

Resource Windfalls and Public Employment: Evidence from Municipalities in Chile

Felipe Larraín B.

Department of Economics, Pontificia Universidad Católica de Chile.

Latin-American Center for Economic and Social Policies (CLAPES), Pontificia Universidad Católica de Chile.

Oscar Perelló P.†

Latin-American Center for Economic and Social Policies (CLAPES), Pontificia Universidad Católica de Chile.

Luis González C.

Latin-American Center for Economic and Social Policies (CLAPES), Pontificia Universidad Católica de Chile.

Abstract

Theory predicts that, if political institutions are not strong enough, an increase in fiscal revenues generated by natural resources will be deviated to expand public sector employment in exchange for political support (Robinson et al 2006, 2014). However, most empirical studies have focused on cross-country differences or have not tested directly the clientelism mechanism. In this paper, we study the effect of extra resource revenues on public-sector employment at the municipal level. We exploit a novel quasi-experiment, a 2005's legal reform in Chile that suddenly increased from 30 to 50 per cent the assignment of mining patents to municipalities where mines operate. Our identification strategy is based on comparing these municipalities to their peers located in nonproducing areas by using a difference-in-differences estimator. We found a sizable expansion of municipal-employment expenditures, which is larger for long-term contract employees. Moreover, we observe that allowances assigned to the municipal Council increased in mining municipalities. We also analyze the effect on other municipal expenditures, but we do not find a robust effect on municipal investment, health or community programs, while the effect on transfers to education is much smaller than the effect on employment. Our findings have several implications for the fiscal decentralization debate, as they suggest a lack of accountability at the municipal level in a developing country such as Chile.

Key words: Natural resources, mining, political economy, clientelism, fiscal decentralization.

1. Introduction

We exploit the 2005's change to the law of mining patents in Chile, which suddenly increased from 30 to 50 per cent the portion of patents assigned to municipalities where mines operate, to study the effect of fiscal windfalls through the political process. In particular, while extra revenues could be used in benefit of the local community, they also can be diverted to offer municipal jobs in exchange of political support. In this paper, we found a sizeable and statistically significant effect of the increase in mining patents on municipal employment expenditures, although they are aimed to be used for development works in local areas. Since theoretical literature suggests that the size of this public-sector employment mechanism depends on the quality of institutions, our results suggest that Chilean municipal governments lack of enough accountability to avoid clientelism. These findings have important implications to the design of fiscal decentralization policies in developing countries.

Our work is based on the framework of Robinson, Torvik and Verdier (2006, 2014). When a permanent resource boom occurs, an incumbent politician has to decide whether resource rents will be consuming or distributing as patronage in the form of public employment. Since the probability of staying in power is an increasing function of public-sector employment, there exist strong incentives to deviate extra revenues. This mechanism reduces the efficiency of the economy by transfer labor to unproductive jobs in the public sector, so the positive income effect induced by the resource windfall can be turned negative if clientelism is too high. In our context, the legal reform of mining patents can be view as an exogenous change in municipal income that is analogous to a permanent resource boom.

In a resource-based economy, fiscal decentralization is intrinsically related to the direct contribution of resource production to local governments. While in Chile taxes collected from mining go to the central government, except for mining patents to production and exploration, in a neighborhood mining country such as Peru the 50 per cent of all taxes from mining companies are directly assigned to local governments where mines are located. Whether a decentralization process as the Peruvian one will lead to higher living standards than the centralized scheme of Chile is not clear, as we should consider the efficiency-cost of unproductive spending. Nevertheless, our results do not lead us to assert that decentralization should be discarded, on the contrary, we highlight that a fiscal decentralization process should be accompanied by an improvement of accountability at the local level.

Our empirical strategy exploits the fact that the 2005's mining reform only affected municipalities that have mining activity on its territory. Therefore, we use a difference-in-differences approach to compare them to other municipalities that are not located in

mining areas, accounting for geographical differences as well as commune-specific and time effects. We use highly detailed data from the *National System of Municipal Information* (SINIM) to evaluate different municipal outcomes, and we begin by checking that the increase in mining patents effectively translate into an increase in municipal revenues. We found that this is true for municipalities that had more than 5 per cent of mining patents over permanent own income (POI), which correspond to the resources directly collected by municipalities, so we define them as our treatment group. The increase in municipal revenues was not obvious since the 20 percentage points increase in mining patents could be offset by *fiscal laziness* in collecting other resources or a diminishing in redistribution transfers from the central government.

Our main result is that the effect of extra mining patents generates a statistically significant expansion of municipal-employment expenditures, which supports the theoretical prediction of a clientelism effect from resource windfalls. SINIM data also allow us to disaggregate among different kinds of municipal employees, according to the length of their contracts. We found that the effect is larger in long-term contracts employees (called *planta* in Chile) than in annual-term contract employees (called *contrata* in Chile, which can be explained by legal restrictions, while the effect is not clear for partial-term employees (called *honorarios* in Chile). Moreover, we also observe a significant increase of allowances assigned to the municipal Council in mining municipalities. Finally, we found that municipal investment, transfers to education and transfers to community programs also increase, which should improve local living standards, but the size of this effect is lower than the increase in municipal-employment.

The potential adverse effects of fiscal windfalls generated by natural resources have been approached by a large literature since Sachs and Warner (1995, 1997, 2001) seminal works. However, empirical evidence is not conclusive, since resource revenues seem to be a blessing for some countries but a curse for others. These differences are claimed to be caused by differences in the quality of institutions (Mehlum et al 2006; Robinson et al 2006, 2014) and also to differences in the kind of natural resources (Boschini et al 2007, 2013). However, the divergent results for natural resources could also be due to econometric limitations of previous literature, since former literature was focused on cross-country comparisons that suffer from strong endogeneity problems. In that sense, the Chilean pseudo-experiment at the municipal level represents a novel approach to test the effect of resource windfalls through the political process. As local governments share a more similar institutional framework, culture and political context than cross-country comparisons, we are able to identify a clearer causal effect. Moreover, our source of revenue variation is a suddenly legal reform, which is much more exogenous than traditional natural resource intensity measures (Brunnschweiler and Bulte 2008, Collier and Goderis 2012).

Our approach is closely related to a set of recent quantitative studies that exploit natural experiments, within-country variations and estimate local impacts. Caselli and Michaels (2013) evaluate the impact of oil windfalls in living standards at the municipal level in Brazil and find that oil-rich municipalities expanded reported spending on public goods and services, but it did not lead to a corresponding increase in social outcomes. These funds may be allocated to a combination of self-enrichment and vote buying. Loayza and Rigolini (2016) find a mixed impact of mining on socioeconomic outcomes at local districts in Peru, as it has a positive income effect but a negative distributional effect. Dube and Vargas (2013) use municipal data in Colombia to show that an increase in oil prices, which is a capital-intensive resource, lead to higher violence, while a labor-intensive commodity such as coffee diminish civil conflicts. Our paper contributes to this wave of studies by evaluating a specific channel through which the political effects of natural resources can operate, the public-sector employment mechanism.

The rest of the paper is structured as it follows: Section 2 briefly describes the municipal budget in Chile. Section 3 discusses the public-sector employment mechanism and its implications to fiscal decentralization. Section 4 describes the data and our empirical strategy. Section 5 presents our results on municipal revenues, municipal-employment expenditures and other municipal outcomes. Section 6 offers some concluding remarks.

2. Mining and municipalities in Chile

The most basic administrative unit in Chile are municipalities, for which we have detailed data on income and outcome variables from the *National System of Municipal Information*. While Chile is abundant in mining resources, all corporate taxes charged to mining companies go to the central government. The only income from mining activities that is directly collected by municipalities are mining patents, which correspond to the right that has to be paid to explore and produce in the municipal territory. Indeed, patents do not depend on production level or profits, but on the extension of the mining area. Nevertheless, previous to the 2005s-mining reform, a 70 per cent of mining patents collected were transferred to the *Regional Development National Fund*, which then distributed these revenues to development works at the regional level, while only 30 per cent were managed by the municipality where the mine operates. This context suddenly changed after 2005, when the percentage of mining patents assigned to municipalities increased from 30% to 50%.

The main components of the municipal budget in Chile are Permanent Own Income (POI) and the Common Municipal Fund (CMF), while the rest of the budget correspond to direct transfers from the central government and other minor sources. During the period 2001-2015, the POI accounts for around 27 per cent of total income while the FCM

represents almost a 47 per cent. Altogether, these components conform what is called the Own Income (OI) of each municipality, which is the part of the municipal budget that can be used in an autonomously way by the municipal administration. The main difference between the POI and the CMF is the way by which they are collected; while the POI corresponds to fiscal resources that each municipality is responsible to collect by its own, the CMF is a redistribution mechanism by which richer municipalities subsidize poorer localities according to certain established criteria. Therefore, mining patents correspond to an item of the POI in the municipal budget.

Table 1 presents a summary of the municipal budget in Chile for the period 2001-2015, distinguishing among mining and non-mining municipalities. Whether a municipality in Chile is considered as mining is usually defined as a function of the contribution of mining patents to the POI. In particular, we treat a municipality as mining if it collected more than 5 per cent of its POI from mining patents in year 2005, right before the mining reform. We will show in section 5 that for this group the 2005's reform had a positive and statistically significant impact on total municipal revenues. On the other hand, we define a municipality as non-mining if it had 0 per cent of mining patents in year 2005¹. We observe that even if mining patents are a minor component for the full sample of municipalities, when we look to the group of mining municipalities they account for a 7.1% of total municipal income and a 33.5% of the POI. The latter means that around a third of the resources that are directly collected by a municipality located in a mining area correspond to mining patents. Notice that, since the mining municipalities group is defined as having more than 5 per cent of mining patents over POI, municipalities that have between 0 and 5 per cent do not belong to either group.

Table 1. Average municipal budget 2001-2015

	All municipalities (344)	Non-mining municipalities (131)	Mining municipalities (51)
Mining patents			
Mining patents as a % of permanent own income (POI)	0.058	0.005	0.335
Mining patents as a % of total income	0.012	0.000	0.071
Municipal budget			
Permanente own income (POI) as a % of total income	0.269	0.262	0.258
Common Municipal Fund (CMF) as a % of total income	0.466	0.475	0.465
Transfers and others as a % of total	0.264	0.262	0.277

¹ Since the non-mining municipalities group is defined in year 2005, it is possible for some municipalities to have mining activities before or after this year. However, mining patents for this group seem to be negligible, and we will show in section 4 that they remain mostly without mining activity.

Notes: Own construction using SINIM data. Mining municipalities are defined as collecting more than 5 per cent of its Permanente Own Income from mining patents in 2005. Non-mining municipalities are defined as not having any income from mining patents in 2005.

3. Mechanisms – resource windfalls and public-sector employment

In order to analyze the channels through which a fiscal windfall operates through the political process, in this case a municipal windfall coming from mining patents, we can adapt the seminal model of Robinson, Torvik and Verdier (2006, 2014). Since the probability of remaining in power is an increasing function of active political supporters, an incumbent politician has incentives to expand public sector employment in exchange of political support. A raise in fiscal income coming from natural resources induce the incumbent to offer unproductive jobs in the public sector, which lead to an efficiency loss in the economy. However, strong institutions can prevent the hiring of clients in the public sector.

The Robinson, Torvik and Verdier model can be applied to our local governments context under the same arguments, where the mayor is the relevant incumbent politician. In the model, the rise in fiscal income comes from an increase in resource prices that are exogenously determined on world markets. In the Chilean case, municipalities do not collect taxes from resource production or utilities, so the variation in international prices has no direct impact on the municipal budget. However, the legal reform of 2005 to mining patents can be view as an equivalent exogenous change in municipal income. Moreover, the resource curse is normally understood as resource abundance instead of short term price fluctuations, so the model studies a permanent resource boom that is analytically equivalent to the permanent rise in mining patents from 30 to 50 per cent.

A different feature of the model respect to our context is that in the latter the incumbent does not have to decide how much of resources to extract in each period. Instead of that, the only decision to make is the amount of resource income that will be deviated to patronage or used to other municipal expenditures. Nevertheless, the public-sector employment mechanism reminds the same. Since this mechanism reduces the efficiency of the economy by transfer labor to unproductive jobs in the public sector, the positive income effect of a resource windfall can be turned negative if clientelism is too high.

It is also important to approach why the deviation of fiscal resources should operate through an expansion of public sector employment, instead of other kind of patronage relations. According to Robinson and Verdier (2013) a first point refers to credibility –an offer of employment may be more credible than an offer of money transfers. Moreover, an incumbent politician may be able to hire people in advance, while transfers of money could be subject to further institutional restrictions. On the same line, Coate and Morris

(1995) suggests that public sector employment is a less obvious way to obtain political support than direct money transfers.

3.1 The role of institutions

A key feature of the Robinson, Torvik and Verdier approach is that it can capture the divergent experiences of resource rich economies under the same framework. A resource boom increases total income if accountability is strong, but can decrease income if institutions are weak. Several previous works have found that the presence of a resource curse is conditional on the quality of institutions (Mehlum et al 2006; Boschini et al 2007, 2013; Collier and Goderis 2012, among others). However, most of them are based on cross-country comparisons that introduce the interaction between institutional quality and natural resource abundance into a growth regression, resulting in serious simultaneity problems.

While Chile is still a developing economy, its political institutions at the national level are significantly stronger than most of Latin American countries and they also compare well to some OECD economies². According to our model, this implies that deviation of resources to clientelism should be bounded in the Chilean case. However, it is possible that local governments do not face the same levels of accountability than the central government, specially in communes located in remote areas. Indeed, the presence of the public-sector employment mechanism in Chile would suggest a lack of accountability at the municipal level.

3.2 Implications for fiscal decentralization

In fiscal terms, Chile is a highly centralized country. As can be seen in Figure 1, tax revenues assigned outside the central government do not exceed 8 per cent, while the OECD average is around 14 percent. In a resource-based economy, fiscal decentralization is closely related to the fiscal contribution of resource production to local communities where resources are extracted. In a neighbor mining country such as Peru, 50 per cent of taxes from mining companies are directly assigned to local governments where mines operate³, while in Chile all taxes collected from mining go directly to the central government. Whether the Peruvian decentralization policy or the Chilean centralized scheme lead to higher living standards is closely related to the effect of resource windfalls through the political process.

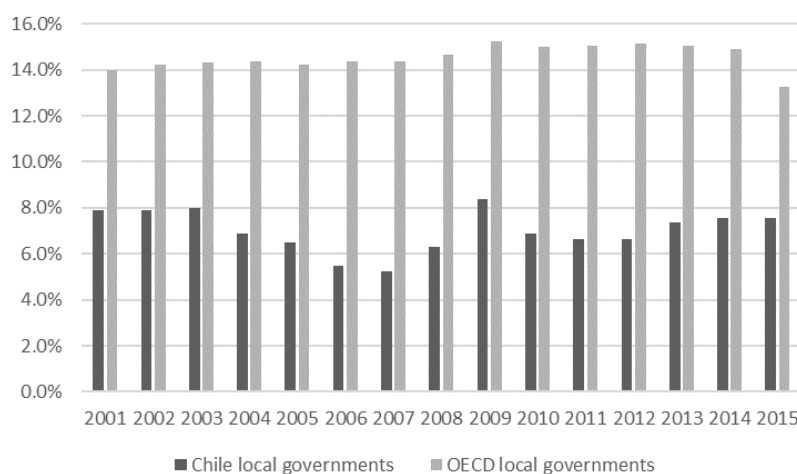
According to Loayza and Rigolini (2016), the effect of mining activity to local communities in Peru is mixed, as it has a positive income effect but a negative

² See for example the *Polity IV* indicators on the quality on democratic institutions, political competition and restrictions to the executive power. Also, Chile ranks 24 in the world in the *Corruption Perceptions Index* 2016 from *Transparency International*.

³ This kind sharing scheme is known as the *Mining Canon* in Peru (Loayza and Rigolini, 2016).

distributional effect. However, they focus on the overall effect of mining on socioeconomic outcomes but not to the specific effect of fiscal revenues through the local government. A more closely related study refers to Caselli and Michaels (2013), which found that an increase in revenues experienced by oil-rich municipalities in Brazil expanded reported spending on public goods and services, but it did not lead to a corresponding increase in social outcomes. Indeed, evidence suggests that funds may be allocated to a combination of self-enrichment and vote buying.

Figure 1. Percentage of tax revenues assigned outside the central government



Source: OECD Fiscal Decentralization Database

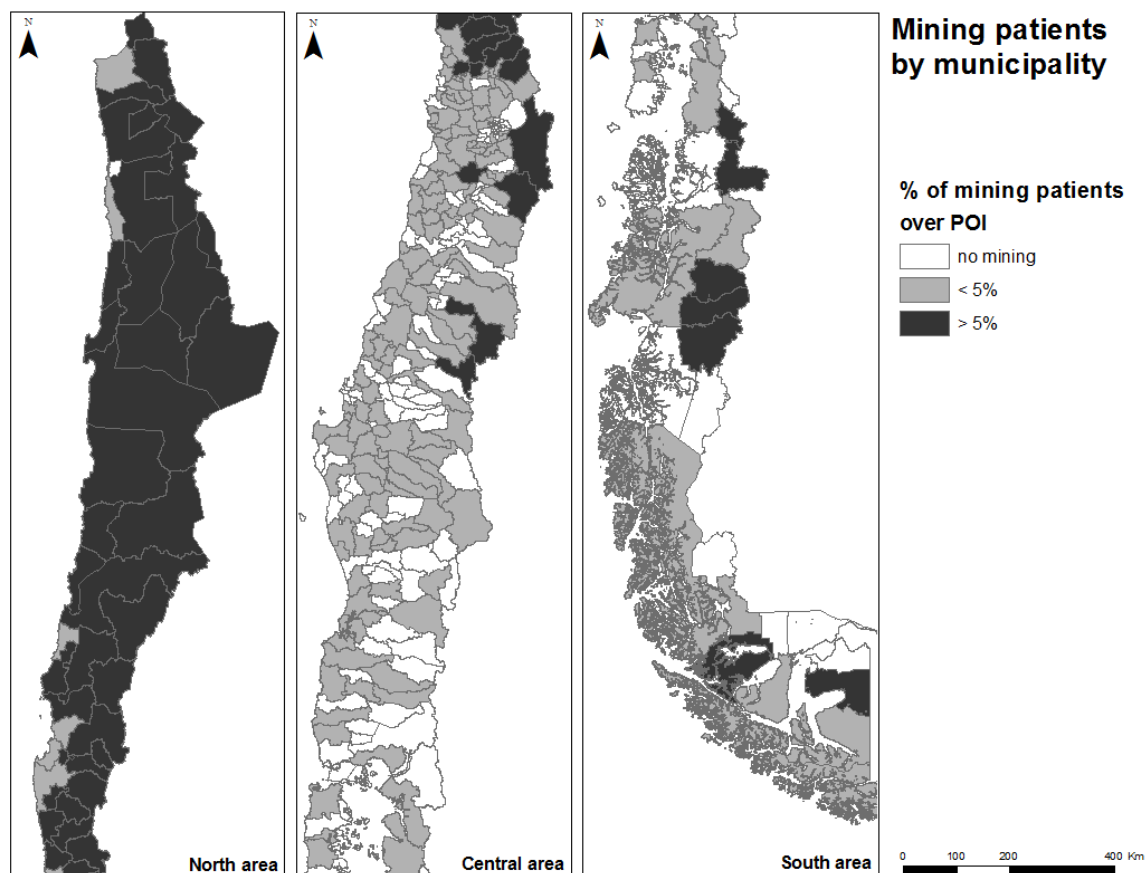
In our case, we evaluate if a country such as Chile is able to avoid the presence of the public-sector employment mechanism from extra fiscal revenues. Even if we do not aim to find a comprehensive answer to the effects of a fiscal decentralization policy on the economy, the Chilean quasi-experiment allows us to better understand its consequences through the political process. The presence of this mechanism would imply that a fiscal decentralization process should be accompanied by a corresponding improvement of accountability at the municipal level, in order to ensure that extra revenues will be efficiently used in benefit of the community.

4. Data and empirical strategy

Using the *National System of Municipal Information* (SINIM) during the period 2001-2015, we construct a binary variable called *Mining* to identify the treated group of mining municipalities, which we define as having more than 5 per cent of mining patents over Permanent Own Income (POI) in the year 2005, right before the legal reform to mining patents begins to operate. The control group is composed by all the municipalities that did

not have any resources from mining patents in year 2005. Figure 2 presents the location of mining municipalities along the Chilean territory and it is notice that most of mining municipalities are concentrated in the North area of the country.

Figure 2. Mining patents as a percentage of permanent own income (POI) by municipality



Source: Own construction using SINIM data on mining patents and permanent own income.

4.1. Empirical Strategy

The main interest of this paper is to explain the behavior of municipal-employment expenditures, so we will evaluate if the increase in mining patents affectively increased total income for our treatment group. After that, we will study the effect of extra mining patents on the aggregate municipal-sector employment (i); the effect on disaggregated municipal-employment distinguishing among long, annual and partial-term salaries employees, as well as on the allowances to the municipal Council (ii); and the effect on other municipal expenditures that contains municipal investment, transfers to education, health and community programs.

Our empirical strategy is based on comparing mining municipalities, which are our treatment group, to municipalities located in nonproducing areas, so they were not directly affected by the 2005's legal reform. To estimate the effect of the increase in mining patents on municipal employment, we use a standard Difference-in-Differences estimator. We will include a set of geographical control variables in our estimations. This set account for the total squared kilometers of the commune (*area*), the distance to the regional capital (*distance*) and a dummy that takes the value of 1 if the municipality does not belong to the Metropolitan Area of Chile (*province*). We will also evaluate our estimations using commune-specific and time effects.

4.2. The treatment: The 2005's change to mining patents law

During 2005 the Chilean Parliament approved a reform to the mining patents law (Nº 19.143). When the reform came into effect during 2006, the portion of mining patents assigned to municipalities increased in 20 percentage points, rising from 30 to 50 per cent. The aim of this policy was to increase the revenues that receive municipalities directly affected by mines operation, in order to promote development works that compensate local communities and improve their living standards. This was also view as a small step in the direction of more fiscal decentralization, which was expected to increase efficiency in the assignment of resources along the country. The increase in mining patents can be viewed as a mostly exogenous fiscal windfall to mining municipalities.

In Figure 3 we present the evolution of mining patents for the treatment group (mining municipalities) and the control group (non-mining municipalities). We observe that mining localities notably increased their mining patents per capita during the period, going from around cl\$15,000 pesos per capita (at constant prices of 2015) until 2005, to reach a peak of around \$60,000 per capita in 2013. The non-mining municipalities group was defined as lacking of mining activities at the year 2005, but remains close to zero during the whole sample period. This means that non-mining localities did not use to have relevant mining activities before 2005 and neither started to have them after that.

We now evaluate the behavior of our main dependent variable, municipal-employment expenditures in per capita terms, before and after the 2005's legal reform. In Figure 4 we can observe that municipal-employment expenditures were already higher in mining municipalities before 2005, but the trends of both groups follow a parallel path. This suggests that the difference-in-differences estimator is a reasonable choice to evaluate the effect of mining patents on municipal employment. After 2005's legal reform, both groups seem to increase their expenditures on municipal employment, however, the rise was much larger in mining municipalities. The fact that municipal-employment expenditures also increase in non-mining municipalities is related to the fact that a 25 per cent of the transfers from the Municipal Common Fund (MCF) are assigned according to

relative Permanent Own Income (POI). Therefore, as mining municipalities get richer, non-mining municipalities are relatively poorer and receive more transfers.

Figure 3. Mining patents per capita by groups of municipalities
(thousands of 2015 Chilean pesos)

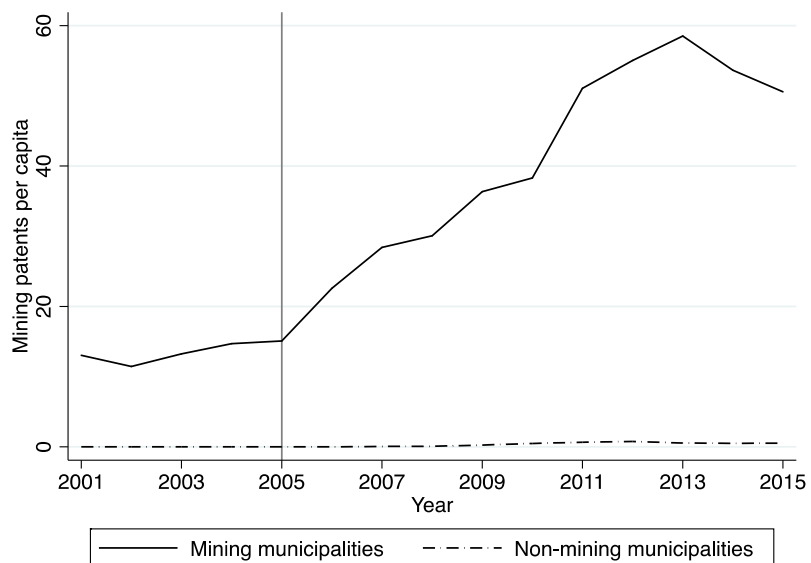
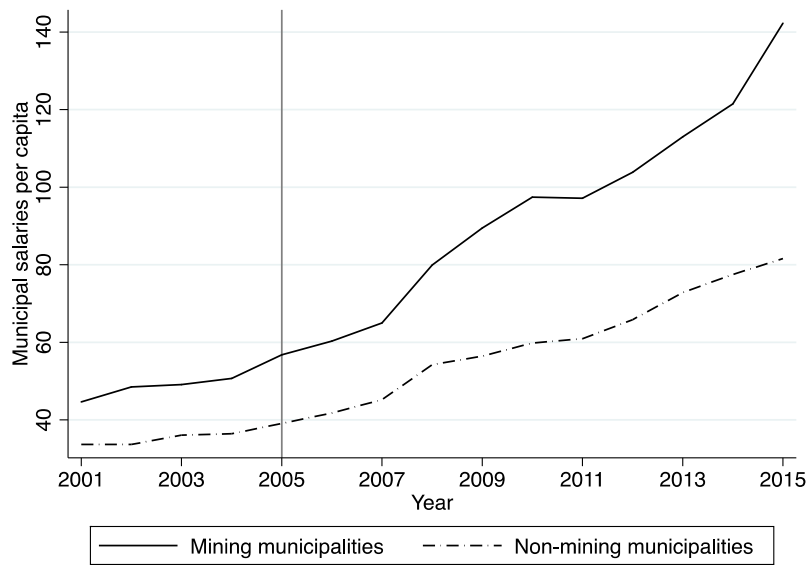


Figure 4. Municipal-employment expenditures by groups of municipalities
(thousands of 2015 Chilean pesos)



4.3 Descriptive statistics

Now we explore the characteristics of our sample in the period previous (2001-2005) and posterior (2006-2016) the treatment, when the 2005's mining reform began to operate. In table 2 we present summary statistics for our main variables, that is, municipal-employment expenditure variables, distinguishing among treatment (mining municipalities) and control (non-mining municipalities) groups. We can observe that, on average, total salaries per capita were higher during the period 2001-2005 in mining municipalities (cl\$49,900) than in non-mining municipalities (cl\$35,800). Then, in period 2006-2015, salaries per capita in mining municipalities rise to cl\$96,900, which correspond to a 94 per cent increase. On the other hand, salaries per capita rise to cl\$61,600 in the non-mining group, which represents a 72 per cent increase. This suggests that, posterior to 2005, this variable grew much faster in municipalities that received extra mining patents. Similar conclusions are derived when we observe the disaggregated expenditures in long and annual-term salaries per capita, while only the partial-term salaries grew faster in non-mining municipalities. Moreover, the allowances assigned to the municipal Council grew from cl\$7,400 to cl\$17,800 in mining municipalities posterior to 2005, that is, a 140 per cent increase. On the other hand, allowance increased an 82 per cent in non-mining municipalities during the same period.

Table 2. Summary statistics for municipal-employment expenditures.

	2001-2005			2006-2015		
	Obs	Mean	Std. Dev.	Obs	Mean	Std. Dev.
Non-mining municipalities						
Total salaries per capita	641	35.8	42.2	1,304	61.6	85.8
Long-term salaries per capita	641	27.9	32.2	1,304	45.3	63.7
Annual-term salaries per capita	641	5.7	7.5	1,304	11.7	15.6
Partial-term salaries per capita	641	2.3	5.1	1,304	4.6	13.4
Allowances to municipal council per capita	641	3.9	9.0	1,304	7.1	16.9
Mining municipalities						
Total salaries per capita	248	49.9	63.7	496	96.9	164.9
Long-term salaries per capita	248	37.3	44.8	496	70.6	117.1
Annual-term salaries per capita	248	8.4	11.5	496	19.0	34.8
Short-term salaries per capita	248	4.3	8.5	496	7.3	16.3
Allowances to municipal Council per capita	248	7.4	15.7	496	17.8	29.2

Notes: All variables are expressed in thousands of Chilean pesos at constant prices of 2015.

5. Results

We first show that municipal revenues effectively increased after 2005 for our mining municipalities group. This is a key step for the analysis, since the 20 percentage points increase in mining patents could be offset by a diminishing in redistribution transfers received from the Municipal Common Fund (MCF), a reduction on direct transfers from the central government or by incentives to *fiscal laziness* in other components of the permanent own income (POI), which are collected by the municipality itself. Table 4 presents the results for municipal revenues per capita evaluating different thresholds to define the mining municipalities group. Columns (1) and (2) show a statistically significant effect for our main treatment group, that is, municipalities that had more than 5 per cent of mining patents over POI in year 2005 before the reform was implemented. According to our estimations, the magnitude of this effect ranges from cl\$89,300 to cl\$122,770 per capita, which is a meaningful impact since the group-average municipal revenues per capita were cl\$364,899 before the treatment period.

The effect of mining patents on municipal revenues is considerably lower -and not always statistically significant- when we consider as our treatment group the municipalities that receive any amount of mining patents in 2005, which is shown in columns (3) and (4). Therefore, this would not be an appropriate treatment group to test the impact of mining patents through the political process. On the other hand, columns (7) and (8) show that the effect is considerably higher when we take the group of municipalities that had more than 10 per cent of mining patents over POI in 2005, which range from cl\$112,890 to cl\$141,540 per capita.

Table 4. Municipal revenues per capita.

Dependent variable: <i>Municipal revenues per capita</i>	Treatment group: Mining >5%		Treatment group: Mining >0%		Treatment group: Mining >10%	
	(1)	(2)	(3)	(4)	(7)	(8)
Post x mining	89.30** (48.72)	122.77*** (22.87)	-13.16 (17.10)	16.56** (7.33)	112.89** (60.09)	141.54*** (27.21)
Controls	Yes	Yes	Yes	Yes	Yes	Yes
Municipal FE	No	Yes	No	Yes	No	Yes
Year FE	No	Yes	No	Yes	No	Yes
Observations	2,479	2,479	4,825	4,825	2,322	2,322

Notes: Columns (1) - (2) correspond to our main treatment group, that is, municipalities that have more than 5% of mining patents over permanent own income (POI) in 2005. Columns (3) – (8) evaluate alternative treatment groups. Odd columns estimate a standard difference-in-difference regression, while even columns estimate an extended model that includes commune-specific and year fixed effects. Controls include distance to the regional capital (*distance*), a dummy that take the value 1 when the municipality is outside the metropolitan region (*province*) and the total area of the commune (*area*). Robust standard errors are reported in parentheses.

*** p<0.01

** p<0.05

* p<0.1

We now evaluate the impact of this increase in municipal revenues on municipal employment. Table 5 present results for total municipal salaries per capita as well as disaggregating by different kinds of municipal employment. Columns (1) and (2) show that the increase in mining patents lead to an expansion of total municipal salaries per capita that is statistically significant at the 5 and 1 per cent, respectively. According to these results, the range of the effect goes from cl\$19,890 to cl\$29,040 per capita, while the average total municipal salaries per capita in 2005 were \$56,760 per capita for this group. This finding is consistent with Robinson, Torvik and Vernier (2006, 2014) framework, in which an exogenous fiscal windfall generated by natural resources is deviated to expand public-sector employment. According to this model, Chilean institutions at the municipal level are not strong enough to avoid the presence of the clientelism mechanism.

Table 5. Municipal employment expenditures

Dependent variable:	Total municipal salaries per capita		Long-term salaries per capita		Annual-term salaries per capita		Short-term salaries per capita	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Post x mining	19.89** (9.16)	29.04*** (5.71)	14.36** (6.55)	21.22*** (4.08)	4.43** (1.84)	6.07*** (1.31)	1.10 (1.00)	1.75*** (0.59)
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Commune FE	No	Yes	No	Yes	No	Yes	No	Yes
Year FE	No	Yes	No	Yes	No	Yes	No	Yes

Observations	2,476	2,476	2,476	2,476	2,476	2,476	2,476	2,476
--------------	-------	-------	-------	-------	-------	-------	-------	-------

Notes: Odd columns estimate a standard difference-in-difference regression, while even columns estimate an extended model that includes commune-specific and year fixed effects. Controls include distance to the regional capital (*distance*), a dummy that take the value 1 when the municipality is outside the metropolitan region (*province*) and the total area of the commune (*area*). Robust standard errors are presented in parentheses.

*** p<0.01

** p<0.05

* p<0.1

Columns (3) to (8) presents disaggregated results for the main kinds of municipal employment in Chile. According to these estimations, the largest increase in salaries corresponds to long-term employees (called *planta* in Chile) -whose have a non-limit contract- and accounts for around 75 per cent of the total increase in municipal employment expenditures. Annual-term employees (called *contrata* in Chile) –whose contracts have to be renewed at the end of each year- account for around 20 per cent of the total increase in salaries, while short-term employees (called *honorarios* in Chile) – whose realize a specific job to the municipality- account for around 5 per cent of the total effect in salaries spending. However, the increase in expenditures of short-term employees is only statistically significant when we include commune-specific and time effects. This proportions can be explained by the differentiated legal restrictions that affect different kind of municipal employees. While the spending on long-term contract expenditures cannot exceed a 35 per cent of the Own Income (OI), annual-term contract expenditures have a tighter restriction and cannot exceed a 20 per cent of long-term contract expenditures (law N°18.883)⁴. Moreover, short-term employees are even more restricted, as they limit corresponds to a 10 per cent of long-term contract expenditures (law N°19.280).

As additional evidence to support the hypothesis of an inefficient increase in municipal employment financed by mining patents, we now evaluate the evolution of the allowances assigned to the municipal Council. In Chile, the municipal Council is composed by the Major and a group of councilors directly elected by popular vote, which range from 6 to 10 according to population. Since allowances are conceived to account for work spending's by the Council, there is no reason to think that the Council's needs suddenly increased in mining localities respect to other municipalities in the country. However, our results presented in Table 6 show a statistically significant increase in allowances to the municipal Council, which range from cl\$7,090 to cl\$8,780 per capita. This effect

⁴ The law N°18.883 was recently modified by the law N°20.922, which expand the limit of long-term employee expenditures from 35 to 42 per cent of the Own Income, while annual-term employee expenditures modify its limit from 20 to 40 per cent of long-term employee expenditures. However, this new regulation was published in May of 2016, so it does not affect our sample period.

corresponds to almost a 100 per cent increase respect to its level in 2005, where allowances accounted for \$9,837 per capita in mining municipalities.

Table 6. Allowances to the municipal Council

Dependent variable:	Allowances to the municipal Council per capita (1)	Allowances to the municipal Council per capita (2)
Post x mining	7.09*** (2.54)	8.78*** (1.79)
Controls	Yes	Yes
Commune FE	No	Yes
Year FE	No	Yes
Observations	2,476	2,476

Notes: Column (1) estimates a standard difference-in-difference regression, while column (2) estimates an extended model that includes commune-specific and year fixed effects. Controls include distance to the regional capital (*distance*), a dummy that take the value 1 when the municipality is outside the metropolitan region (*province*) and the total area of the commune (*area*). Robust standard errors are presented in parentheses.

*** p<0.01

** p<0.05

* p<0.1

We have shown that the increase in mining patents leads to a significant increase of municipal revenues in mining municipalities, which translate into a large increase in municipal employment expenditures, and also to an apparently unjustified increase in allowances to the municipal Council. Now we investigate whether the increase in municipal revenues also leads to an increase in municipal expenditures that are closer related to the living standards of the community. Table 7 presents the results for other municipal expenditures. In columns (1) and (2) we can observe that the effect on municipal investment is positive but only statistically significant when we include commune-specific and time effects. Moreover, this effect is around 50 per cent of the increase in total salaries per capita shown in Table 5. Columns (3) and (4) show a statistically significant impact on transfers to the educational system, which represent around 30 per cent of the increase in total salaries, while columns (5) and (6) show that there is no significant effect on transfers to the health system. Columns (7) to (8) show that the effect on community programs is only significant when including commune and time effects, and its magnitude is negligible since it accounts for around 3 per cent of the increase in total salaries.

Table 7. Other municipal expenditures

Dependent variable:	Municipal investment per capita		Transfers to education per capita		Transfers to health per capita		Transfer to community programs per capita	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Post x mining	9.03 (8.71)	13.90*** (5.88)	6.34* (3.54)	10.38*** (1.83)	0.18 (1.77)	1.70 (1.09)	0.70 (0.47)	0.83** (0.33)
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Commune FE	No	Yes	No	Yes	No	Yes	No	Yes
Year FE	No	Yes	No	Yes	No	Yes	No	Yes
Observations	2,476	2,476	2,476	2,476	2,476	2,476	2,476	2,476

Notes: Odd columns estimate a standard difference-in-difference regression, while even columns estimate an extended model that includes commune-specific and year fixed effects. Controls include distance to the regional capital (*distance*), a dummy that take the value 1 when the municipality is outside the metropolitan region (*province*) and the total area of the commune (*area*). Robust standard errors are presented in parentheses.

*** p<0.01

** p<0.05

* p<0.1

The results in Table 7 suggest that the increase in other municipal expenditures, which have a more direct impact on living standards, is less clear. The magnitude of this effect is bounded respect to what could potentially be, as many resources are deviated to increase municipal employment. Indeed, the jointly effect in municipal investment, transfers to education and transfers to community programs seem to be smaller than the increase in total municipal salaries. Maybe more illustrative is the fact that the increase in transfers to education is of similar size to the increase in the allowances to the municipal Council.

6. Concluding remarks

This article has examined how an increase in municipal revenues impacts on municipal employment. The increase in mining patents induced by the legal change of 2005 represents a novel quasi-experiment to obtain an exogenous variation in the municipal income. Hence, we exploit detailed data from the *National System of Municipal Information (SINIM)* over 16 years and use a difference-in-differences estimation to compare mining municipalities to their peers in nonproducing areas. We demonstrate that mining municipalities significantly expanded municipal employment, even if mining patents are aimed to be used for development works in the local area. Moreover, this effect seems to operate through different kinds of municipal employment, but specially through long-term employment, since annual and partial-term employee expenditures are more restricted.

Our results are consistent with Robinson, Torvik and Vernier (2006, 2014) framework, which predicts that fiscal windfalls from natural resources can be deviated to offer public-sector employment in exchange of political support. Moreover, our findings suggest that Chilean institutions at the local government are not strong enough to avoid the clientelism mechanism. Since Chile has relative strong political institutions at the national level, this fact reinforces the idea that national institutions do not necessarily translate into similar accountability levels at the local level.

This paper has several implications related to fiscal decentralization. In resource-based economies, fiscal decentralization is intrinsically linked to the portion of resource revenues that goes directly to local governments where resources are extracted. In Chile, all corporate taxes collected from mining companies go to central government, which contrast to the case of Peru, where 50 per cent of taxes on mining companies goes to local governments. However, because of the presence of the clientelism mechanism, rising the amount of fiscal revenues managed by municipalities would not necessarily increase living standards in mining areas. Since Chile is significantly more centralized than most OECD countries, we should expect a growing demand for fiscal decentralization policies. Our results do not lead us to assert that decentralization should be discarded, on the contrary, we emphasize that a fiscal decentralization process should be accompanied by improvements in accountability at the municipal level.

References

- Aragón, F. M., & Rud, J. P. (2009). The blessing of natural resources: Evidence from a peruvian gold mine. *Banco Central de Peru Working Paper Series*, 15.
- Boschini, A. D., Pettersson, J., & Roine, J. (2007). Resource curse or not: A question of appropriability. *The Scandinavian Journal of Economics*, 109(3), 593-617
- Boschini, A., Pettersson, J., & Roine, J. (2013). The resource curse and its potential reversal. *World Development*, 43, 19-41.
- Bravo, J., 2013. The Incentive Effect of Equalization Grants on Tax Collection, *The B.E. Journal of Economic Analysis & Policy*, 13 (1).
- Brunnschweiler, C. N., & Bulte, E. H. (2008). The resource curse revisited and revised: A tale of paradoxes and red herrings. *Journal of environmental economics and management*, 55(3), 248-264.
- Caselli, F., & Michaels, G. (2013). Do oil windfalls improve living standards? Evidence from Brazil. *American Economic Journal: Applied Economics*, 5(1), 208-238.

- Coate, S., & Morris, S. (1995). On the form of transfers to special interests. *Journal of political Economy*, 103(6), 1210-1235.
- Collier, P., & Goderis, B. (2012). Commodity prices and growth: An empirical investigation. *European Economic Review*, 56(6), 1241-1260.
- Dube, O., & Vargas, J. F. (2013). Commodity price shocks and civil conflict: Evidence from Colombia. *The Review of Economic Studies*, 80(4), 1384-1421.
- James, A., & Aadland, D. (2011). The curse of natural resources: An empirical investigation of US counties. *Resource and Energy Economics*, 33(2), 440-453.
- James, A. (2015). US state fiscal policy and natural resources. *American Economic Journal: Economic Policy*, 7(3), 238-57.
- Loayza, N., & Rigolini, J. (2016). The local impact of mining on poverty and inequality: evidence from the commodity boom in Peru. *World Development*, 84, 219-234.
- Mehlum, H., Moene, K., & Torvik, R. (2006). Institutions and the resource curse. *The economic journal*, 116(508), 1-20.
- Michaels, G. (2011). The long-term consequences of resource-based specialization. *The Economic Journal*, 121(551), 31-57.
- Robinson, J. A., Torvik, R., & Verdier, T. (2014). Political foundations of the resource curse: A simplification and a comment. *Journal of Development Economics*, 106, 194-198.
- Robinson, J. A., & Verdier, T. (2013). The political economy of clientelism. *The Scandinavian Journal of Economics*, 115(2), 260-291.
- Sachs, J. D., & Warner, A. M. (1997). Fundamental sources of long-run growth. *The American economic review*, 87(2), 184-188.
- Sachs, J. D., & Warner, A. M. (2001). The curse of natural resources. *European economic review*, 45(4), 827-838.
- Smith, B. (2015). The resource curse exorcised: Evidence from a panel of countries. *Journal of Development Economics*, 116, 57-73.

