increase in the value of a non-conditional grant to funding schools is more likely to lead to similar increases in educational expenditures. Third, wealthy municipal governments are usually net contributors to educational expenditures, which leads them to spend just the amount being wished by the local MV. In such a case, an increase in the value of grants to funding education will produce no significant effect on expenditures, as the recipient governments is likely to react by withdrawing some of this contribution, so that the whole expenditure stays the same.

[4] Average municipal contribution in 2015 equals 9.7%, this being generally higher for rich municipalities. Nevertheless, this contribution is more than 40% of the budget for only 3.2% of cases, and above 20% of the budget for 12.5% of cases. Contributions above cero and below 20% accounts for 82% of municipal governments. Interestingly, this last component is entirely decided by local authorities as it depends on residents' priorities and municipality's resource availability.

[5] Until this Law was passed, parents were allowed to make voluntary contributions to MUN schools, which came to be known as the "co-payment" system.

The empirical model.

We build upon Zampelli (1986), whose empirical model has three features worth mentioning. First; it is a highly nonlinear, which is known to be an advantage as it circumvents the bias of linear models in the estimated grantee government's income effect (Becker 1996). Second; in contrast to most empirical studies in the USA, results reported by Zampelli do not formally support the FPE hypothesis, this being evidence of Zampelli's model being a stronger testing of this effect. Third; it contains a built in parameter that measures the degree of grant fungibility, which is a relevant issue in our case.

Formally, the model in question (Eq. 1) states that local government voluntary contributions to education are equal to the total spending (T_i) minus the non-fungible component of educational categorical grants $\left((1-\emptyset_i)G_i\right)$ (Eq. 1). This total is explained by the (municipal) income effect (first parenthesis), a price effect (second parenthesis), a population based scale factor and a random error $\left(e^{\xi\, POP_i+\,\mu_i}\right)$. Under the assumption that municipal governments have some leeway to decide on the share of potential revenues they have access to, municipal income is made up of all sources of revenue that the municipal government wishes to retain for its own purposes. This includes the potential fungible resources from local sources (OWN), the fungible share of all categorical grants $\left(\sum_j \emptyset_j G_j\right)$ and the unconditioned grants being received (RS). The retained share of these sources is accounted for by π. We may expect that a "perfect FPE" leads to π = 1. Parameter α stands for the municipal income elasticity of education. As for the "price" of municipal education, this will be higher as the degree of grant fungibility $(\emptyset_i)$ approaches to 1. Intuitively, this implies that a fully fungible grant $(\emptyset_i = 1)$ can be used in any alternative purpose other than the one being targeted, which raises the opportunity cost of educational spending. Parameter β stands for the municipal price elasticity (see formal derivation in APPENDIX I).

Our estimated model innovates in adding a dummy that captures the likely difference in the magnitude of the FPE across municipal tax revenues quartiles (D_q). Expectedly, municipalities with a larger tax base –usually the wealthier ones – will have more leeway to vary their tax revenue collection if they so decide. On the contrary, narrow tax base municipalities (first quartile) will have little if no margin to actually adjust their tax revenues in response to grants being received. Thus, δ_q is expected to be negative for rich municipalities (fourth quartile) and positive (or no significant) for the poor ones.

$$T_i + (\emptyset_i - 1)G_i = \left(OWN + \pi\left[1 + \delta_q D_q\right]\left\{\sum_j \emptyset_j G_j + RS\right\}\right)^{\alpha}\left(\frac{T_i + (\emptyset_i - 1)G_i}{T_i}\right)^{\beta+1} e^{\xi POP_i + \mu_i} \qquad (1)$$

Based upon Eq. 1 we need to know the effectiveness of changes on G_i on the local expenditure on education $(T_i + (\emptyset_i - 1)G_i)$. This is summarized by the "grant-expenditure elasticity", which may be derived from the estimated parameters above (see APPENDIX II).

In the case under analysis, one more dollar of G_i may not lead to an equivalent increase on educational expenditures due to at least two reasons. First, the existing Law on Municipal Rents

gives municipalities some autonomy on the rates being charged on business licenses and other similar charges. While this margin of maneuver is more likely to be enforceable in jurisdictions with a larger tax base and wealthier residents (Volden 2007), a significant share of municipalities strongly depend on the FCM[6] (see The Chilean Case), which is exogenous to the municipal budget in the short run. Regardless of inter municipal differences, we may expect that on average, recipient local governments would lower their fiscal effort as G_i raises. Second, since more than 90% of municipalities do contribute to funding education (see above), there is the chance that an increase in G_i will lead them to partially reduce this contribution. In short, actual expenditure effectiveness of central level decisions on G_i depends on: i) how close we are from a perfect FPE $(\pi = 1)$, and ii) the degree of fungibility of categorical grants that municipalities receive.

Model estimation.

The estimation of our empirical model in Eq. 1 is based on a yearly panel between 2011 to 2015, which includes 345 municipalities. Formally, the joint municipal budget in Chile is divided into three separate accounting records (OECD 2017), which are education, health and municipal budgets. While they are closely interconnected, we will differentiate grants given to each of them. Thus, our empirical exercise requires the following information: i) total municipal educational spending (T), ii) current categorical grants transferred to education (G^E), health (G^H) and municipal budgets (G^M), iii) capital grants on account of the same categories (GC^E, GC^H, GC^M), iv) unconditional transfers given to municipalities (RS) and v) self-generated municipal revenues (OWN). A data description of per capita values of variables is provided in table A (APPENDIX III), and a data summary is shown in table 1. Issues worth mentioning are the following. First, a small number of municipalities have no categorical transfers (minimum value equals zero), which corresponds to cases in which the service in question does not exists or the municipality gets no transfers for this concept. Second, the coefficient of variation is clearly higher for capital grants relative to current grants, which reflects the fact that capital grants are mainly given upon request, and formally evaluated before they are assigned. Third, local tax revenues as well as non-categorical grants also exhibit a high variation, this being the result of major differences in local tax bases and socio demographic indicators. Finally, a much lower CV is observed in the case of current grants, which are assigned on the basis of enrolled students and residents being potentially attended (section 3).

[6] 25% of municipalities get more than 60% of their revenues from the FCM. This same figure reaches 49% for those municipalities in which the FCM is above 50% of all revenues.

Table 1. Summary Statistics (average values 2011-2016, US$ dollars 2016)

Variables	Obs.	Mean	Std. Dev.	CV	Min	Max
T	1,707	349.98	224.62	0.642	18.44	1904.28
G^E	1,707	216.94	145.66	0.671	4.11	1231.95
G^H	1,707	70.75	43.55	0.616	0.00	417.55
G^M	1,707	35.98	109.15	3.034	0.00	3457.74
GC^E	1,707	2.31	12.65	5.474	0.00	215.97
GC^H	1,707	0.13	1.19	9.092	0.00	29.45
GC^M	1,707	88.44	194.35	2.198	0.00	3,054.55
OWN	1,707	74.58	137.60	1.845	2.43	1,910.95
RS	1,707	183.25	503.14	2.746	-1,366.21	6,532.50
pob_{1000}	1,707	76.70	128.87	1.680	0.20	1395.51

Estimation of Eq. 1 was estimated by using nonlinear least squares (NLLS). For a large sample and normal errors, it may be shown that NLLS provides consistent estimators of parameters. Dummies were added to control for specific regions and years. We make two sets of estimations. The first one only considers current transfers to education (table 2). The second one includes current and capital grants altogether (table 3). Within every set, four different values of $\emptyset$ (fungibility coefficient) were considered. The choice of model is made upon the Akaike Information (AIC) and the Bayesian information Criteria (BIC). Relevant coefficients to look at are the marginal propensity to "tax" resources from different sources (π_L, π_G, π_R), the income elasticity (α) and the price elasticity of municipal educational spending (β). In order to measure the extent to which π may differ across jurisdictions, four municipal income quartiles were defined, whose effect is caught by three dummies (D_{Q2}, D_{Q3}, D_{Q4}). A set of regional dummies were added (regions names in the tables). While the model presented in the appendix assigns a different propensity to tax for each type of revenue source, we will assume that π is the same for all cases $(\pi = \pi_L = \pi_G = \pi_R)$. This is consistent with the fact that, once all municipal revenue sources have been filtered by the fungibility coefficient (Ø), they become "equally fungible" from the view point of the municipal government. For the sake of simplicity, a similar assumption will be made about Ø itself, so that a unique value is assumed for all categorical grants $(\emptyset = \emptyset_j, \forall_j)$. It may be observed from tables 2 and 3, that model 1 (Ø=0.2) is chosen in both cases (min value of AIC and BIC). This result leads us to conclude that at least 20% of categorical grants on municipal education are fungible. An F test on π is conducted for all estimated models under the null $\pi = 0$ and $\pi = 1$ respectively (table 4). Since both nulls are rejected, no evidence of perfect FPE exists.

Table 2. Non-Linear Least Squares. *Current Transfers*.

VARIABLES	(1)	(2)	(3)	(4)
	ϕ=0.2	ϕ=0.4	ϕ=0.6	ϕ=0.8
π	0.752***	0.698***	0.685***	0.680***
	(0.0462)	(0.0318)	(0.0300)	(0.0295)
D_{Q2}	0.0430	0.0443	0.0466	0.0489
	(0.0555)	(0.0369)	(0.0325)	(0.0297)
D_{Q3}	-0.0486	-0.0366	-0.0278	-0.0231
	(0.0567)	(0.0382)	(0.0336)	(0.0306)
D_{Q4}	-0.282***	-0.217***	-0.173***	-0.140***
	(0.0433)	(0.0328)	(0.0305)	(0.0289)
α	0.598***	0.781***	0.798***	0.803***
	(0.0161)	(0.0103)	(0.00918)	(0.00858)
β	-0.179***	-0.455***	-0.667***	-1.254***
	(0.0482)	(0.0659)	(0.106)	(0.227)
ξ	-0.00217***	-0.000846**	-0.000852**	-0.000915***
	(0.000386)	(0.000298)	(0.000275)	(0.000259)
Aysén	2.309***	0.983***	0.845***	0.778***
	(0.115)	(0.0696)	(0.0602)	(0.0544)
Antofagasta	1.893***	0.477***	0.369***	0.342***
	(0.124)	(0.0762)	(0.0669)	(0.0614)
Araucanía	2.256***	1.143***	0.981***	0.881***
	(0.0994)	(0.0634)	(0.0557)	(0.0510)
Arica y P.	2.253***	0.866***	0.713***	0.638***
	(0.129)	(0.0816)	(0.0704)	(0.0634)
Atacama	2.461***	1.266***	1.078***	0.963***
	(0.108)	(0.0732)	(0.0653)	(0.0604)
BioBío	2.443***	1.268***	1.091***	0.984***
	(0.0985)	(0.0601)	(0.0524)	(0.0477)
Coquimbo	2.503***	1.315***	1.125***	1.008***
	(0.103)	(0.0669)	(0.0593)	(0.0545)
L. B. O'Higgins	2.312***	1.182***	1.013***	0.909***
	(0.0968)	(0.0618)	(0.0546)	(0.0503)
Los Lagos	2.469***	1.253***	1.072***	0.962***
	(0.103)	(0.0633)	(0.0550)	(0.0500)
Los Ríos	2.222***	1.052***	0.867***	0.754***
	(0.116)	(0.0832)	(0.0739)	(0.0677)
Magallanes y la A.	2.113***	0.705***	0.550***	0.480***
	(0.115)	(0.0714)	(0.0629)	(0.0578)
Maule	2.435***	1.277***	1.086***	0.966***
	(0.0970)	(0.0619)	(0.0549)	(0.0506)
Metropolitana	2.180***	1.065***	0.913***	0.819***
	(0.102)	(0.0695)	(0.0626)	(0.0584)
Tarapacá	2.423***	1.129***	0.983***	0.908***
	(0.113)	(0.0694)	(0.0604)	(0.0549)
dummy2012	0.108***	0.111***	0.0858**	0.0677**
	(0.0324)	(0.0293)	(0.0266)	(0.0247)
dummy2013	0.128***	0.129***	0.107***	0.0916***
	(0.0314)	(0.0286)	(0.0260)	(0.0241)
dummy2014	0.171***	0.141***	0.118***	0.102***
	(0.0303)	(0.0282)	(0.0258)	(0.0240)
dummy2015	0.192***	0.205***	0.182***	0.165***
Observations	1,707	1,707	1,707	1,707
Adj. R-squared	0.968	0.961	0.952	0.943
AIC	18180.5	18552.1	18882.7	19186.6
BIC	18316.6	18688.2	19018.7	19322.6

Standard errors in parentheses. * p<0.05, ** p<0.01, *** p<0.001

Table 3. Non-Linear Least Squares.
Current Transfers plus Capital Expenditure Transfers.

VARIABLES	(1)	(2)	(3)	(3)
	ϕ=0.2	ϕ=0.4	ϕ=0.6	ϕ=0.8
π	0.722***	0.698***	0.688***	0.682***
	(0.0366)	(0.0310)	(0.0297)	(0.0277)
D_{Q2}	0.0510	0.0478	0.0461	0.0445
	(0.0447)	(0.0358)	(0.0318)	(0.0293)
D_{Q3}	-0.0474	-0.0343	-0.0299	-0.0296
	(0.0457)	(0.0370)	(0.0328)	(0.0302)
D_{Q4}	-0.261***	-0.203***	-0.162***	-0.136***
	(0.0364)	(0.0319)	(0.0297)	(0.0280)
α	0.734***	0.785***	0.794***	0.795***
	(0.0124)	(0.00975)	(0.00882)	(0.00824)
β	-0.321***	-0.477***	-0.739***	-1.510***
	(0.0461)	(0.0642)	(0.103)	(0.222)
ξ	-0.000929**	-0.000627*	-0.000600*	-0.000634*
	(0.000331)	(0.000285)	(0.000264)	(0.000251)
Aysén	1.279***	0.863***	0.736***	0.672***
	(0.0871)	(0.0664)	(0.0583)	(0.0533)
Antofagasta	0.787***	0.384***	0.304***	0.289***
	(0.0937)	(0.0724)	(0.0645)	(0.0598)
Araucanía	1.437***	1.047***	0.891***	0.793***
	(0.0773)	(0.0608)	(0.0542)	(0.0501)
Arica y P.	1.158***	0.685***	0.523***	0.437***
	(0.102)	(0.0786)	(0.0688)	(0.0626)
Atacama	1.582***	1.134***	0.945***	0.827***
	(0.0868)	(0.0706)	(0.0639)	(0.0596)
BioBío	1.601***	1.191***	1.027***	0.926***
	0.0743)	(0.0572)	(0.0506)	(0.0466)
Coquimbo	1.645***	1.211***	1.030***	0.918***
	(0.0803)	(0.0641)	(0.0575)	(0.0533)
L. B. O'Higgins	1.484***	1.080***	0.915***	0.811***
	(0.0749)	(0.0593)	(0.0532)	(0.0495)
Los Lagos	1.580***	1.151***	0.981***	0.877***
	(0.0787)	(0.0605)	(0.0533)	(0.0490)
Los Ríos	1.390***	0.966***	0.795***	0.690***
	(0.0980)	(0.0805)	(0.0720)	(0.0666)
Magallanes y la A.	1.055***	0.606***	0.472***	0.411***
	(0.0878)	(0.0683)	(0.0612)	(0.0570)
Maule	1.612***	1.186***	1.006***	0.893***
	(0.0746)	(0.0592)	(0.0532)	(0.0494)
Metropolitana	1.359***	0.999***	0.861***	0.772***
	(0.0815)	(0.0665)	(0.0607)	(0.0573)
Tarapacá	1.407***	0.967***	0.813***	0.727***
	(0.0867)	(0.0667)	(0.0591)	(0.0546)
dummy2012	0.129***	0.0897**	0.0600*	0.0401
	(0.0324)	(0.0287)	(0.0262)	(0.0245)
dummy2013	0.153***	0.125***	0.104***	0.0894***
	(0.0315)	(0.0279)	(0.0255)	(0.0238)
dummy2014	0.164***	0.129***	0.106***	0.0906***
	(0.0308)	(0.0276)	(0.0253)	(0.0237)
dummy2015	0.233***	0.214***	0.197***	0.186***
	(0.0303)	(0.0271)	(0.0250)	(0.0235)
Observations	1,707	1,707	1,707	1,707
Adj. R-squared	0.969	0.962	0.954	0.944
AIC	18130.6	18480.4	18820.3	19146.9
BIC	18266.6	18616.5	18956.3	19283.0

Standard errors in parentheses. * p<0.05, ** p<0.01, *** p<0.001

Table 4. F test on π

	Current Transfers (CT)		Current and Capital Transfers (CCT)	
Model	$H_0: \pi = 0$	$H_0: \pi = 1$	$H_0: \pi = 0$	$H_0: \pi = 1$
1	265.73 (0.000)	28.81 (0.000)	389.10 (0.000)	57.59 (0.000)
2	482.65 (0.000)	90.25 (0.000)	505.29 (0.000)	94.89 (0.000)
3	523.62 (0.000)	110.29 (0.000)	537.69 (0.000)	110.18 (0.000)
4	532.98 (0.000)	118.06 (0.000)	606.98 (0.000)	131.51 (0.000)

P values in parenthesis.

Concerning π, our point estimation is in the range of 0.722 (current and capital transfers) to 0.752 (current transfers only) for model 1 (Ø=0.20). The 95% interval for these estimations ranges between 0.65 and 0.8 (table 5), and 0.662 and 0.843, respectively. This implies that at least 15% of additional fungible resources are returned to local residents. The same estimated coefficient ranges between 0.17 and 0.05 in Zampelli (1986) for different sets of restrictions on Ø. This is consistent with the more rigid structure of local taxes in the Chilean case as compared with the USA one, and the fact that municipal governments in Chile have very limited access to credit, which forces them to spend all additional resources (Letelier 2011). Nonetheless, a value of π well below 1 demands an explanation of how municipalities in Chile "return" some of the grants they receive to local residents. The answer probably lays in the fact that at least partially, actual collection of local taxes and fees depends on the will of the municipality in question. Despite the Law is quite uniform and centralized in terms of tax bases and tax rates, some leeway is given to municipalities to decide on business licenses, fines on car drivers, building permissions and some other charges. Expectedly, this effect is clearly higher for relatively wealthy municipalities (negative and significant D_{Q4}), which is in line with the hypothesis that a larger tax base gives municipal governments more leeway to vary tax effort in response to grants being received (table 5).

Table 5. 95% Conf. Interval, ϕ=0.2.

	CT		CCT	
Parámetro	Lower limit	Upper limit	Lower limit	Upper limit
π	0.662	0.843	0.650	0.794
α	0.566	0.629	0.709	0.758
β	-0.273	-0.084	-0.411	-0.230
ξ	-0.003	-0.001	-0.002	-0.0002
DT/dg	0.759	0.740	0.726	0.668
σ_g^{Exp}	0.459	0.470	0.414	0.450

As for the income elasticity, this is in the range of 0.598 (current transfers only) to 0.734 (current and capital transfers), suggesting that educational spending tends to grow less than proportionally relative to growth in municipal income. Similar estimated coefficients for the USA report values

close to 0.2 (Schmidt and McCarty 2008). Our price elasticity estimation exhibits point values of -0.179 and -0.321 respectively, leading to correspondingly large intervals. While these values are generally higher than Zampelli's (-0.64 to -0.32), both sets of results are not strictly comparable given the range of services being included in each case. For the purpose of our study, a relevant parameter is the "educational grant-elasticity" of municipal educational spending, that we will call σ_g^{Exp}(Eq. A9.1 and A9.2 in APPENDIX III). Table 6 shows said estimation for our four municipal quartiles and the two definitions of grants. In each case, the average share of MINEDUC's contribution to funding education is reported (% MINEDUC). We see that our estimated elasticity ranges between 0.37 and 0.50, which is below the expected effect of a 1% increase in the value of educational grants had the municipal contribution to education were to stay the same.

Table 6. Expenditure – Grant elasticity; σ_g^{Exp}

	Current Transfers		Current and Capital Transfers	
Quartile	% MINEDUC	σ_g^{Exp}	% MINEDUC	σ_g^{Exp}
Q1	0.6840	0.4956	0.6840	0.4657
Q2	0.6672	0.4827	0.6672	0.4545
Q3	0.6532	0.4755	0.6532	0.4473
Q4	0.5603	0.4044	0.5603	0.3724

A potential source of inconsistency on results above may stem from the effect of expenditures (our dependent variable) on some of the revenue sources being specified in Eq.1. This would be a case in point if $T_i + (\emptyset_i - 1)G_i$ represented the whole expenditures of municipality in question. Nonetheless, our endogenous variable only stands for the municipal expenditure on education. Given the way in which municipal grants are assigned in Chile, said reverse causality can be dismissed. Frist, non-categorical grants (RS), are assigned on the basis of a set of indicators that affect the whole municipal revenues, and have little if no relationship with the expenditure on education. Second, categorical grants intended to support education are based on a voucher per student, which again is not related to the voluntary municipal contribution to funding schools.

From the view point of the national educational policy, above results entail a dilemma, as the way in which school education has been funded so far assumes a perfect FPE ($\pi = 1$), and a value of σ_g^{Exp} compatible with the share of MINEDUC contribution to municipal education. That is to say, all increases in the value of grants are expected to be spent on education. The reason why this does not occur is twofold. On the one hand, most municipal governments do contribute to funding schools, which they do on a voluntary basis. As they receive more money from the national level, they may also decide to reduce or adjust this contribution in line with the MV preferences. On the other, categorical grants are partially fungible, which allows municipalities to partially use them on items other than education.

Above results suggest that both the way in which schools get their funding as well the type of jurisdiction that schools depend upon do matter regarding the degree of control that the donor government has over the actual expenditure made on education. On the one hand, the multi-functional purpose of municipal governments makes the fungibility problem an important one, as it may potentially deviate categorical grants to unintended uses. On the other, the lack of evidence on a full flypaper effect implies that recipient municipalities do have some leeway to decide on the

local tax effort, and thereby, grants being assigned to education may have a lower impact than expected. It follows that, from the central government view point, one advantage of having specialized districts lies on the "higher control" on educational spending.

However clear this conclusion might be, it should not be interpreted as an argument to move back from a locally decentralized administration and return all schools to some kind of centrally controlled public entity. There is the chance that some municipalities have enough resources and management capacity to be in charge of schools, so that an "all across the board" reform will leave some educational districts worse off. A relevant trade-off exists between the national government's need to control the expenditures being made, and the need to have a sound management capacity at the local level. It might be the case that a set of selected municipalities do have this capacity, albeit they may partially offset national educational grants through a combination of the FPE and FE.

Conclusions.

Our research question hinges upon the potential for a significant "fungibility effect" when it comes to categorical grants given to subnational jurisdictions to funding public education. Since multifunctional recipient jurisdictions may partially contribute to that funding on a voluntary basis, we hypothesize that said effect may hinder the national government capacity to control the national expenditure, as more generous grants may lead to lower voluntary support.

We provide evidence showing that; i) categorical grants given to funding municipal Schools in Chile are partially fungible, ii) the so called FPE appears not to be statistically relevant, and that, iii) increases in the value of these grants do not lead to a proportional increase on the whole local educational spending being made. This result suggests that municipal governments withdraw some of their own contribution to education and/or return to local residents some of the grants they receive as a response to an increase in the value of said grants.

Since municipal schools in Chile are going to be made dependent on special educational districts, a question then arises as to how said reform will affect the funding of public schools. Regardless of the formula to be used in the distribution of educational grants to these new districts, the fact of them being specialized jurisdictions with no taxes of their own, will rule out the chance of this money being spent on things other than local public education. Our results show that this tighter control will be particularly strong on the case of wealthier municipalities, as they are the ones with the lower elasticity of Educational Expenditures with respect to grants.

Nonetheless, a relevant trade-off exists between the national government's need to control local spending, and the need to have a sound management capacity to administer basic services at the local level. It might be the case that municipalities with lower expenditure-grant elasticity – usually the wealthier ones, are also the ones with the best local educational services, which poses a dilemma on the national plan to withdraw schools from the municipal level.

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APPENDIX I
(Empirical Model)

Following Zampelli (1986):

1. Our demand for local public goods may be writes as: $Q_i = B^{\alpha} p_i^{\beta}$ [Eq. A1], where Q_i is the quantity of public good "i", B is the amount of fungible resources available for the public sector, p_i is the "effective price" of Q_i and α and β stand for the corresponding income and price elasticities. Since Q_i is not observable, Eq.1 may be expressed as: $p_i Q_i = B^{\alpha} p_i^{\beta+1}$ [Eq. A2], in which $p_i Q_i$ is the effective expenditure on Q_i.
2. Local government budget $(B)$is the sum of fully fungible resources plus the fungible share of grants given to the local government in question. It follows that $B = \pi_L R_L + \pi_G \sum_j \emptyset_j G_j + \pi_R RS$ [Eq. A3], where i) R_L = potential fungible resources from local sources, ii) π_L = marginal propensity to tax R_L, iii) $\emptyset_j G_j$ = fungible share $(\emptyset_j)$ of grants to funding local public good "j" (G_j).
3. If we do not impose restrictions on the use of grants, total expenditure on "i" would be $p_i Q_i = L_i^* + \lambda \pi_G \emptyset_i G_i + \Psi_i \pi_R RS + \sum_{j \neq 1} (1 - \lambda_j)\, \pi_G \emptyset_j G_j$ [Eq. A4], where i) L_i^* = local government's fungible resources that would have been spent on Q_i in case restrictions did not exist, ii) λ = fraction of $\pi_G \emptyset_i G_i$ spent on "i", iii) $(1 - \lambda_j)$ = fraction of $\pi_G \emptyset_j G_j$ spent on "i" and iv) Ψ_i = fraction of $\pi_R RS$ spent on "i"
4. Since categorical grants are expected to be fully spent on the particular public good being funded, recipient government will adjust L_i^* to respect that restriction. Thus, expenditure on "i" out of own resources may be written as:
$$L_i = L_i^* - (1 - \lambda)\pi_G \emptyset_i G_i - (1 - \pi_g)\emptyset_i G_i - (1 - \pi_R)\, \Psi_i RS + \sum_{j \neq i} (1 - \lambda_j)\pi_G \emptyset_j G_j \quad [Eq. A5]$$
5. A simplified version of $[Eq. A5]$ may be written as: $L_i + \emptyset_i G_i + \Psi_i RS = L_i^* + \lambda \pi_G \emptyset_i G_i + \Psi_i \pi_R RS + \sum_{j \neq i} (1 - \lambda_j) \pi_G \emptyset_j G_j = p_i Q_i$ [Eq. A6], whose left hand side corresponds to the amount of fungibles resources spent on "i". Since the cost being paid is $L_i + G_i + \Psi_i RS$, the price of "i" (p) is the ratio between the opportunity cost of resources and the direct cost being mentioned $(p_i = [L_i + \emptyset_i G_i + \Psi_i RS]/[L_i + G_i + \Psi_i RS])$. The more fungible G_i is, the higher the opportunity costs of resources devoted to "i" (numerator) and the higher the value of p_i. By replacing Eq.6 into Eq.2 we get: $p_i Q_i = L_i + \emptyset_i G_i + \Psi_i RS = \left(\pi_L R_L + \pi_G \sum_j \emptyset_j G_j + \pi_R RS\right)^{\alpha} p_i^{\beta+1}$ [Eq. A7]
6. Since Ψ_i cannot be either observed nor estimated, we remove it from the left hand side in Eq. A6 do this we express the cost of "i" as; $T_i = L_i + G_i + \Psi_i RS$. Rearranging terms we get: $T_i + (\emptyset_i - 1)G_i = L_i + \emptyset_i G_i + \Psi_i RS = p_i Q_i$. By replacing this result and expression of P_i into [Eq. A7], we get an expression that may be estimated:
$$T_i + (\emptyset_i - 1)G_i = \left(\pi_L R_L + \pi_G \sum_j \emptyset_j G_j + \pi_R RS\right)^{\alpha} \left(\frac{T_i + (\emptyset_i - 1)G_i}{T_i}\right)^{B+1} \quad [Eq. A8]$$

7. Nevertheless, Zampelli (1986) reduces the number of parameters to estimate in [Eq. A8] by doing the following; i) $\pi_L R_L$ is replaced by OWN and ii) parameters π_G and π_R are assumed to be equal, which leads to [Eq. A9]

$$T_i + (\emptyset_i - 1)G_i = \left(OWN + \pi\left\{\sum_j \emptyset_j G_j + RS\right\}\right)^{\alpha} \left(\frac{T_i + (\emptyset_i - 1)G_i}{T_i}\right)^{\beta+1} \quad \text{[Eq. A9]}$$

T_i: Out of Municipal Budget spending on education
G_i: Categorical Grants from the central government.
RS: Fungible transfers received.

APPENDIX II
(Educational Grant-Elasticity of Municipal Spending on Education: σ_g^{Exp})

$$\sigma_g^{Exp} = \frac{\partial T_i}{\partial G_i^E}\frac{G_i^E}{T_i} \quad \text{[Eq. A9.1]}$$

where:

$$\frac{\partial T_i}{\partial G_i^E} = \frac{(\beta+1)\left(\frac{G_i^E(\emptyset_i - 1)}{T_i} + 1\right)^{\beta} (\emptyset_i - 1)e^{\varepsilon POP}(OWN + \pi[\emptyset_i\{G_i^E + G_i^H + G_i^M\} + RS])^{\alpha}}{T_i} + \alpha\left(\frac{G_i^E(\emptyset_i - 1)}{T_i} + 1\right)^{\beta+1} \emptyset_i \pi e^{\varepsilon POP}(\pi[\emptyset_i\{G_i^E + G_i^H + G_i^M\} + RS])^{\alpha-1} - \emptyset_i + 1 \quad \text{[Eq. A9.2]}$$

APPENDIX III
(Data Description)

Table A. Data Description.
All variables in per capita terms. Thousands of pesos of 2016.

Variable	Definición
T	Total Expenditure on Education.
G^E	Transfers to Education, from the Ministry of Education.
G^H	Transfers to Health, from the Ministry of Health.
G^M	Transfers to Municipal Sector, from different institutions.
GC^E	Capital transfers to Education.
GC^H	Capital transfers to Health.
GC^M	Capital transfers to the Municipal Sector.
OWN	Tax revenues.
RS	Net Municipal Common Fund.
Population	Municipal population.

Source: All variables extracted from National System of Municipal Information (SINIM), Ministry of Internal Affairs, 2011-2015. Except Net Municipal Common Fund, which is self elaborated over the base of SINIM 2011-2015.