Economic effect of splitting a region: A case from the south of Chile

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ABSTRACT

The economic impact of territorial reforms has been discussed in the literature, but mostly looking at amalgamations rather than de-amalgamations. Little is known about the impact of territorial splits and even less in a centralized and emerging country. This paper aim to fill this gap by analyzing the specific case of the Los Rios region, who was splinted from Los Lagos region in the south of Chile. By using a synthetic control approach, a difference in differences and event studies, we estimate the causal effect of such reform over GDP, private sales, and employment on the affected regions, including the effect of the new administrative status for the city of Valdivia who became regional capital. Once we accounted for all sources of external shocks, we did not find any impact of the division on the regions of Los Lagos and Los Rios and no effect of the new administrative status for Valdivia. We believe these results are very important as illustrate that policies aimed to splits regions or relocate the capital status to promote growth should consider the context and the scope of competences of the subnational governments.

Keywords: Territorial reform, synthetic control method, decentralization, local governments, administrative status, differences in differences.

JEL Codes: R11, R12, H77.

1 Introduction

Optimal territorial size and the effects of territorial reforms have been attracting the interest of researchers in local governments and economic geographers.

Territorial reforms constitute an interest topic of research mainly for the following reasons. First, is politically controversial, as municipal splits are not in response to an optimal design or a planned policy from a central government but rather occur as a result of bottom-up pressure. It is reasonable to suppose that this characteristic of the process has influenced the little weight that has been given from the public sphere to the evaluation of these interventions. Second, the economic effect of this policy from a theoretical point of view is difficult to disentangle as presents opposite positions. From one perspective, Oates (1999) argues that decentralized levels of government can increase welfare as they reduce heterogeneities regarding preferences in public goods. The second perspective claims in favor of territorial amalgamations enhancing the benefits of scale economies in the provision of public goods (Gendźwiłł et al., 2020). Another relevant factor in territorial reforms is related to the role of the administrative center, which generates a positive effect on economic activity (Egger et al., 2021).

This paper analyzes the effect of a territorial reform applied in 2007 that split a region into two in the South of Chile. The new region of Los Rios was created giving it back an old status of administrative center to the city of Valdivia. We aim to estimate the causal effect of such reform by employing three quasi-experimental designs. First, a synthetic control approach is used to study the effect on per capita GDP in the area as a whole, i.e., without making a distinction between the new units. Second, a difference in differences has been applied to determine which region is most favored by the territorial reform. Finally, we estimated the effect of the new administrative status on Valdivia that became a regional capital.

As we have these three research questions which are slightly different, we looked at the literature focused on territorial reforms, administrative forms of the state & economic growth and the economic importance of having an administrative status such as regional capital.

Focusing on the territorial split, papers related to our objectives are focused more on amalgamations rather than divisions (Gendźwiłł et al., 2020).

Even tough municipal amalgamations are not our focus, we highlight the work by Egger et al. (2021) that study how municipal mergers in Germany affect local activity. The novelty of this paper is that they looked at the difference between the "hosting municipality", i.e.,. the one who keeps the status of capital versus the "absorbed municipality" who loses such status. By using differences in differences, they found that municipalities absorbing partners experienced a notable increase in economic activity in contrast, absorbed municipalities went through a decrease. The main take away of this work is the importance of being an administrative center.

Regarding territorial secessions are, for example, the work of Swianiewicz and Łukomska (2017) who analyzed municipal fragmentation in Poland using a synthetic control method. The fundamental difference with our objective is that they focused on the effect over administrative cost as a procedure to test the argument linked to scale economies in the provision of public goods.

The paper by de Andrade Lima (2021) is the closest approach to ours. Analyzing a reform applied in Brazil in 1988 where the state of Tocantins was splinted from the State of Goiás, they founded a positive effect in per capita GDP either in the sum of both regions and separating each of them, being the effect higher in the newly created state of Tocantins. They tried to look into in the mechanism of such effect by looking at the change in fiscal outcomes.

An important piece of literature to us is related to the administrative form of the state and the competences of regional governments. We believe the results could differ between countries as they also differ on the definition of decentralization. We consider the definitions

made by Falleti (2005) who distinguish three types of decentralization[1]. The Chilean case rest upon what is known as administrative decentralization (Navarrete-Yánez and Higueras-Seguel, 2014). The literature argues in favor of a positive relationship between decentralization and economic growth when this is accompanied by a high degree of political decentralization (Canavire-Bacarreza et al., 2020; Filippetti and Sacchi, 2016; Thiessen, 2003).

To answer the question if having an administrative status matter, Heider et al. (2018) study the impact of administrative reforms in Germany over population growth finding a negative impact of losing the status of capital city. Quistorff (2015) found no significant effect of losing the administrative status in the case of Rio de Janeiro in Brazil, but a positive effect of gaining the new one for Brasilia.

In overall the conclusions are that being capital matters and that the mechanism behinds are explained by a multiplicative effect from public sector employment to private sector employment (Faggio et al., 2019; Jofre-Monseny et al., 2020) besides the idea of fiscal spending multiplier (Turner and Turner, 2011; Chodorow-Reich, 2019; Corbi et al., 2019). Indeed, in some cases, has been argued that governments used relocation policies such as changing the capital cities as a tool to address unemployment in stagnated regions under the idea of the multiplicative effect of the public sector (Jefferson and Trainor, 1996; Faggio and Overman, 2014; Faggio et al., 2019). A recent and provocative paper defying this idea regarding changes in local public employment as a policy tool for lagging regions has been

[1] Administrative decentralization: Comprises the set of policies that transfer the administration and delivery of social services such as education, health, social welfare, or housing to subnational governments.

Fiscal decentralization: refers to the set of policies designed to increase the revenues or fiscal autonomy of subnational governments. This can include for example the delegation of tax authority.

Political decentralization: is the set of constitutional amendments and electoral reforms designed to open new spaces for the representation of subnational polities. Example of this are reforms that allows popular election of regional authorities.

made by Becker et al. (2021). They developed a new economic geography model on which public sector employment affects private sector employment through different channels such as wages, house prices, productivity and amenity spillovers. Using the creation of the new West German government in Bonn in the second World War as source of exogenous variation and applying a SCM and differences in differences they found that the new administrative status for Bonn implied a huge increase in public employment which did not translates to a private employment increase of the same magnitude. In terms of local public employment multiplier, they got that an increase of one unit of public employment would increase private employment in 0.86, which is considerably lower than the existing literature.

Our paper contributes in two manners. We first contribute to the impact analysis of such reform which has not been done. Second, and more important, we contribute to the literature by analyzing a case in a developing country and with a low degree of decentralization compared with the current cases in the empirical research.

The results are surprising and do not go in the direction of the current literature. In overall, once we account for all potential sources of external shocks, there is no policy effect of the territorial division neither for Los Lagos nor Los Rios. Moreover, we could not find any effect over Valdivia of getting the new administrative status as capital regional. This result is far-reaching as open new questions and future research lines.

The body of the paper is as follows. Section 2 presents the political and institutional context of the policy. Section 3 outlines briefly the literature behind our empirical research. Section 4 presents and describes the data and methods used for reaching our purposes. The results are presented in section 5. In section 6 we discuss our results, limitations, and conclusions.

2 Political and Institutional Context

2.1 The regionalization process in Chile

The modern regionalization process carried out in Chile is framed within the context of the military dictatorship in the period between September 11, 1973, and March 11, 1990.

In the 1970s, the country was divided into 25 provinces[2], which were subdivided into departments and these into communes (Ribera Neumann, 2008).

To achieve a better use of the territory and its resources, on December 17, 1973, the National Commission for Administrative Reform (CONARA) was created, which started a process of gradual regionalization that would serve as the basis for a new institutional framework aimed at stimulating harmonious socioeconomic growth (Caviedes and Cárcamo, 2000). Thus, on July 10, 1974, the territorial division of the country into regions was established, generating 13[3] of them, which were subdivided into provinces and these into communes.

It is important to note that this reform caused certain territories to lose their status as administrative centers. It is this condition that triggered a series of territorial movements that sought to recover the historical role of regional capital. In the case of Valdivia, immediately after the reform of 1974 the city's civil society began to exert pressure, organizing itself around associations of producers, artisans and the chamber of commerce and industry (Vial Cossani et al., 2016). These actors, together with politically diverse leaders, realized that a new region would imply a new political administration and new resources that will enhance the economic activity of the territory (Valenzuela and Rojas, 2017).

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[2] Tarapacá, Antofagasta, Atacama, Coquimbo, Aconcagua, Valparaíso, Santiago, O´Higgins, Colchagua, Curicó, Talca, Maule, Linares, Ñuble, Concepción, Arauco, Biobío, Malleco, Cautín, Valdivia, Osorno, Llanquihue, Chiloé, Aysén, Magallanes.

[3] I de Tarapacá, II de Antofagasta, III de Atacama, IV de Coquimbo, V de Valparaíso, VI del Libertador General Bernardo O'Higgins, VII del Maule, VIII del Biobio, IX de la Araucanía, X de Los Lagos, XI de Aysén del General Carlos Ibáñez del Campo, XII de Magallanes y de la Antártica Chilena.

On October 2, 2007, the New Region of Los Ríos was born, where the Province of Valdivia ceases to be part of the X Region of Los Lagos to become part of the new Region.

Figure 1 illustrates the borders pre and post reform in the south of Chile.

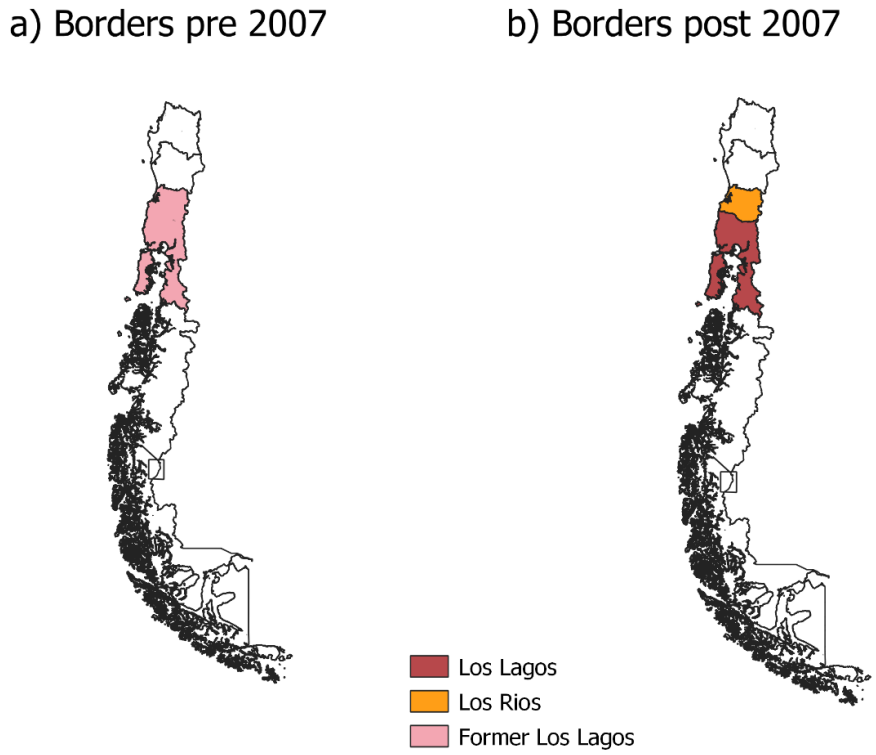

Figure 1. Regional borders before and after the creation of Los Rios region.

2.2 Institutional Context

As previously commented, the administrative organization of Chile is in a first level the regions, then provinces and finally municipalities. Regions are administrated by the regional Government, which is composed by a regional intendant which is designated by the president of Chile[4], and a regional council[5]. The main competences are:

[4] This changed with a reform introduced in 2018. We focus here in the period of analysis.
[5] Before 2013 they were elected by the municipal councils elected by uiversal sufragge. Popular election of regional councils started in 2013.

- **Regional Intendant:** maximum regional authority and natural and immediate representative of the president of the republic. Is designated by the President. Its principal functions are:
    - To direct the tasks of the government in the region.
    - To keep the President of the Republic permanently informed about the fulfillment of the functions of the internal government in the region.
    - Formulate development policies for the region
    - Submit to the regional council the draft regional development plans and strategies and their modifications.
    - Submit to the regional council the draft budget of the regional government and its modifications, adjusted to the guidelines and limits established by the national development policy, the National Budget Law and other legal norms on the financial administration of the State.
- **Regional Council:**
    - To approve the rules of procedure for its own operation as well as the creation of commissions.
    - Resolve, based on the proposal of the intendant, the distribution of the resources of the National Regional Development Fund[6] corresponding to the region. prove regional regulations and regional development plans.

As discussed in the introduction, Chile can be classified as a country with administrative decentralization with a low degree of political and fiscal decentralization. For example, at the policy period, the regional intendant was not chosen by universal suffrage and the regional governments could not design and apply their own policies to improve regional

[6] Principal source of funding. Is a national transfer contemplated in the national budget.

development and no capacity to collect or implement their own taxes. As a manner of comparing the degree of decentralization by countries, figure 2 shows the ratio of subnational expenditure regarding national expenditure across countries. Data comes from the IMF's Fiscal Decentralization Dataset.

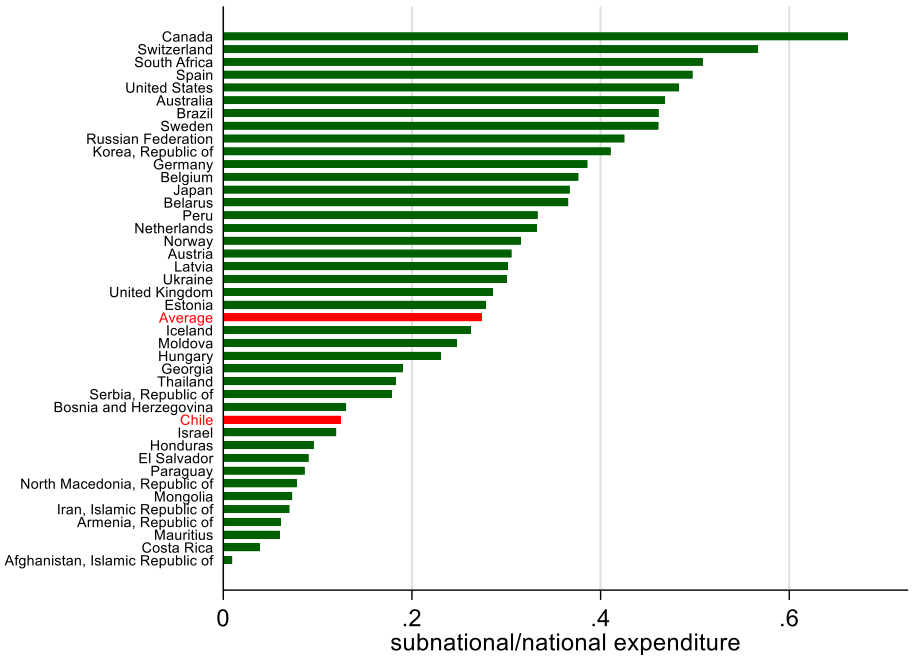

Figure 2. Ratio of subnational government expenditure by countries, year 2007.

As we can see Chile presents a ratio of 12% compared with an average of 27%.

3 Literature Review

As we already commented in the introduction, territorial divisions usually lead to a higher economic growth being higher in the new geographical unit. In addition, we mentioned the importance of getting a new administrative status. Here we briefly go further into the theoretical view about being an administrative center.

Being a capital city may affect growth because usually implies that these cities concentrate the location of public facilities. Theoretically public facilities present demand and supply effects and in addition there can be externalities (Heider et al., 2018).

The *demand effects* are related to the employment effects of public facilities (more public jobs) and the multiplier effect resulting from private expenditures made by these employees. Are also included the effects resulted from the increase in local public spending. An empirical analysis made by Turner (2014) shows that public employment and expenditure agglomerates in the capital cities and decreases with distance to them. Additionally, there may be indirect effects associated from people visiting the city where a certain public facility is located.

The *supply effects* are directly related with the nature or functions of each public facility. For example, in each capital city along with the regional government are located regional ministerial departments who realizes in each region the work of the ministries such as economy, defense, agriculture, culture and more.

Externalities can arise as higher levels of government may orient the construction of roads toward the capital.

4 Data and Method

The aim consists in estimating the causal effect of the policy intervention in economic outcomes. The major challenges consist in the counterfactual's definition for the treated region and the definition of a treated unit that is constant. For these issues, in this paper are employed three strategies. We start with a synthetic control method in where the counterfactual is a synthetic region based on the weighted average of all the regions that did not experience a border reform[7]. For the treated unit, is considered the old region, i.e., the sum of the current Los Rios and Los Lagos. The second method recognize as in Lima (2021) that the two regions could have experienced a different path in the outcome after the reform. The new region of Los Rios gained a new administrative status and according to the literature is expected to describe

[7] We exclude here the region “Tarapacá” which was also split in the period of analysis.

a higher effect. To address this source of heterogeneity between treated regions, we use more disaggregated data to reconstruct the new regions as if they existed before the intervention. Specifically, pre-policy period Los Rios region is considered as the Valdivia Province, which correspond to the same administrative border and for Los Lagos is considered the sum of the provinces of Chiloe, Llanquihue, Osorno and Palena. To estimate the effect of the reform over the treated regions a difference in differences approach is used where we specify a model including all the country, a model with a selected control and a model applying an entropy balance method to match the pretreatment characteristics of all the municipalities resulting in a weighted control. Finally, we apply an event study method which also allow us to see if parallel trends assumptions hold[8]. Event studies are applied in the estimation of heterogeneous effects between Los Rios and Los Lagos and to detect the hypothesis that being a capital city matter, we test this hypothesis over the city of Valdivia that became the capital of the new region of Los Rios.

4.1 Synthetic Control method

We follow here Abadie and Gardeazabal (2003) and Abadie (2021). A treatment effect δ is defined as the difference between treated unit Y_t^1 and the potential outcome without policy Y_t^0:

$$\delta = Y_t^1 - Y_t^0 \quad (1)$$

The potential outcome reflects how the outcome of interest would have evolved for the affected unit in the policy's absence. The key challenge is that we do not observe this potential

[8] There should not be any effect in pretreatment periods.

outcome and here, SCM assumes that a combination of units (regions) may approximate the characteristics of the affected unit (region). Then, the policy effect is estimated as:

$$\delta = Y_t^1 - \sum_{j=2}^{J+1} w^* Y_{jt} \quad (2)$$

Where w^* is a vector of optimally chosen weights which is chosen as to minimize the norm $\|X_1 - X_0 W\|$ where the X_1 is a vector of pre-treatment characteristics for the treated unit and X_0 for non treated units. The data used is the following:

Table 1. Set of variables for the SCM.

Variable	Source
Outcome Variable	
GDP percapita ($ 2003)	Central Bank of Chile/Population in INE
Control Variables	
Population	OCDE
Share of agricultural sector on GDP	Central Bank of Chile
Share of manufacturing sector on GDP	Central Bank of Chile
Share of public sector on GDP	Central Bank of Chile
Share of Commerce, restaurants and hotels on GDP	Central Bank of Chile
Share of Fishing on GDP	Central Bank of Chile
Average years of schooling	CASEN

We applied the model for the period 1996-2010, which is the period without methodological changes in the series's estimation.

4.2 Differences in Differences.

The following regression is specified:

$$y_{it} = \beta_1 (\text{ Los Rios }_i .\ \text{Split }_t) + \beta_2 (\text{ Los Lagos }_i .\ \text{Split }_t) + X'_{it}\alpha + \gamma_i + \theta_t + \varepsilon_{it} \quad (3)$$

Where y is an economic outcome such as the log of employment for a municipality i at year t. Los Rios and Los Lagos are dummies that take the value of 1 for municipalities located in the respective region, 0 otherwise. Split is a dummy with a value 1 for post policy periods and 0 otherwise. X'_{it} is a vector of controls, γ_i is a municipal fixed effects and θ_t a time fixed

effect. β_1 and β_2 measure the effect of the administrative reform on the respective region. The set of variables are:

Table 2. Set of variables for the DiD analysis.

Variable	Source
Outcome Variable	
Formal Employment	SII[9]
Annual sells of private companies (deflacted in UF)	SII
Control Variables	
Population	INE
Share of agricultural sector on total sells	SII
Share of manufacturing sector on total sells	SII
Share of teaching on total sells	SII
Share of Commerce on total sells	SII
Share of hotels and accommodation on total sells	SII

The period of data cover years 2005 to 2014. Unfortunately, there is no data available for years prior to 2005.

4.3 Event Studies

We follow Schmidheiny & Siegloch (2020) and Miller, Johnson, & Wherry (2021) with a normalization in the pre-policy period (-1). The econometric specification is:

$$\mathrm{LnY}_{i,t} = \gamma_0 + {}_i \sum_{j=2005}^{2005} \lambda_j * Los\ Rios\ (Los\ Lagos)_i + \sum_{j=2007}^{2014} \beta_j * Los\ Rios\ (Los\ Lagos)_i + X'_{it}\alpha + \gamma_i + \theta_t + \varepsilon_{it} \quad (4)$$

Where Y is deflacted sales per-capita or private employment, X'_{it} is a vector of controls, γ_i is a municipal fixed effects and θ_t a time fixed effect and ε_{it} is the error term. We expect λ_j to be 0 as an approach to support parallel trends assumption. The omitted or baseline category is y= -1, so that each estimation of β_j provide us the difference in sales or employment in the

[9] Servicio de Impuestos Internos (Tax Agency)

treated regions relative to the control group between a year j and the year prior the territorial division.

4.4 Entropy Balance

To detect heterogeneous effect and for testing the hypothesis that being a regional capital matters, we have used an entropy balance. We apply the method developed by Hainmueller (2012) which is a non-parametric matching technique who re-weight the observations so that the covariate distributions of the control group match exactly with the treated group. We match the first moment of the outcome and the control variables defined in Table 2. This allows us to remove any concern regarding the parallel trends' condition.

5 Results

5.1 Aggregated Analysis

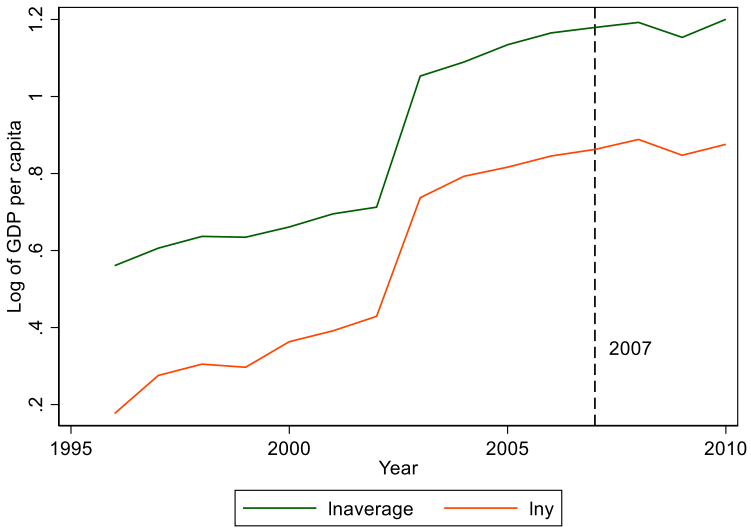

Figure 3. Trends in the log of per-capita GDP: Treated region vs the rest of Chile.

Figure 3 plots the trends in the logarithm of per-capita GDP of the treated region, i.e., the sum of Los Rios and Los Lagos, and the rest of the country, excluding Tarapacá who was also treated. We can see that the trends evolve parallel even after the policy period. In fact, at first glance, it could be said that there is no effect of the regional division policy on the sum of the two territories. To evaluate properly the effect of the policy we should ask ourselves how

the log of per-capita GDP would have evolved in treated region after 2007 in the absence of the territorial reform. To do this, is necessary to construct a counterfactual which has been done first by applying a synthetic control method.

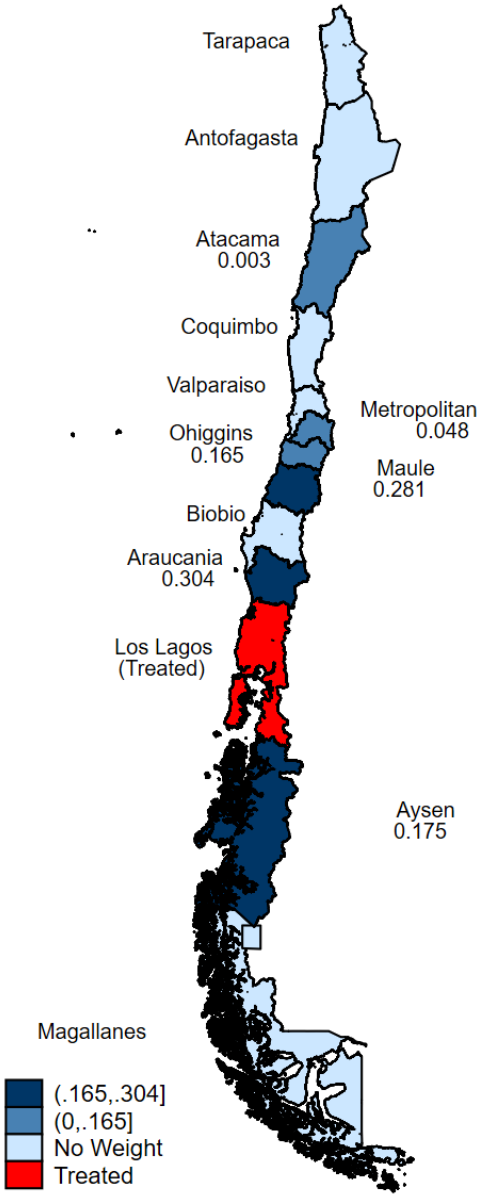

Figure 4. Weights computed for the synthetic region.

As explained in the method section, a synthetic treated region is constructed by minimizing the differences of a vector of pretreatment characteristics. Then the synthetic region is a convex combination of different regions taken from the full set of regions, known as the

donor pool. Figure 4 illustrates the weights used to construct the synthetic region. As we can see, the counterfactual was constructed considering six regions.

In table 3 is compared the pretreatment characteristics for the former region, the synthetic control and the average of the country excluding the treated region. We can see that using the average of the country does not provide a good control as their characteristics differ significantly with respect the treated region. In contrast, we can see that the synthetic control approximates better the pretreatment characteristics.

Table 3. Average of pretreatment predictors 1996-2006.

Variable	Treated	Synthetic	Country Average
Lny	0.49365	0.4905457	0.8440732
lny(2003)	0.7371818	0.7065213	1.053176
lny(2004)	0.7927837	0.7565746	1.089482
lny(2007)	0.8625283	0.872855	1.179214
lny(2005)	0.8164695	0.8224455	1.134432
Pop	1102067	987889	1276985
Agri	0.1064975	0.1290274	0.073478
Manu	0.138989	0.1345686	0.1510061
publicsector	0.0465178	0.0697967	0.0618291
Sp	0.1281217	0.1302249	0.1109423
sp(2003)	0.1511381	0.1503219	0.1188522
sp(2004)	0.148404	0.1447774	0.1163155
publicsector(2003)	0.05694	0.0840585	0.0698478
publicsector(2004)	0.0554266	0.0804896	0.0683901
Pesca	0.1364477	0.0319469	0.0303882
comerce	0.0848521	0.0839188	0.0793611
comerce(2003)	0.0914836	0.0821664	0.0756277
comerce(2004)	0.0878699	0.0841722	0.0777005
avgschooling	8.583765	8.772825	9.510617
avgschooling(1996)	7.982951	8.232232	9.071223
avgschooling(1998)	8.497725	8.508785	9.272852
avgschooling(2000)	8.499798	8.854359	9.612962
avgschooling(2003)	8.971061	9.066715	9.744021
avgschooling(2006)	9.047486	9.255822	9.857684

Then, the estimation of the effect of the territorial reform introduced at the end of 2007 will be the difference between the log of per-capita GDP in the former Los Lagos region and its synthetic counterpart in the post policy period.

Figure 5 shows us the result of our estimation. The first graph shows the fit of the synthetic region and the evolution that the former region would have displayed without the intervention. The second graph plot the effect of the policy by showing the differences between the treated and the synthetic region. Surprisingly, the results are not as expected. In the first place, we can see that the synthetic region fits well with the pretreatment trajectory of the former Los Lagos. We cannot see any change in the gap in the first years after the separation of the region, which shows us that there was no policy effect on the aggregation of both regions (Los Rios and Los Lagos).

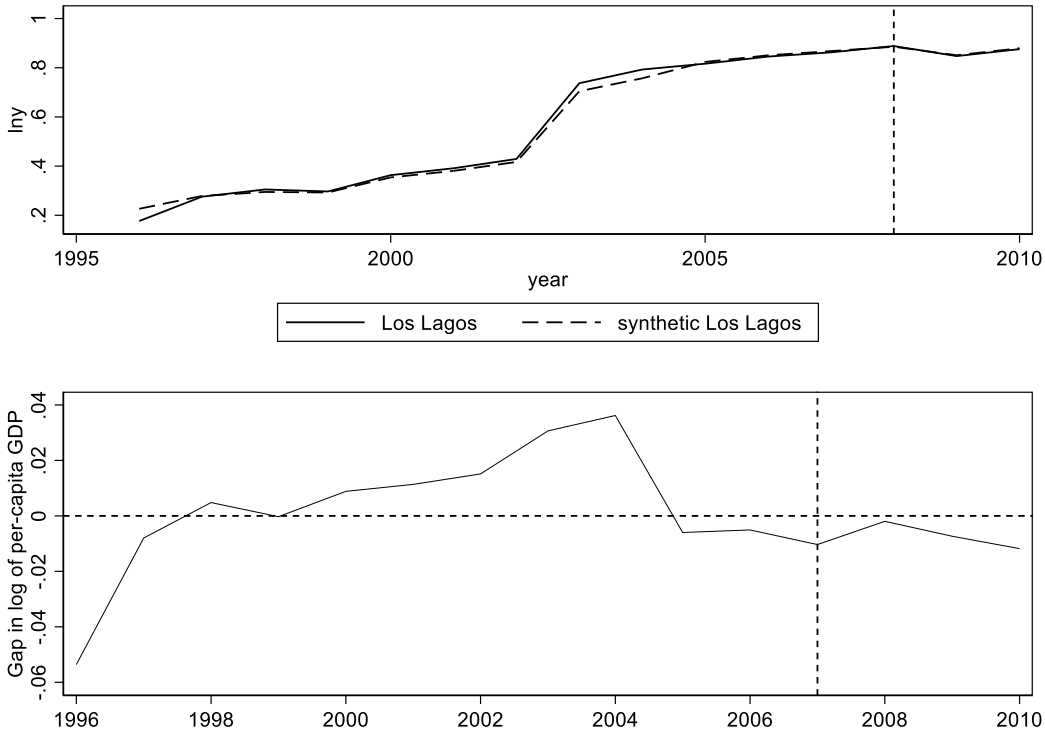

Figure 5. Trends and estimation of the effect of the territorial reform on former Los Lagos.

Following Abadie, Diamond, and Hainmueller (2010) and Abadie, Diamond, and Hainmueller (2015) we conduct a set of placebo studies reassigning the territorial reform to regions that were not treated. This is done by using the synth_runner package in STATA which

gives a distribution of "in-place" placebo effects allowing us to see statistical significance of post-treatment effects (Galiani and Quistorff, 2017).

Figure 6 displays the estimates of the placebo tests. We can see that in the years following the policy period there is no significant effect in the treated region and in the donor pool.

Figure 6. Gaps in log of per capita GDP in the treated region and in each placebo test.

Note: The black line shows the gap between the former Los Lagos region and its synthetic control. Blue lines report the estimations of the placebo effect for each region in the donor pool.

Table 4. Estimation of the territorial reform over the former Los Lagos region.

Year	estimates	pvals	pvals_std
2007	-0.007368	0.7272727	0.2727273
2008	0.0010341	1	0.8181818
2009	-0.0050602	0.9090909	0.5454545
2010	-0.0048286	0.9090909	0.7272727

The statistical significance of post-treatment effects are displayed in table 4. As we can see, there is no significant effect of the policy in the years following the reform. We can

therefore conclude that the division and creation of the new region of Los Rios did not bring a change in the trajectories of the GDP per capita.

Finally, we can see the ratios post-treatment RMSPE and pre-treatment RMSPE. A high ratio shows a high post policy effect and a good fit of the pre-treatment trajectories

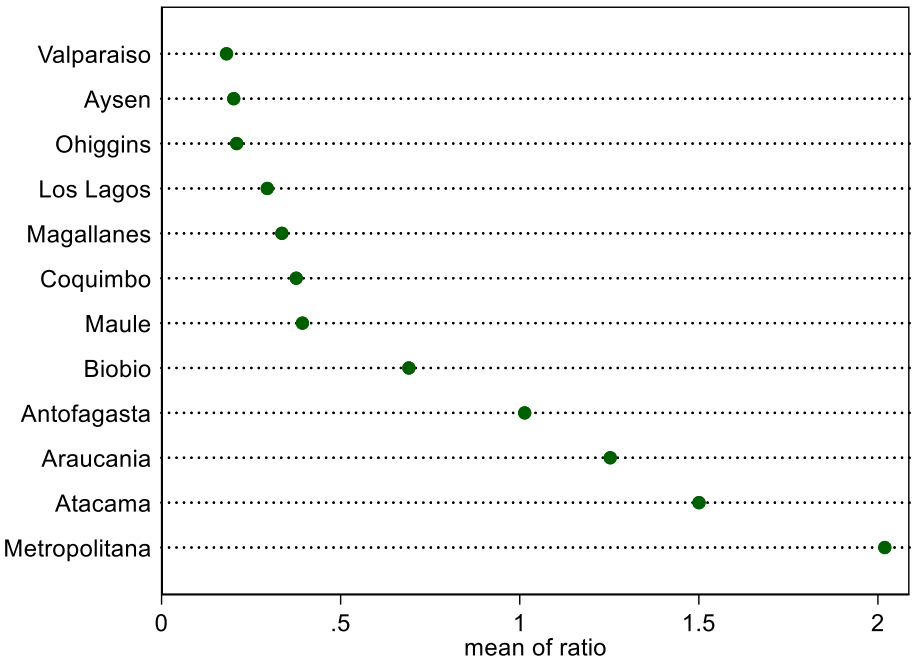

Figure 7. Ratio of post and pre RMSPE.

We can see that the treated region is the one of the lowest ratios, which confirms no policy effect.

One of the biggest concerns that could affect the results is the crisis known as "Salmon crisis" which affected severely the treated region at the end of 2007 until 2010. We address this issue in the following section.

5.2.1 Micro analysis and heterogeneous effects

First, let's look at the behavior of the outcome variables. In panel A is illustrated the evolution of the log of deflacted sales (per capita) and in Panel B the log of employment. The selected control has been chosen considering regions with relatively similar characteristics. These regions are O'Higgins, Maule, Biobio, Araucania, Aysen y Magallanes. We can see in

both graphs that the evolution of sales and employment is similar between the country average, Los Rios and the selected control, but is not the case for Los Lagos who present a huge fall of sales from 2007 to 2010, the period of the salmon crisis.

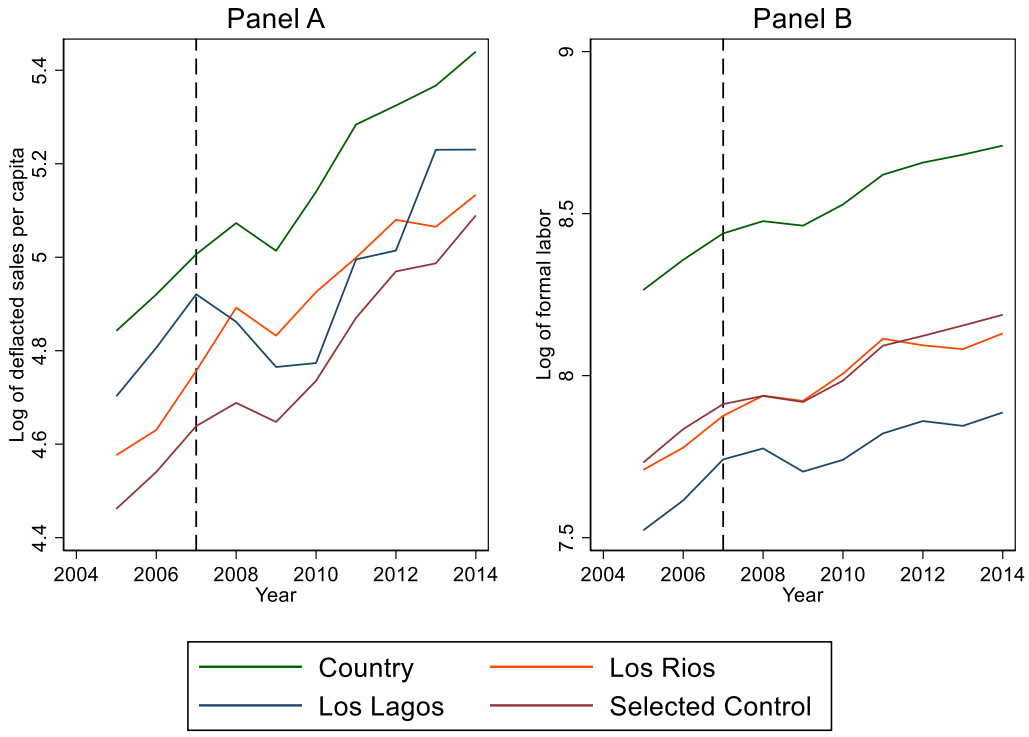

Figure 8. Trends in the outcome's variables.

Note: Panel A depicts the evolution of the log of sales per-capita. Panel B shows the log of employment.

Table 5. Descriptive statistics of the Control and treated regions. Pre-treatment period.

Variable	Country	Los Rios	Los Lagos	Selected Control
Log of sales per capita	4.881417	4.603425	4.754326	4.501066
Log of employment	8.310881	7.74349	7.5687	7.783341
Share of agriculture	0.2961352	0.4445511	0.4316552	0.401193
Share of manufactures	0.1474466	0.1095139	0.1082518	0.1335872
Share of teaching	0.0079939	0.0033139	0.0029154	0.0064267
Share of commerce	0.3004447	0.2428618	0.3052779	0.307654
Share of hotels and accommodations	0.020042	0.0128083	0.0275176	0.016831

In addition, Table 5 present descriptive statistics where we can see that the selected control approximates better the sectorial composition of both treated regions.

Table 6 presents the results of the differences in differences estimator for the treated regions using the deflacted sales per-capita as outcome.

Table 6. Results of the difference in differences estimator on deflacted sales per-capita 2005-2014.

	Los Rios				Los Lagos			
Variable	Model 1	Model 2	Model 3	Model 4	Model 1	Model 2	Model 3	Model 4
treat1								
1	(omitted)	(omitted)	(omitted)	(omitted)	(omitted)	(omitted)	(omitted)	(omitted)
post								
1	.594***	.621***	.583***	.575***	.601***	.629***	.59***	.648***
treat1#post								
1 1	0.032	0.03	.037**	0.013	-.105***	-.108***	-.118***	-.112**
year								
2006	.077***	.077***	.063**	.053***	.08***	.083***	.073***	.108***
2007	-.431***	-.445***	-.426***	-.408***	-.422***	-.429***	-.406***	-.397***
2008	-.362***	-.39***	-.367***	-.304***	-.367***	-.396***	-.372***	-.393***
2009	-.421***	-.432***	-.413***	-.359***	-.43***	-.445***	-.421***	-.471***
2010	-.296***	-.343***	-.321***	-.257***	-.315***	-.37***	-.338***	-.391***
2011	-.155***	-.213***	-.198***	-.149***	-.164***	-.222***	-.205***	-.215***
2012	-.113***	-.115**	-.1**	-.082***	-.125***	-.135**	-.117**	-.187***
2013	-.073***	-.1***	-.074***	-.08***	-.066***	-.087**	-.07***	-0.045
2014	(omitted)	(omitted)	(omitted)	(omitted)	(omitted)	(omitted)	(omitted)	(omitted)
Agri			-.992**				-.77*	
manu			-0.168				-0.104	
enseñanza			-2.77**				-2.52**	
comerce			-1.05**				-1.03**	
Alojamiento			-2.19**				-2.94***	
_cons	4.83***	4.47***	5.27***	4.58***	4.83***	4.5***	5.22***	4.7***
Control	Country	Selected	Selected	Entropy Balance	Country	Selected	Selected	Entropy Balance
Covariates	NO	NO	YES	-	NO	NO	YES	-
N	2890	1700	1700	2890	3060	1870	1870	3060
r2_a	0.935	0.909	0.92	0.927	0.928	0.894	0.904	0.867
aic	796	258	33.5	-835	1200	719	528	2700

legend: * p<.1; ** p<.05; *** p<.01. Se clustered at the regional level.

Model 1 includes all the country as a control, Model 2 includes the selected regions[10] as controls. Model 3 includes the selected regions and incorporates covariates. One of the

[10] All the regions from the south of Chile.

primary considerations when including covariates is that we assume homogeneous treatment effects in X, i.e, the treatment is exogenous to the included covariates. In addition, is assumed parallel X-trends (Sant'Anna and Zhao, 2020). We strongly believe these assumptions holds as the included covariates are related to the economic structure which we believe are not related to an administrative status and changes according to processes of structural transformation.

Model 4 address the viable concerns of including covariates by re-weighting the data by an entropy balance[11] (Hainmueller, 2012; Hainmueller and Xu, 2013). Figure A1 in the appendix illustrates the use of the weighted control.

All the models were estimated in a first instance using as a treatment the former region, i.e., incorporating the municipalities of Los Rios and Los Lagos as a unique treated unit. We could not find any significant effect which is consistent with the result of the SCM[12].

Regarding the heterogeneous effect, we can see that in Los Rios the only model that achieves a significant effect is the model 3 which relies in the conditional parallel trends assumption. Model 4 provides the lowest and insignificant value of all the estimations with the best fit according the Akaike´s criterion. Looking at Los Lagos we can see significant results in all the specifications with a negative impact ranging from -10.5% to -11.8%.

Table 7 replicates the same models but now at looking at changes in the log of employment. As before, we did the exercise considering the former Los Lagos region, and we did not get any significant effect on the four specifications.

[11] We balance the pretreatment characteristics year by year and we construct a post policy period weight by averaging the pre intervention period. 4 weights have been constructed for each region and variable.

[12] The results are not included here but can be asked.

The estimations in table 7 show us that there was no significant effect on employment for Los Rios and Los Lagos. This would indicate us that the negative impact in Los Lagos did not affect employment.

Table 7. Results of the difference in differences estimator on log of employment 2005-2014.

	Los Rios				Los Lagos			
Variable	Model 1	Model 2	Model 3	Model 4	Model 1	Model 2	Model 3	Model 4
Post								
1	.444***	.4523***	.4472***	.4451***	.441***	.4462***	.429***	.4414***
treat1#post								
1 1	0.0156	0.0213	0.0114	-0.0062	-.0331*	-0.0274	-0.0358	-0.043
Year								
2006	.0922***	.1008***	.101***	.0841***	.0931***	.1015***	.1***	.1028***
2007	-.2702***	-.2742***	-.2746***	-.2625***	-.2589***	-.2555***	-.2473***	-.2125***
2008	-.2314***	-.2466***	-.2476***	-.205***	-.2216***	-.2291***	-.2234***	-.1845***
2009	-.2455***	-.265***	-.2634***	-.2147***	-.241***	-.2559***	-.2491***	-.2216***
2010	-.1792***	-.1977***	-.1926***	-.1445***	-.1782***	-.1945***	-.1843***	-.171***
2011	-.0868***	-.09***	-.0893***	-.051**	-.0875***	-.0908***	-.0872***	-.0802***
2012	-.0517***	-.0633***	-.0621***	-.0421***	-.0499***	-.0593***	-.0553**	-.0464***
2013	-.0289***	-.0344**	-.0328*	-.0407***	-.0293***	-.0346**	-.032**	-.0356***
2014	(omitted)	(omitted)	(omitted)	(omitted)	(omitted)	(omitted)	(omitted)	(omitted)
Pop			-6.60E-07				-1.60E-07	
Agri			0.0871				0.0465	
Manu			.3632***				.2846**	
enseñanza			0.2804				0.3231	
Commerce			-.099**				-.2587*	
Alojamiento			-0.2843				-0.2086	
_cons	8.241***	7.73***	7.701***	7.701***	8.194***	7.699***	7.731***	7.518***
Control	Country	Selected	Selected	Entropy Balance	Country	Selected	Selected	Entropy Balance
Covariates	NO	NO	YES	NO	NO	NO	YES	NO
N	2890	1700	1700	2890	3060	1870	1870	3060
r2_a	0.9834	0.9766	0.9769	0.9775	0.9836	0.9776	0.978	0.979
Aic	-801.6	-307.7	-336.4	-1270	-830.8	-337.7	-378.7	-805.7

legend: * p<.1; ** p<.05; *** p<.01. Se clustered at the regional level.

A more rigorous approach is to look at event studies. This allows us to see if parallel trends hold (we should not see any affect pre-policy period) as well as to see the policy effect year by year in the post policy period. Following the indicated by the Akaike's criterion we use the specifications of model 3 and 4.

The first that we can notice at looking at Figure 9, who illustrates the effects of the policy in Los Rios, is that in all specifications and variables there is no impact in the reform's

year. This can be due in part to the timing of the policy as the new territorial division became effective in October.

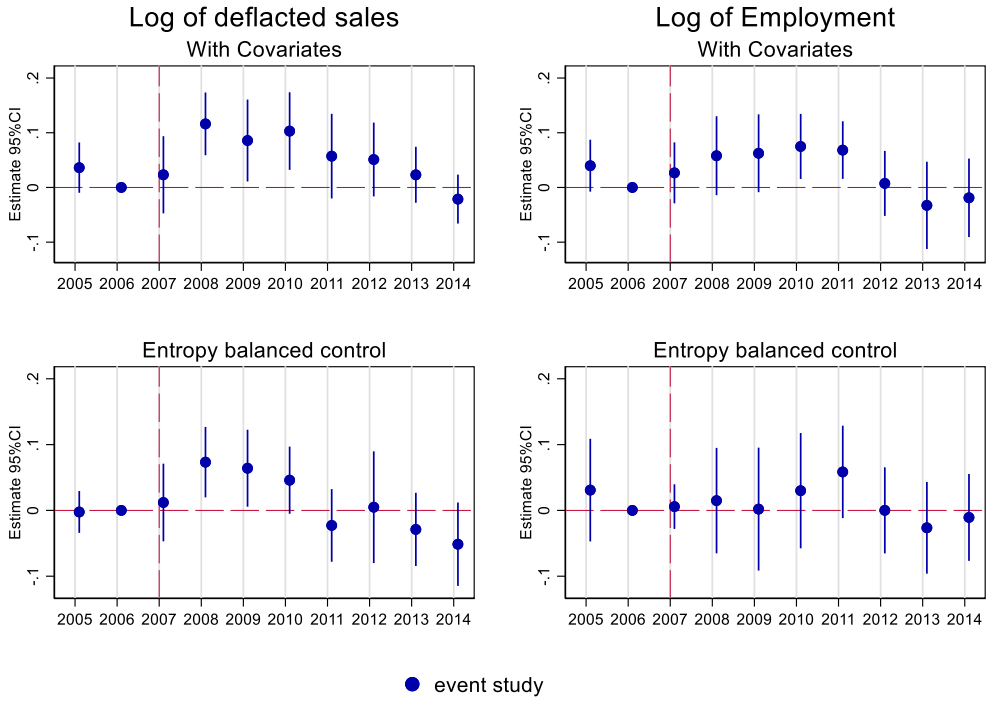

Figure 9. Event studies for Los Rios.

Looking at the impact in sales per-capita we can see positive effects from 2008 until 2010. After this year, the policy effect becomes insignificant. For example, the model using the selected control and covariates reports a positive impact of 11.62% in 2008, 8.58% in 2009 and 10% in 2010. The pattern reported by the model weighted by the entropy balance reports a more stable pattern as we see a descendent impact from 7.33% in 2008 to 4.59% in 2010. Regarding employment, we can see that the first model reports positive effects in 2010 and 2011 while the balanced model reports any significant effect of the reform. If we rely on the Akaike´s criterion, we will choose the model with the entropy balance and we will not claim any impact of the reform over employment.

In Figure 10, the same exercise is replicated for Los Lagos. Looking first at sales, we cannot see any effect in the year when the reform is applied, but what is clear is the negative

and descending pattern from 2008 to 2012. Opposed to the case of Los Rios, the entropy balance did not fit well for Los Lagos, giving an Akaike´s of 2648 in contrast to a value of 515 in the model with the selected control and covariates. What we can see in the model with the selected control is a decline from 9.73% in 2008 to 21% in 2012. The event studies clearly confirm the negative impact on Los Lagos being higher with time. For employment, we can see a peculiar pattern being first positive but insignificant and then negative and significant from 2011. We cannot claim that the effect perceived from 2011 is related to the policy itself.

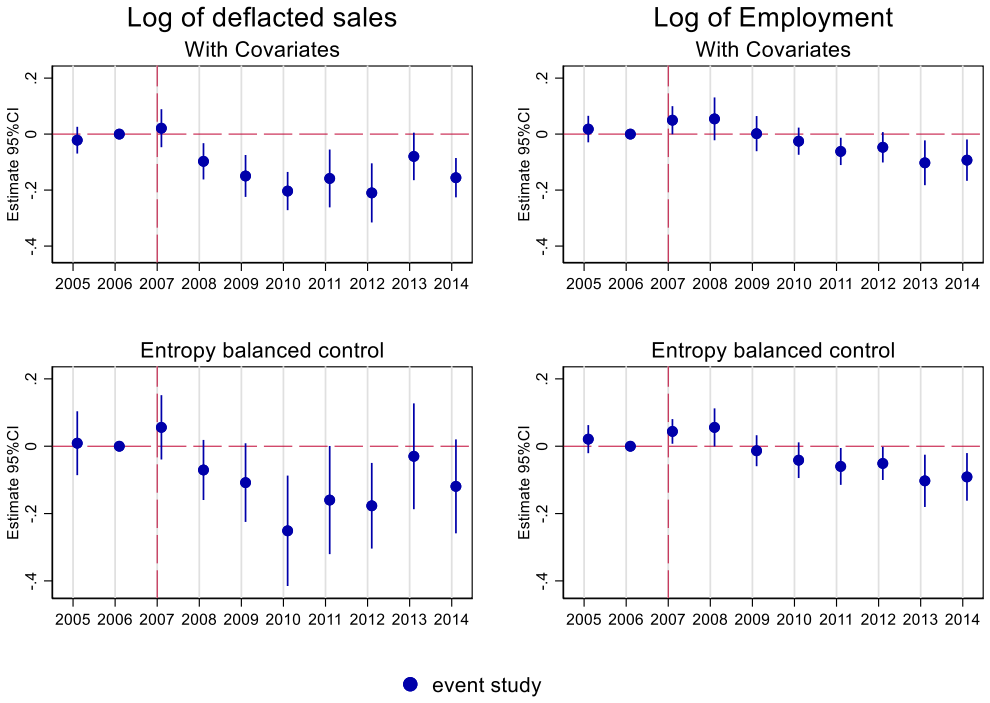

Figure 10. Event studies for Los Lagos.

The relevant question here is if we can really argue that what we observe is entirely because of the split or if this negative effect obtained for Los Lagos is enhanced by the "Salmon crisis".

5.2.2 Robustness check of the heterogeneous effects.

In this section, we address different sources of concerns regarding the previous results. The principal preoccupation is the Salmon crisis. We address this issue by replicating the

estimations but excluding the activities under the code 032 "Aquiculture" which is related to breeding of fish and marine species. For this purpose, we use the data of the SII by municipalities and sub-economic activities and we aggregate the sales, excluding this activity.

A second concern could be the 2010 earthquake that hit unevenly the regions, being the regions most affected Maule and Biobio. We address this by excluding these regions.

Finally, we can always worry about spillovers. We deal with it by excluding the closest neighbor of each region.

For each estimation, we have relied on the entropy balanced control as has demonstrated to be the technique that best fits the pretreatment characteristics.

Table 8. Robustness check of the differences in differences estimations.

	Los Rios				Los Lagos			
Variable	Standard	No Aquiculture	No Earthquake	No Neighbors	Standard	No Aquiculture	No Earthquake	No Neighbors
SALES								
Treatment effect	0.013	-0.048	-0.00075	-0.00085	-.112**	0.0028	-.12**	-.111*
N	2890	2865	2260	2570	3060	3036	2430	3000
r2_a	0.927	0.931	0.923	0.924	0.867	0.928	0.868	0.869
Aic	-835	52.5	-579	-731	2700	1700	2100	2600
EMPLOYMENT								
Treatment effect	-0.0062	0.0017	-0.017	-0.011	-0.043	-0.039	-0.048	-0.054
N	2890	2871	2260	2570	3060	3042	2430	2370
r2_a	0.978	0.98	0.976	0.975	0.979	0.974	0.978	0.984
Aic	-1300	-1600	-838	-828	-806	147	-435	-1300

legend: * p<.1; ** p<.05; *** p<.01. SE clustered at region level.

Table 8 summarizes the results of the robustness checks. The weight of the estimation excluding aquiculture has been calculated using the new sales variable and including the share of aquiculture in order to give more weight to those observations that are more probable of have faced a decline because of the salmon crisis. The weight in estimation 3 and 4 excludes the regions affected by the earthquake and the neighbors, respectively.

Looking at Los Rios we can see that the estimation is consistent with all robust analyzes, in overall we can say that there is no policy effect over sales and employment for the post policy period 2007-2014. When moving to Los Lagos, we can see that the estimation is robust

on employment and in sales when we adjust for the earthquake shock and spillovers. We got a very important result when we exclude the Aquiculture sector, we can see that the negative effect reported in Los Lagos completely disappear telling us that the negative effect experienced in Los Lagos could be completely attributed to the Salmon crisis with no relevance of the territorial division.

Given that the exclusion of the aquiculture sector is only sensible in the sales variable, we realized event studies only considering sales and neglecting employment. The event study is summarized in Figure 11.

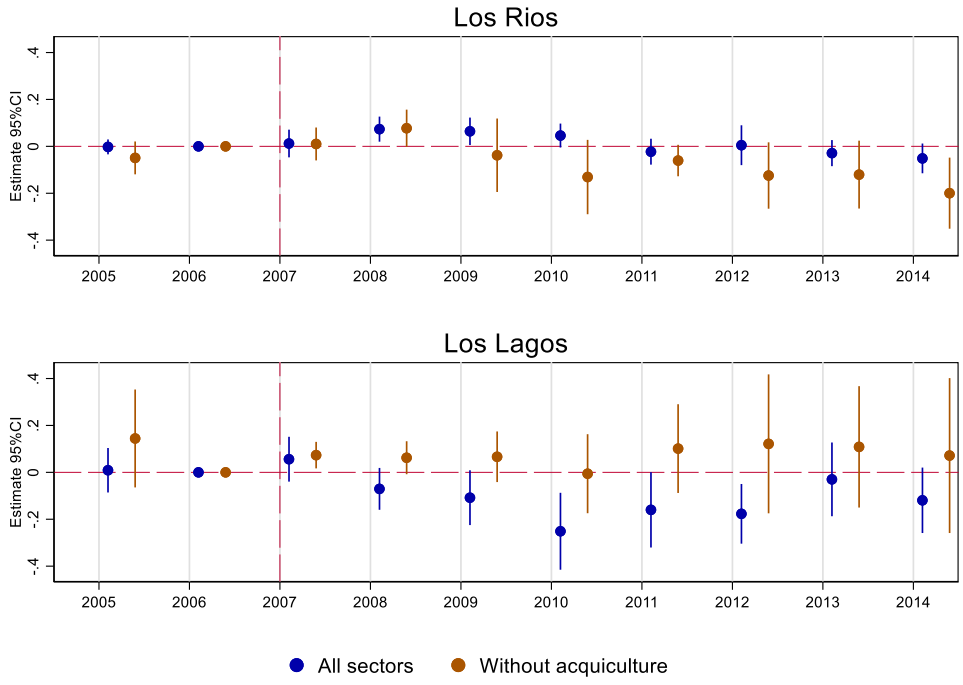

Figure 11. Event studies in Los Rios and Los Lagos with and without the aquiculture sector.

As we can see in figure 11 in 2007 the point estimation in both regions is similar between the sales variable with and without the aquiculture sector, so we can be sure that the salmon crisis did not affect the regions in that year. We can see that the estimations start to diverge since 2008 for Los Lagos and 2009 for Los Rios. Summarizing, when excluding the aquiculture sector, we cannot see any policy effect in Los Rios at least until 2014 where we can

see a negative and significant effect which cannot be attributed to the policy itself. In the case of Los Lagos, we can see a positive and significant effect in 2007 but after this year there is no significant effect. This suggests that the previous findings were influenced by the shock caused by the salmon crisis, who hit mainly this region.

5.3 The effect of the being regional capital.

Here, we estimate the effect of obtaining a new administrative status for Valdivia. The creation of the region of Los Rios gave it the status of regional capital. For the estimation, we did not apply a synthetic control method, as the pre-treatment periods are not enough for this technique. We relied on a difference in differences estimator with an entropy balance, excluding the capital cities in each region[13]. We also excluded Los Lagos as the region was treated.

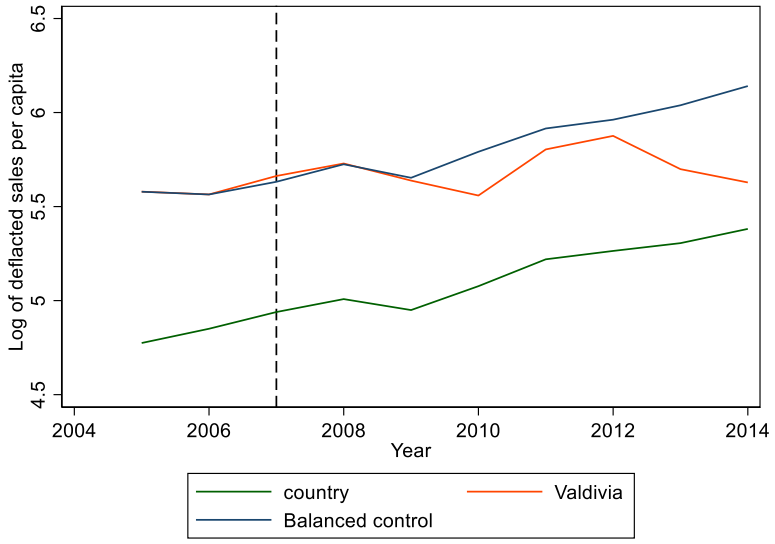

Figure 12. Trends in the log of per-capita sales for Valdivia, the country average, and the entropy balanced control.

Figure 12 illustrates the use of the entropy balance technique to re-weight the control group. We can see how the balanced data fits better the pretreatment trajectory.

[13] To be clearer, the control group consist in all the municipalities that are not capital in their respective region.

As we can see in figure 13, we cannot see any significant effect of the new administrative status from 2007 to 2009. After this year we see a negative pattern. The result implies that the hypothesis of being a capital city matter does not hold for the Chilean case and in specific for the city of Valdivia[14].

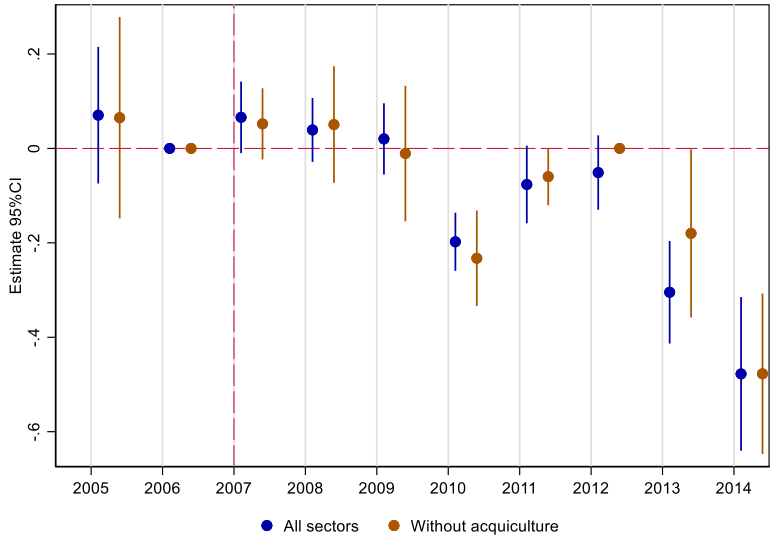

Figure 13. Event studies of the municipality of Valdivia, log of per-capita deflacted sales 2005-2014.

6.-Discussion and Conclusion.

In this paper, we evaluated the economic effect measured as GDP, sales and employment of a territorial reform who divided a region in two in the south of Chile. Our research consists of a novel case study due to the characteristics of the country and the region.

Regarding the first research question about if the policy was beneficial for the sum of both regions, we got a negative answer. By means of a synthetic control method, we could obtain an insignificant effect of the territorial division in the former Los Lagos region at least in the medium term.

[14] Is difficult to generalize the result as probably being a capital city in a central and bigger region has different implications.

The second question was about heterogeneous effect, as we wanted to answer whether the reform was more beneficial to one region than another. According to the literature, we were expecting a higher effect on Los Rios as this territory gained a new administrative status. For this purpose, we applied four econometric specifications of a difference in differences estimator. At first, we confirmed this hypothesis as we got no significant effect in Los Rios and a negative effect in Los Lagos but once we accounted for the effect of the Salmon crisis, we got no significant effect of the policy on both regions in line with the result of the synthetic control method. This is a very strong result as suggest us that if we had not accounted for the shock caused by the salmon crisis, we would have misinterpreted the real impact of the reform over the region of Los Lagos.

The third question was to know whether the new administrative status of Valdivia, who became a regional capital, brought an increase in the economic activity of the city. To answer that, we looked at an event study controlling with cities that are not regional capital to get the pure effect of Valdivia becoming one. We applied an entropy balance to match the pre-treatment trajectories. We did not get any significant effect from 2007 to 2009. We got a negative pattern starting in 2010. A standard difference in differences estimator would indeed suggest a negative effect.

Let's look now the results with the glass of the literature. First, we saw that having a new administrative status implies demand and supply effects. One of them was related to the increase in local public spending with the associated multiplicative effect on the economy. We do not have data on local public spending, but we have data of municipal investment. Figure A2 in the appendix shows the trends of municipal spending in Los Rios, the country average and an entropy balanced control. We can see that trends evolve in parallel until 2007 and since then diverge slightly. Figure A3 in the appendix shows an event study of the municipal investment. In overall we cannot see any change which is confirmed with a standard difference

in differences estimation. This would imply that is not the case that the multiplicative effect is not in action but that there was not even any change in local public investment. The same conclusion applies for the city of Valdivia, which can be seen in table A1 in the appendix.

Unfortunately, we do not have reliable data on local public employment, which does not allow us to test the hypothesis of local public employment multipliers. We know that there was no change in private employment, but we do not know if also, there was no change in public employment or if there was, if this change did not multiply into private employment.

Finally, let's look at the result under the magnifying glass of other cases analyzed by the recent literature such as Germany, Poland, and Brazil. Taking the closest approach to our, i.e., the Brazilian case, we can see that this country has a completely different form of state administration. In the separation's year of the state of Tocantins was also established a new constitution and the federative pact which imply that states in Brazil have the autonomy to collect taxes, have their own legislation and enjoy political and administrative independence (de Andrade Lima, 2021). This is not the case in Chile, as we already mentioned, Chile rest upon what is known as a model of administrative decentralization being a very centralized country politically and financially (Navarrete-Yánez and Higueras-Seguel, 2014). The 2007 reform did not imply any change in the competences that would have implied more territorial autonomy and according to Vial Cossani et al. (2016) the reform did not change at all the design of the authorities in charge of the Regional Government and its scheme of attributions.

The previous discussion is noteworthy for two reasons, first, policies oriented to the relocation of the capital to promote lagging regions should consider the context and scope of the competences of subnational governments and second, as point to a future research line in which territorial reforms and research on optimal city size should be accompanied with the literature about decentralization and economic growth. Only with this link we could answer

about the impact of territorial reforms and how this can be reinforced by the decentralization models.

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Appendix

Figure A1. Trends in the log of municipal investment per-capita.

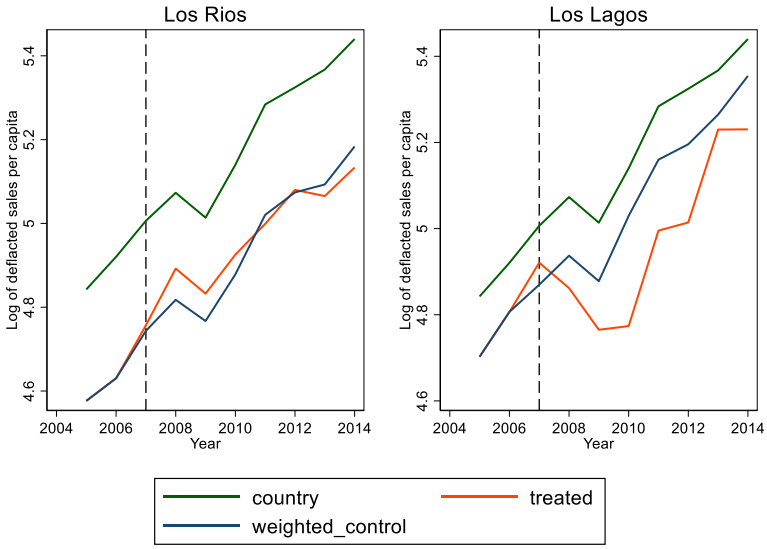
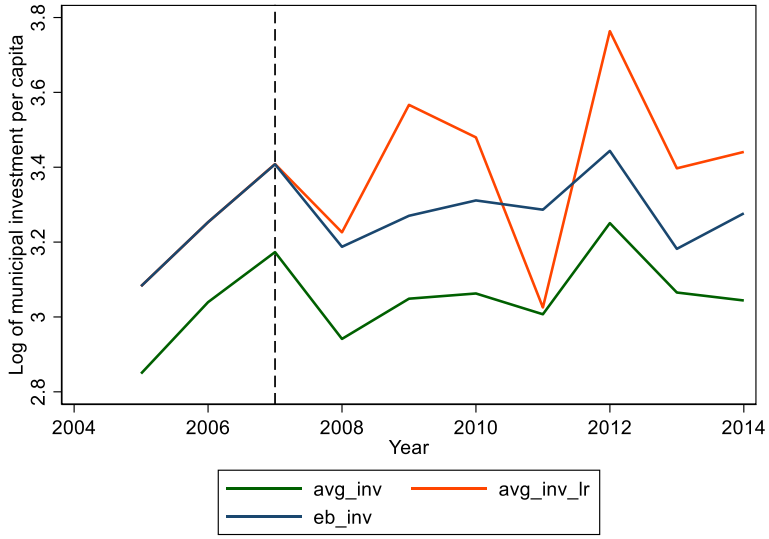


Figure A2. Trends in the log of municipal investment per-capita.



Note: avg_inv is the country average, avg_inv_lr corresponds to the average in Los Rios and eb_inv is the entropy balanced control.

Figure A3. Event studies over the municipal investment in Los Rios, average and balanced control.

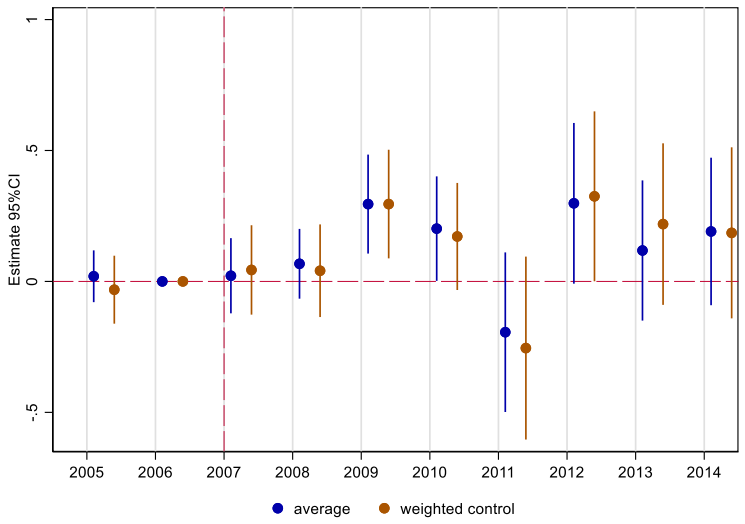


Table A1. Difference in differences estimation of the treatment effect of the territorial division over municipal investment per-capita, 2005-2014.

Variable		Los Rios	Valdivia
treat			
	1	(omitted)	(omitted)
post			
	1	0.178	.959***
treat#post			
1 1		0.144	0.105
year			
	2006	.155***	.294***
	2007	0.038	-.515***
	2008	-.143**	-.631***
	2009	0.071	-.441**
	2010	0.046	-.38**
	2011	-0.197	-.545***
	2012	.253***	-0.219
	2013	-.061**	-0.035
	2014	(omitted)	(omitted)
_cons		3.1***	2.11***
N		2878	2768
r2_a		0.503	0.568
aic		5100	4100

Note: Control group for Valdivia excludes the rest of capital cities.