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GOVERNMENT SUBSIDIES AND POLITICAL ELECTIONS: EVIDENCE FOR CHILE[*]

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Santiago, Junio 2005

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ABSTRACT

In this paper, we explore the effects of government subsidies (monetary and in-kind) in presidential elections in Chile in 1989-2000. Our dependent variable is the percentage of votes obtained by the incumbent. We use a panel with three periods (the elections of 1989, 1993 and 1999) and 228 counties. We correct for the potential simultaneity problem derived from the fact that an incumbent facing a difficult political scenario might react by increasing subsidies to improve his/her electoral performance. Our results indicate that the greater the government spending on these types of programs (measured by the percentage of the population that receives the subsidy), the higher the votes for the incumbent. When we separate monetary and in-kind subsidies, we find that only in-kind subsidies are statistically significant. We estimate that to obtain an additional vote, the incumbent has to spend between US$1,680 and US$1,920 (measured in PPP) in government subsidies.

Keywords: political elections, subsidies, business cycle, unemployment.
JEL classification: C33, E32

1. INTRODUCTION

It is commonly believed by the popular press and the public that in a political election, the incumbents are rewarded the greater the government spending is. Academic literature has also adopted this view and much of the theoretical work attempting to explain the distribution of federal funds assumes a model where the incumbent is rewarded the greater the amount of resources he or she obtains for his/her district.[1]

Nonetheless, the empirical evidence supporting this view has been rather mixed. Until the mid-1990's, most of the evidence was not supportive of the idea that additional spending or employment yielded electoral benefits (see Feldman and Jondrow 1984, Stein and Bickers 1994). Moreover, Peltzman (1992) challenges this view and finds that

[1] Weingast (1979), Niou and Ordershook (1985), Inman (1988), Inman and Fitts (1990).

the American voter is fiscally conservative. Using state-level election returns for presidential, senatorial and gubernatorial elections from 1950-88, he finds that voters penalize federal and state spending growth. This, of course, does not mean that for a given amount of total outlays, voters of a district prefer that the resources be spent in their community rather than elsewhere, but it challenges the general view that voters favor more government spending.

In contrast, Levitt and Snyder (1997) find that federal spending in the USA benefits congressional incumbents. To obtain this outcome, they indicate that the results in the literature are contaminated by the fact that incumbents that have difficulties in being reelected are likely to exert greater effort in obtaining federal money for their district. However, this variable is usually omitted from the specification, which introduces a downward bias in the estimations. To accurately measure the impact of fiscal spending, they correct by means of instrumental variables. In their case, voters are not fiscal conservatives since they prefer more government spending.

The case of Chile has several characteristics that make it a very interesting case of study. First, since the return to democracy in 1990, there have been several political elections in which the governing coalition (the *Concertación*) has been very successful. Second, and more importantly, while in government, the *Concertación* has significantly increased government social spending.[2] The time series data show an increasing number of people receiving government subsidies. Indeed, while in 1990 17.1% of the population received in-kind subsidies and 10.1% received monetary subsidies, in 1998 these figures had increased to 30.1% and 16.2%, respectively (Table 1, panel A). Finally, we have access to a very rich data set, which provides data on the number of people that receive government subsidies in each county. There is not only an important time-series variation in the data, but there also is a significant cross-section variation among counties. While there are counties where almost nobody receives subsidies, there are others where more than 40% do (Table 1, panel B).

[2] Social spending includes central government spending in education, health, social security, the environment, housing and other social activities.

Table 1
Government Subsidies

Panel A
% of recipients

	Subsidies in kind	Monetary Subsidies	Any Subsidy
% recipients in 1990	17.1	10.1	26.1
% recipients in 1992	28.3	15.4	39.4
% recipients in 1998	30.1	16.2	40.7

Panel B
Number of counties in which the population receiving subsidies is:

Monetary subsidies	0 - 10%	10% - 20%	20% - 30%	30% - 40%	40% - 50%	50% or more
1990	17	45	5	3	1	0
1992	5	102	23	2	3	0
1998	10	112	65	10	0	0
Subsidies in kind	0 - 10%	10% - 20%	20% - 30%	30% - 40%	40% - 50%	50% or more
1990	5	47	22	0	0	0
1992	2	5	49	70	12	0
1998	5	4	44	108	32	4
Any Subsidy	0 - 10%	10% - 20%	20% - 30%	30% - 40%	40% - 50%	50% or more
1990	16	31	26	1	0	0
1992	4	3	40	72	19	0
1998	2	3	4	38	87	63

The purpose of this paper is to investigate empirically whether these subsidies have an influence on political voting in Chile. The question to answer is whether in political elections Chilean voters reward direct subsidies from the government.

The literature on economic variables and political elections in Chile has concentrated basically on the effects of the business cycle on electoral results.[3] Cerda and Vergara (2004), for instance, find that both the unemployment rate and the deviation of GDP from its trend have a significant effect on political voting in Chile.

Although business cycle factors are important, they are not the only factors determining electoral performance. In this paper we focus on other factors that might be

[3] Panzer and Paredes, 1991; Engel and Araos, 1989; Villena, 2003; Cerda and Vergara, 2004. The literature on business cycles and political elections in the US has been abundant. See Fair (1978, 1996), Kramer (1971), Stiegler (1975).

more manageable to the incumbent and which might allow him/her to improve his/her electoral performance. We focus on government social spending, and more specifically, on government subsidies. We concentrate on this type of government spending since it is related to the programs that reach individuals more directly, and, therefore, they are more likely to impact voters' decisions.

Contrary to the approach of some literature, in this paper we are not interested in the overall stance of fiscal policy, but just on government social spending. This is an important distinction since the Chilean government has been quite conservative regarding the overall fiscal stance. In most of the years since 1990, there has been a budget surplus and the government's debt has decreased sharply since then.[4] This suggests that although voters might like social spending, they also realize that it has to be financed either by decreasing public spending in other areas and/or by increasing taxes.

Government social spending has varied considerably during the last century. Figure 1 shows the evolution of this variable as a fraction of GDP since 1905. There is a clear upward trend on the series, as is the case in most countries. The significant jump in the early 1970's is related to the populist policies of the Allende government, while the one in the early 1980's is related to the recession of 1982-83. Our paper focuses on the last period, starting in 1989. Between 1973 and 1988, there were no political elections and before 1973, we have no data on government subsidies.

These last fifteen years have been the years that the *Concertación* has been in power. Since 1990, there has been a significant increase in government social spending. Between 1989 and 2003, social spending[5] increased 115% in real terms. The largest increases were in education (215%) and health (200%) (Figure 2). Social spending as a percentage of GDP increased from 13.5% in 1989 to 15% in 2003.

[4] The net debt of the central government fell from 48% of GDP in 1989 to 11% of GDP in 2004.

[5] Social spending includes spending on education, health, social security, the environment, housing and other social activities.

Figure 1
Government social expenditure as a % of GDP, Chile: 1905-2000

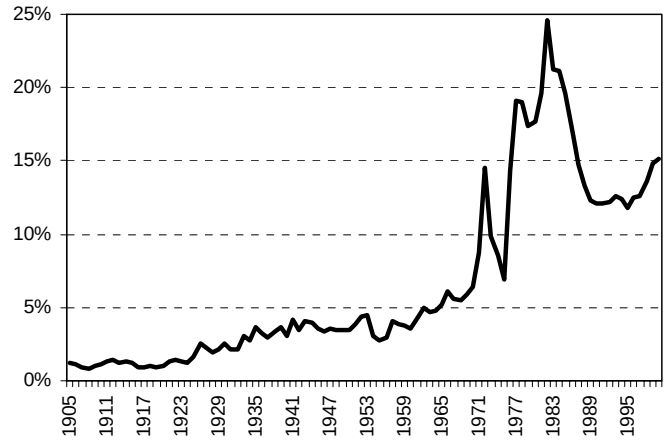


Figure 2
Fiscal social expenditure as a % of GDP, by type of expenditure, Chile: 1976-2000

Social spending has several components. The main objective of some of them is to attain long-run social targets–such as increasing schooling or decreasing the infant mortality rate-, but other parts of social spending may be due to the political scenario: in periods in which the incumbent faces little popular support, the government might expand social spending to "improve" its approval rating. As health, education and

housing are more related to long-run objectives, we will focus on the impact of subsidies (monetary and in-kind subsidies), which seem more easily manageable by the presidency in the short run.[6]

Our dependent variable is the incumbent's vote in presidential elections in Chile since 1989. We use a panel with three periods (the elections of 1989, 1993 and 1999) and 228 counties. We also have data on the share of people in each municipality who receive government subsidies, which includes monetary and in-kind subsidies. We investigated whether these subsidies have an impact on political elections. We also controlled by business cycle variables and by variables such as the poverty rate, whether the mayor belongs to the government's coalition and by other demographic variables.

We initially estimated our model using standard methods. However, we recognized that there might be a simultaneity problem in our exercise. In fact, while social spending may determine electoral performance, it might also be that an incumbent facing a difficult political scenario will react by increasing social spending to improve his/her electoral performance. Therefore, government spending can affect electoral performance, but, also, expected electoral performance can lead to more social spending. To deal with the problem, we used a 2SLS approach. As usual, the instruments should be correlated with subsidies but not correlated with the incumbent's reaction to the electoral scenario. We used instruments related to poverty levels since they are correlated with subsidies (in poorer counties, a larger fraction of the population receives subsidies). On the other hand, poverty is exogenous to the incumbent's reaction and, therefore, it is not related to electoral performance other than by aggregate economic factors that are already included in the electoral performance equation. Thus, those factors should be orthogonal to the residuals in our equation once we control by aggregate exogenous economic factors.

The paper is organized as follows: In the second section, we provide an overview of the Chilean political environment since the return to democracy in 1990. Section three contains a description and an analysis of the data and the methodology as well as an analysis of the results. The simultaneity problem is addressed in section four. Section five concludes.

[6] Additionally, we do not have data on overall social spending by county.

2. A POLITICAL BACKGROUND

In October 1988, after fifteen years in power, General Pinochet lost a plebiscite in which voters were asked whether they wanted to have the General in power for eight more years. The plebiscite was established in the constitution of 1980 by the military government itself. It was not supposed to be lost, especially considering that the government had a clear advantage in terms of resources and media. However, the No (to Pinochet) option won with 56% of the vote (Table 2).

Table 2
Presidential Elections and Plebiscite: National Results
1988-1999

Year	Candidate	Votes	%
1989	Votes YES	3,119,110	44.01
1989	Votes NO	3,967,569	55.99
	Total	**7,086,679**	**100.00**
1989	Hernán Büchi Buc	2,052,116	29.40
1989	Francisco J. Errázuriz Talavera	1,077,172	15.43
1989	Patricio Aylwin Azócar	3,850,571	55.17
	Total	**6,979,859**	**100.00**
1993	Manfred Max Neef	387,102	5.55
1993	Eugenio Pizarro Poblete	327,402	4.70
1993	Eduardo Frei Ruiz-Tagle	4,040,497	57.98
1993	Cristián Reitze Campos	81,675	1.17
1993	Arturo Alessandri Besa	1,701,324	24.41
1993	José Piñera Echeñique	430,950	6.18
	Total	**6,968,950**	**100.00**
1999 1r	Arturo Frei Bolívar	26,812	0.38
1999 1r	Sara María Larraín Ruiz-Tagle	31,319	0.44
1999 1r	Gladys Marín Millie	225,224	3.19
1999 1r	Tomas Hirsch Goldschmidt	36,235	0.51
1999 1r	Ricardo Lagos Escobar	3,383,339	47.96
1999 1r	Joaquin Lavin Infante	3,352,199	47.51
	Total	**7,055,128**	**100.00**
1999 2r	Ricardo Lagos Escobar	3,683,158	51.31
1999 2r	Joaquin Lavin Infante	3,495,569	48.69
	Total	**7,178,727**	**100.00**

Source: Ministry of the Interior and TRICEL. Chile.

That same constitution established that if the government's nominee (in this case, Pinochet) lost the plebiscite there would be open presidential elections the year after. In December 1989, Mr. Patricio Aylwin, the candidate of the opposition to the government (the *Concertación*, a coalition of parties from the center and left), won the election with

55% of the vote and became the first democratically elected president since 1973. The government's candidate (Mr. Hernán Büchi, a former Minister of Finance during the Pinochet regime) obtained 29% of the vote.[7]

Since 1989, there have been three presidential elections in Chile. All three of them have been won by the *Concertación*. In the second one, in 1994, Mr. Eduardo Frei won with 58% of the vote against 24% for Mr. Arturo Alessandri, the candidate of the center-right coalition. The third presidential election, however, was more contested. Indeed, in the first round, in December 1999, neither of the candidates obtained 50% of the vote. The *Concertación* candidate, Mr. Ricardo Lagos, obtained 47.96% and the opposition (center-right) candidate, Mr. Joaquín Lavín, obtained 47.51% of the vote. The rest went to smaller parties.[8] The Chilean constitution establishes a second round for these cases between the two first majorities. In the second round, Mr. Lagos won with 51.3% of the vote against 48.7% for Mr. Lavín. As documented in Cerda and Vergara (op.cit.), the reduction in the vote in favor of the *Concertación* in this election is related to the first recession in Chile in sixteen years. GDP fell 0.8% in 1999 and the unemployment rate climbed from 6.2% in 1998 to 9.7% in 1999 (Figures 3 and 4).[9]

Overall, the *Concertación* has done remarkably well in political elections in the last fifteen years. Despite the recession, it won the presidential election of 1999 (in both rounds[10]) and afterwards, it has won another congressional election in 2001 and a municipal election in 2004.

[7] A third candidate, presented as an independent, but generally considered to be close to the center-right, obtained 15% of the vote.
[8] The communist candidate, Mrs. Gladys Marín, earned 3.2% of the vote.
[9] For 1989, we added up the votes for the government's candidate and the votes for the candidate who presented himself as an independent (Errázuriz) although in the public opinion, he was considered closer to the government.
[10] The second round was in January 2000.

Figure 3
% vote for the incumbent and GDP growth
Presidential elections

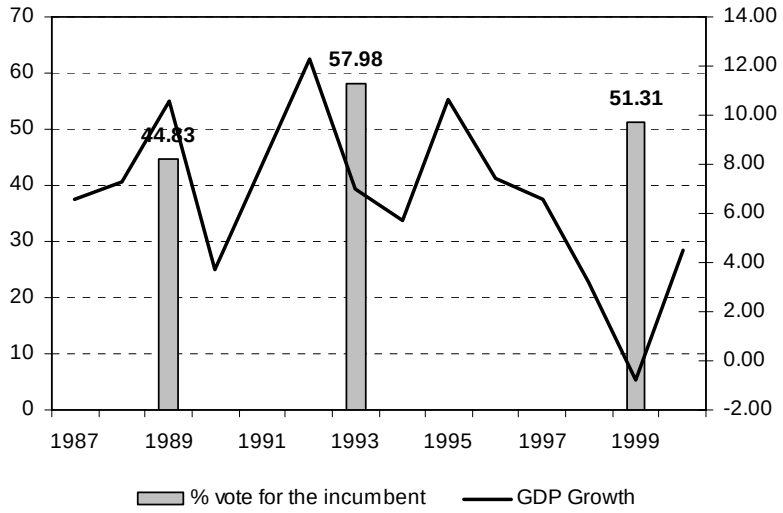
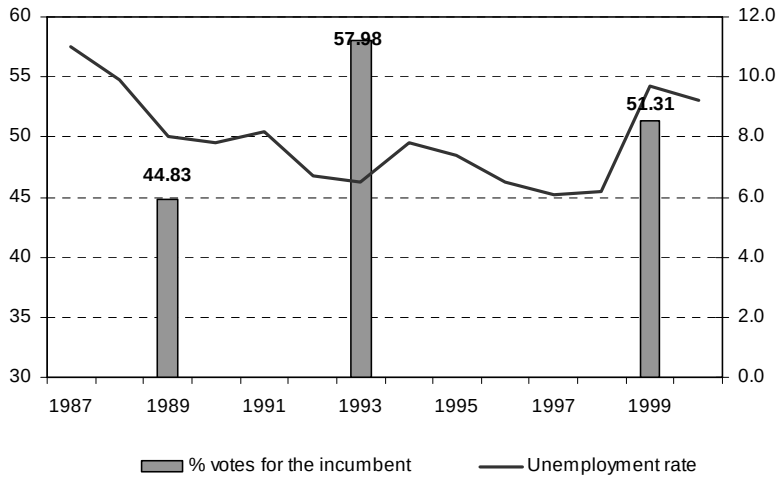


Figure 4
% vote for the incumbent and the unemployment rate
Presidential Elections



3. DATA AND METHODOLOGY

In this section, we discuss the properties of our data set and the estimation possibilities at hand. We follow the literature on economic variables and electoral performance as we hypothesize that the electoral performance of the incumbent depends on two types of variables: (1) economic and (2) non-economic variables. Non-economic variables include variables that encompass issues such as moral values, political ideas and the like. Economic variables are included since the population may punish incumbents by not voting for them if they consider that there is a poor economic management of the economy. Among the variables that might influence the vote we include aggregate economic variables indicating the state of the economy (business cycle variables) and government subsidies that are spent directly on individuals. The difference between these two types of economic variables is that business cycle variables are less dependent on the incumbent's decisions. This is more the case in small open economies such as Chile, in which the business cycle is more dependent on external factors, such as terms of trade and international interest rate shocks Nonetheless, we still argue that voters attribute some degree of responsibility to the incumbent for the bad macroeconomic performance and will punish him/her at the ballot box. Subsidies, on the other hand, are in part arbitrarily determined by the incumbent, and as such, might have a significant effect on voters' decisions.

3.1 Rough correlations

Since the end of the Chilean military regime, there have been several presidential, congressional and municipal elections. Figures 5 and 6 plot incumbents' electoral performance vis-à-vis the growth rate in social spending and subsidies. Even when we mix in the figures the outcome of presidential, national congress and county elections, there is an astonishing time-series correlation between the series. In fact, the correlation between the series in figure 5 is 0.84 while in figure 6 it is 0.67.

Figure 5
Incumbent electoral performance and social spending growth rate

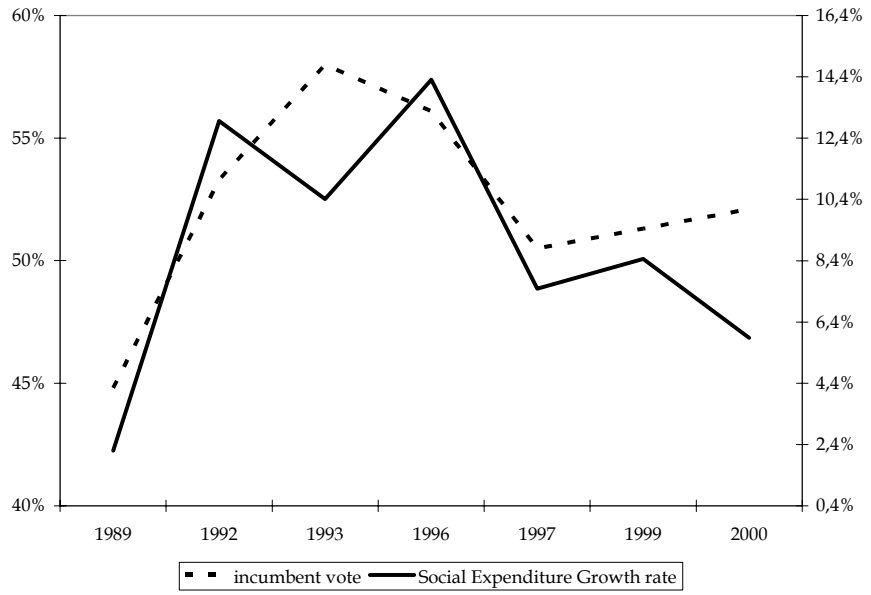
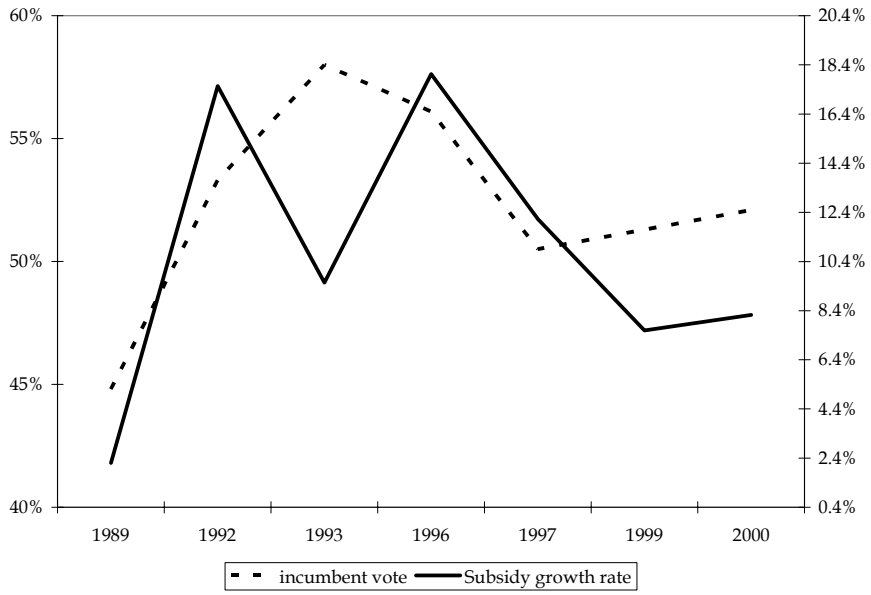


Figure 6
Incumbent electoral performance and subsidy growth rate



Tables 3 to 5 show the evolution of business cycle variables and electoral performance for each type of election. As a measure of the Chilean business cycle, we include GDP growth, the inflation rate and the average unemployment rate in each year in which an election took place. Electoral performance is measured by the percentage of votes obtained by the incumbent. All three tables show an important correlation between each of the economic variables and electoral performance.

Table 3
Presidential Elections

Year	Electoral performance	Unemployment	GDP Growth	Inflation
1989	44.8	8.0	-1.1%	21.4
1993	58.0	6.5	0.2%	12.2
1999	51.3	9.8	-2.6%	2.3
Correlation Coefficient		-50%	40%	-50%

Table 4
National Congressional Elections

	Year	Electoral Performance	Unemployment	GDP Growth	Inflation
Upper House	1989	36.8	8.0	-1.1%	21.4
	1993	55.4	6.5	0.2%	12.2
	1997	50.5	6.1	5.1%	6.0
Lower House	1989	36.2	8.0	-1.1%	21.4
	1993	55.5	6.5	0.2%	12.2
	1997	49.9	6.1	5.1%	6.0
Correlation Coefficient					
Upper House			-89.7%	44.2%	-78.5%
Lower House			-88.4%	41.5%	-76.6%

Table 5
County Elections

	Electoral Performance	Unemployment	GDP Growth	Inflation
1992	53.3	6.7	0.4%	12.7
1996	56.1	6.5	4.1%	6.6
2000	52.1	9.2	-2.8%	4.5
Correlation Coefficient		-0.77	0.98	0.01

The data shown in these tables are obviously not conclusive regarding causality. Those results might also occur if the causality went from electoral performance to

economic variables (this hypothesis seems highly unlikely) or if there were a set of other variables, not included in the tables, that might determine both economic and electoral variables. However, the data show that there is clearly an association among aggregate economic variables and electoral performance.

To look more carefully at our question of interest, we decided to analyze presidential elections at the Chilean county level. We do so because there is a great variation in electoral performance throughout the country. Hence, we obtained a great variation in our data set by including the cross-sectional dimension of the data. In fact, from Table 6, which shows descriptive statistics of electoral performance by region, we may conclude that there is a great variation in the data between and within regions and over time in a given region. We decided to focus on presidential elections rather than on congressional elections or municipal elections because those representatives do not have the same power as the president to determine economic policies. Hence, it is more likely that people will evaluate economic policies in presidential elections.

3.2 Data and preliminary results

Our dependent variable is the percentage of votes obtained by the incumbent at the county level in presidential elections since 1989 in Chile. We obtained these data from the Chilean electoral service (Servicio Electoral de Chile). There are 228 counties in our data set. We also obtained data on different variables of interest that might explain the electoral performance according to the 1990, 1992 and 1998 Surveys of Socioeconomic Characteristics of the Chilean Population (CASEN). These data correspond to a representative survey of the Chilean population. The Survey includes approximately 200,000 individual data per year. Using this survey, we obtained the explanatory variables by county. The CASEN survey allows us to extract the following candidates as explanatory variables: (1) variables related to demographics, such as the average age of voters and the fraction of female voters; (2) the fraction of the population under the poverty line; (3) the unemployment rate; and (4) government subsidies.

Table 6
Vote for the incumbent by region

Region	Year	Observations	Mean	Std. Dev.	Min.	Max.
I	1989	10	48.86	12.47	30.22	66.46
	1993	10	46.00	10.59	25.80	58.98
	1999	10	38.89	12.66	15.33	51.41
II	1989	9	27.89	6.36	21.47	39.53
	1993	9	56.94	5.97	47.79	66.87
	1999	9	59.13	4.68	53.48	65.22
III	1989	9	31.69	6.86	19.95	46.86
	1993	9	59.61	3.44	53.03	63.33
	1999	9	60.90	4.86	53.24	70.68
IV	1989	15	31.74	9.63	21.14	54.04
	1993	15	62.56	4.68	54.82	71.86
	1999	15	62.11	9.50	47.60	78.29
V	1989	37	31.91	9.02	19.52	61.92
	1993	37	59.63	6.72	46.22	71.09
	1999	38 a/	48.64	7.67	34.70	62.72
VI	1989	33	31.35	5.15	20.75	42.31
	1993	33	64.48	3.94	55.22	71.14
	1999	33	51.76	4.56	42.94	62.51
VII	1989	29	30.47	5.28	21.50	42.89
	1993	29	60.64	6.17	42.85	71.26
	1999	30 b/	50.55	7.41	37.44	62.21
VIII	1989	49	30.02	10.05	10.69	54.72
	1993	49	61.57	6.36	48.17	74.80
	1999	52 c/	51.11	11.14	26.71	73.04
IX	1989	30	31.50	9.07	19.54	59.75
	1993	30	54.08	7.88	37.08	67.54
	1999	31 d/	40.68	8.01	23.35	56.84
X	1989	42	33.69	8.57	19.12	56.74
	1993	42	54.48	6.75	35.49	65.39
	1999	42	44.38	8.42	24.45	60.05
XI	1989	10	44.10	15.24	25.09	76.43
	1993	10	52.09	3.77	46.17	55.51
	1999	10	40.97	9.17	22.95	54.31
XII	1989	11	46.77	19.28	27.55	86.67
	1993	11	55.64	13.42	31.43	67.16
	1999	11	44.93	14.97	13.33	59.73
XIII	1989	51	32.07	8.78	20.12	63.38
	1993	51	58.68	8.25	29.40	69.66
	1999	52 e/	50.48	8.23	24.10	61.66

a/ It includes "Con Con" county
b/ It includes "San Rafael" county
c/ It includes the following counties: "Chiguayante," "Chillan Viejo" and "Sn. Pedro de la Paz"
d/ It includes "Padre Las Casas" county
e/ It includes "Padre Hurtado" county
Source: Servicio Electoral de Chile

It is not possible to obtain from the CASEN survey other economic variables of interest at the county level, such as GDP growth rate or the inflation rate. To deal with this issue, we obtained data on GDP by Chilean regions from the National Accounts. However, there are no inflation rate data, not even by region. Thus, as variables measuring economic performance, we include the unemployment rate at the county level and a measure of output gap at the regional level, where output gap is the deviation of GDP from its trend (measured by means of the Hoddrick-Prescott filter).

The CASEN survey contains questions concerning direct subsidies to individuals. These are monetary and in-kind subsidies. Monetary subsidies include government payment directly to specific individuals. These subsidies are received by: (i) the elderly, the mentally disabled and physically disabled individuals; (ii) pregnant women and women with a newborn in the household; (iii) unemployed household heads. There are other monetary subsidies, but the amount they provide is almost insignificant as compared to the ones just described. In-kind subsidies are received by: (i) grade and high school students receiving free breakfasts and lunches at school and free textbooks for school use; (ii) grade and high school students receiving medical and dental care at schools; (iii) households receiving free food (mainly milk) and medicines.

For our purposes, the "subsidy" variable is measured as the fraction of the population in each county receiving any of these subsidies. An alternative would be to use the per-capita amount of subsidies received in every county per year. Unfortunately, for some subsidies (especially in-kind subsidies), we do not have data on the amounts involved.

Figures 7 to 9 plot the fraction of inhabitants receiving in-kind subsidies in each of the 13 Chilean regions for different years. In these figures, each point represents a county. It is possible to conclude that people receiving in-kind subsidies have increased considerably over time, but also that some regions have experienced greater increases than others. The greatest increases have occurred in regions 2 to 4. Compared to table 6, these are the regions with the greatest increase in the vote obtained by the incumbent over time.

Figure 7
Fraction of population receiving subsidies by Chilean region, 1989

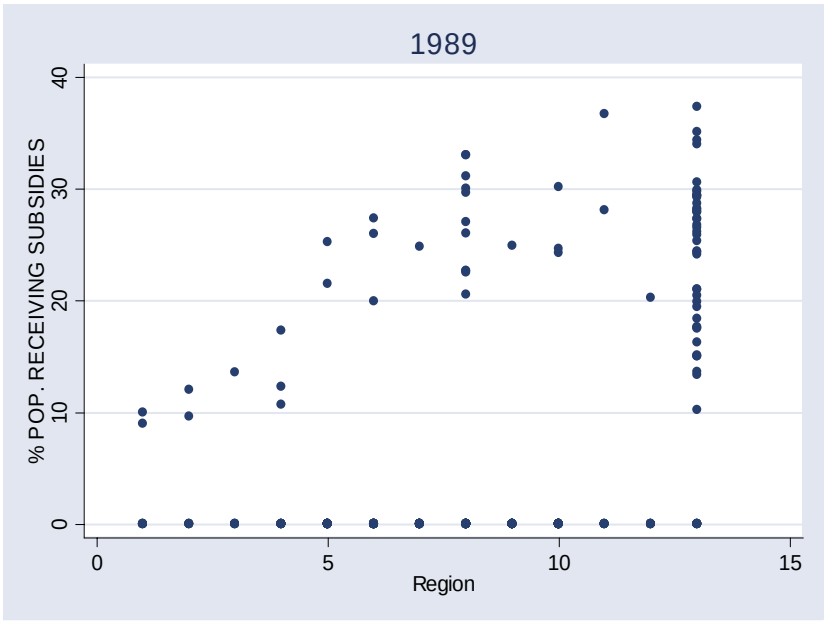


Figure 8
Fraction of population receiving subsidies by Chilean region, 1993

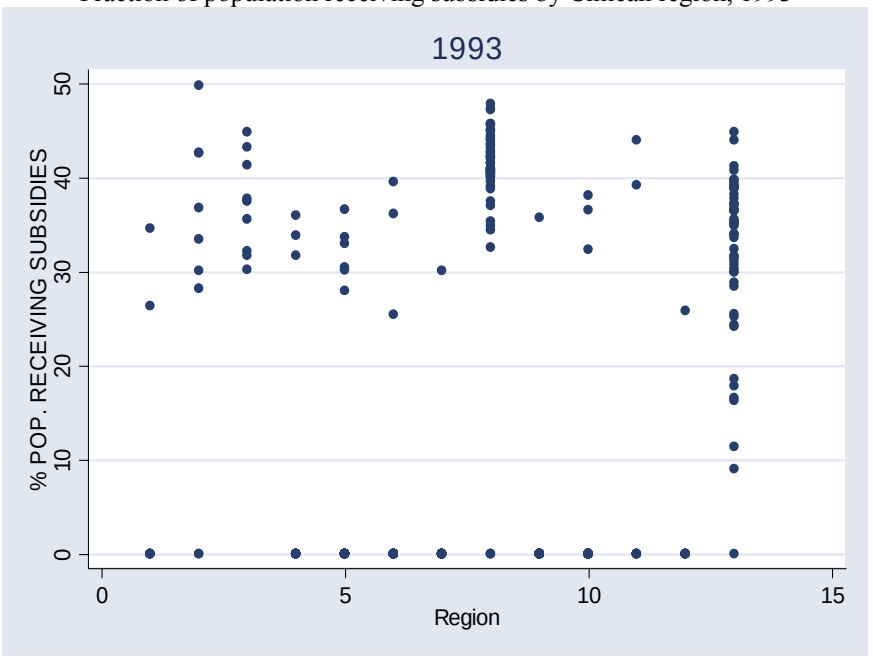
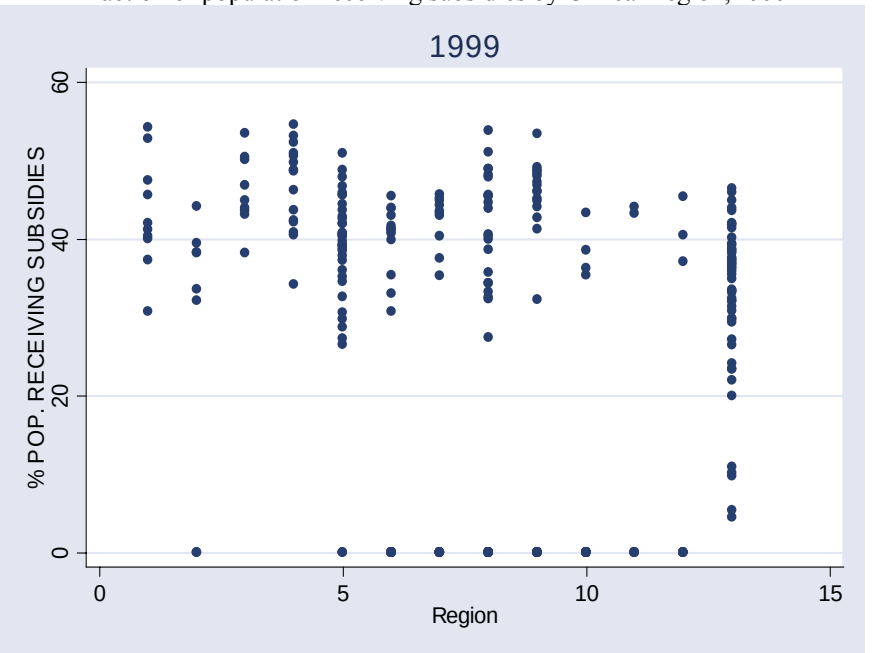


Figure 9
Fraction of population receiving subsidies by Chilean region, 1999



To control for other political considerations, we obtained, from the Chilean electoral service, the political party of the mayor in office. We constructed an indicator function that assumes the value one when the mayor belongs to the same political coalition as the presidential incumbent, and a value of zero otherwise. In theory, a mayor from the same coalition as the presidential incumbent might help him/her earn more votes in the county.

To proceed with the econometric analysis, we hypothesized the following relationship:

(1) $$V_{it} = \alpha_0 + X_{it}'\beta + Z_{it}'\gamma + \mu_i + \lambda_t + v_{it}$$

Where the subscripts indicate the ith county and the tth year. The variable V_{it} is the incumbent´s electoral performance while X_{it} is a set of economic variables (including aggregate business cycle variables and subsidies) and Z_{it} is the set of other non-economic variables determining V_{it}. In Z_{it}, we include demographics plus other political variables

that might influence people´s vote. Finally, μ_i is a county-fixed effect, λ_t is a time-fixed effect[11] and v_{it} is a well-behaved error term distributed $iid(0,\sigma_v^2)$.

As explanatory variables, we include subsidies, the unemployment rate and the square of the unemployment rate to capture a potential non-linear effect of this variable. We expect the overall impact of the unemployment rate to be negative, but possibly the squared term will be positive, which would capture a non-linear effect that indicates that the marginal effect declines as the unemployment rate increases. We also included demographic variables, time-effects, the output gap, the fraction of the population in poverty and the mayor's political affiliation.

We initially estimated our panel data using a random-effect GLS method. However, the Hausman test was rejected in all the specifications, denoting a rejection of the hypothesis of orthogonality between the county-fixed effect and the explanatory variables. Hence, we estimated a fixed-effects model (Table 7). Column 1 of Table 7 shows the results when we do not control by other variables except for the time-fixed effects. Subsidies are positive and statistically significant, indicating the larger the percentage of the population that receives the subsidy, the higher the vote for the incumbent. The unemployment rate appears with the expected sign and it is statistically significant. Columns 2 to 5 provide the sensitivity analysis as we introduce other variables.

The estimated coefficient of subsidies does not vary considerably as we include more explanatory variables in the benchmark equation. Regarding the business cycle variables, our results indicate that the higher the rate of unemployment, the lower the vote of the incumbent. The relationship is not linear since the effect declines as the unemployment rate increases. The output gap also has the expected sign and it is statistically significant.

[11] We include the time-fixed effect as it might allow the capture of the impact of aggregate determinants that do not vary across counties but that do influence electoral performance--such as the inflation rate. While the inflation rate in Chile was 21% in 1989, it fell gradually over the next decade, reaching 2.3% in 1999. This time variable can also be thought to be controlling by the quality of the candidates. For instance, it has been argued in Chile that the increase in the vote for the opposition in the 1999 election was also related to a better opposition candidate in that election.

Table 7
FE effect estimation

Dependent variable: electoral votes, %, by county

	Equation 1	Equation 2	Equation 3	Equation 4	Equation 5
Unemployment	-1.37**	-1.34**	-1.16**	-1.16**	-1.04*
	(-2.40)	(-2.27)	(-1.99)	(-1.97)	(-1.84)
Unemployment, squared	0.050**	0.048**	0.043*	0.043*	0.037*
	(2.26)	(2.21)	(1.92)	(1.93)	(1.75)
Subsidies	0.32**	0.33**	0.28**	0.28**	0.23**
	(2.83)	(2.79)	(2.43)	(2.43)	(2.06)
Demographics	No	Yes	Yes	Yes	Yes
Output Gap			0.40**	0.40**	0.38**
			(2.31)	(2.30)	(2.27)
Poverty				-0.03	-0.01
				(-0.25)	(-0.07)
Mayor					6.58**
					(3.40)
Time-effects	Yes	Yes	Yes	Yes	Yes
R2 Overall	0.4952	0.5092	0.5113	0.5092	0.5638
Within	0.7610	0.7615	0.7698	0.7699	0.7867
Between	0.1280	0.1457	0.1414	0.1389	0.2387
Observations	384	384	384	384	384
Groups	228	228	228	228	228

Demographics include average age and fraction of females. T statistics in parenthesis.
** indicates significant at 5% and * significant at 10%.

The political party of the mayor appears to have a significant effect on the vote in presidential elections. If the mayor belongs to the coalition of the incumbent, then there is a positive effect on the vote for the candidate of the government's coalition in that county. Poverty, on the other hand, is not statistically significant.

We tried several lags for the different variables, but they were not statistically significant. This supports the idea that the economic events that influence political elections are current events rather than lagged events.[12]

[12] For this case, we assumed that current events are those that happen in the year of the election or in the year before the election, the reason being that we do not have all the required data for the election year (since the CASEN survey is not performed every year).

4. POTENTIAL SIMULTANEITY

The results reported above provide consistent evidence under different specifications and estimation methods of the impact of subsidies on an incumbent's electoral performance. However, it is likely that the estimated coefficient is downward-biased. In fact, as people determine their votes in terms of the subsidies they receive, the incumbent might react to this decision. Hence, in an election in which the incumbent forecasts a difficult reelection, he/she might increase subsidies to increase his/her possibilities.

It is possible to think of the following simultaneous model:

(2) $$V_{it} = X_{it}\beta + S_{it}\gamma + u_{it}$$

(3) $$S_{it} = Z_{it}\delta + V_{it}\alpha + \varepsilon_{it}$$

where $\gamma>0$, $\alpha<0$. In the above model, X_{it} and Z_{it} are exogenous single-valued variables that might determine either electoral performance (V_{it}) or subsidies (S_{it}) in order to keep the model as simple as possible. Furthermore, u_{it} and ε_{it} are *iid* random variables with a mean of zero and a variance of σ_u^2 and σ_ε^2, respectively. Then, note that if we estimate equation (2) directly, we get:

$$\operatorname*{plim}_{NT\to\infty}\hat{\gamma} = \gamma + \operatorname*{plim}_{NT\to\infty}\left(\frac{S'P_X S}{NT}\right)^{-1} \operatorname*{plim}_{NT\to\infty}\left(\frac{S'P_X u}{NT}\right)$$

$$= \gamma + \frac{\sigma_u^2}{\sigma_z^2\left(\frac{\delta}{1-\gamma\alpha}\right)^2 + \sigma_u^2\left(\frac{\alpha}{1-\gamma\alpha}\right)^2 + \sigma_\varepsilon^2\left(\frac{1}{1-\gamma\alpha}\right)^2}\frac{\alpha}{1-\gamma\alpha} < \gamma$$

where $P_X = \left[I - X(X'X)^{-1}X'\right]$.

A direct estimation of equation (2) biases downward our estimation of β, our parameter of interest. It therefore follows that our estimation of equation (1) might be biased.

To address this problem, we estimated equation (1) using a 2SLS fixed-effect panel regression, explaining subsidies in the first stage. In this estimation, the key element is choosing the instruments (IV). As usual, our IV should be correlated with subsidies, but uncorrelated with the residual in equation (1). Hence, the set of instruments to be used must influence subsidies, but should not be correlated with the incumbent's reaction to the electoral scenario. To determine this IV, we hypothesized that subsidies depended on: (a) specific rules and (b) arbitrary decisions by the incumbent. The first set of variable is exogenous to the incumbent and, therefore, should resolve the simultaneity problem.

In Chile, subsidies are directed to the poor. For instance, the school meal program is targeted towards students attending public (or semi-public) schools that can be classified as high-risk. High risk is a condition defined by the Chilean government as a combination of variables such as household income and students' weight and height. It is supposed to indicate students with low human capital. High-risk students come from poor households. Poor people go to public schools where they receive these subsidies. Similarly, the free textbook program is directed only to students at public schools. Since one of the determinants of high risk is income, two candidates to be used as instrumental variables are the fraction of population in each county that is in the first two deciles of the income distribution and the average income in each county.

Figure 10 confirms this relationship between poverty and the percentage of the population receiving subsidies. Each panel of this Figure plots average income (per county) vis-à-vis the fraction of the population receiving subsidies for different years. As it is clear from the figure, there is a negative non-linear relationship. The different panels of Figure 11 plot the fraction of the population in the first and second deciles of income vis-à-vis the fraction of the population receiving subsidies for different years. As expected, they show a clear positive relationship. .

Thus, income and the fraction of population in the first and second deciles of the income distribution will be used as our instrumental variables in the fixed-effects equations. As the relationship in the graphs seems to be non-linear, we will also use the square of these variables as instruments.

Table 8 reports the results of our estimations as we use IV. Part (a) of this table shows the first-stage regressions while part (b) shows the second-stage regressions. The first-stage regressions confirm our idea that the instruments are not weak, while part (b)

of the table shows that, with the exception of subsidies, the coefficients of our variables of interest in equation (1) almost do not vary as we use IV. In the case of subsidies, the coefficient increases considerably, multiplyed by a factor of between two and three, which confirms that the simultaneity problem caused a downward bias in its coefficient.

Our results also confirm the importance of the unemployment rate. The average unemployment rate in the Chilean economy in 1989-2003 has been 8%. Our results (from equation 5 in Table 8) predict that if the unemployment rate were to increase from 8% to 9%, the incumbent's vote would decline by 1.1 percentage points. The coefficient of the output gap is positive and statistically significant, indicating that if actual output is above its trend, the better the performance of the incumbent will be in presidential elections.

Figure 10
Plots of in-kind subsidies vis-à-vis average income by years

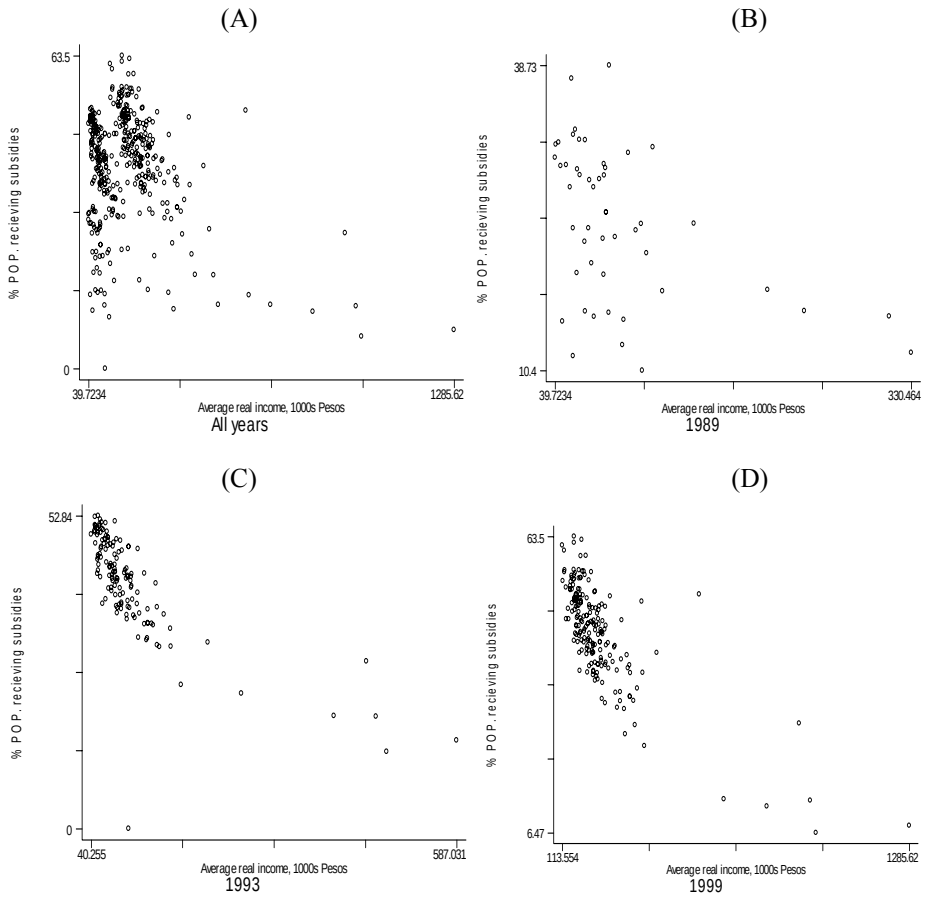


Figure 11
Plots of in-kind subsidies vis-à-vis population in 1st and 2nd income decile

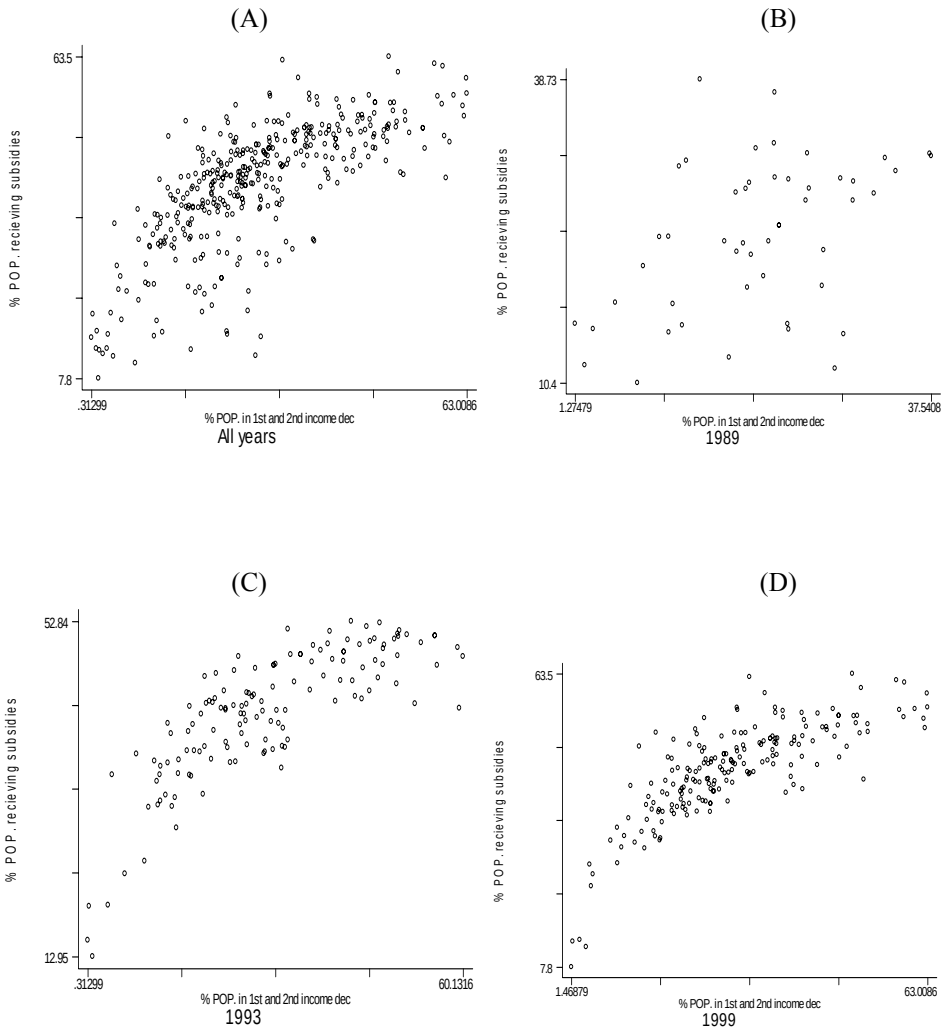


Table 8
2SLS - FE estimation
(a) First - Stage Regression

Dependent variable: subsidies, %, by county

	Equation 1	Equation 2	Equation 3	Equation 4	Equation 5
Log(Average Income)	96.09**	113.3**	113.1**	111.8**	110.5**
	(6.16)	(6.71)	(6.72)	(6.52)	(6.47)
Log(Average Income), squared	-4.28**	-4.96**	-4.96**	-4.92**	-4.85**
	(-6.33)	(-6.80)	(-6.81)	(-6.67)	(-6.60)
Deciles (1st and 2nd)	0.46**	0.42**	0.39**	0.40**	0.42**
	(2.39)	(2.25)	(2.07)	(2.10)	(2.18)
Deciles (1st and 2nd), squared	-0.002	-0.001	-0.005	-0.001	-0.001
	(-0.78)	(-0.59)	(-0.49)	(-0.47)	(-0.49)
Unemployment	-0.014	0.0005	0.071	0.047	0.06
	(-0.04)	(0.00)	(0.21)	(0.13)	(0.18)
Unemployment, squared	-0.013	-0.013	-0.015	-0.014	-0.015
	(-1.03)	(-1.05)	(-1.19)	(-1.06)	(-1.15)
Demographics	No	Yes	Yes	Yes	Yes
Output Gap			0.13	0.12	0.11
			(1.32)	(1.27)	(1.17)
Poverty				-0.04	-0.042
				(-0.41)	(-0.40)
Mayor					
Time-effects	Yes	Yes	Yes	Yes	Yes
R2 Overall	0.8124	0.7466	0.7449	0.7400	0.7432
Within	0.7529	0.7681	0.7709	0.7712	0.7754
Between	0.7810	0.7128	0.7073	0.7017	0.7050
Observations	380	380	380	380	380
Groups	227	227	227	227	227

(b) Second – Stage Regression

Dependent variable: electoral votes, %, by county

	Equation 1	Equation 2	Equation 3	Equation 4	Equation 5
Unemployment	-1.47**	-1.35**	-1.22**	-1.21**	-1.11*
	(-2.47)	(-2.19)	(-1.98)	(-1.97)	(-1.86)
Unemployment, squared	0.051**	0.047**	0.043*	0.044*	0.039*
	(2.25)	(1.98)	(1.83)	(1.87)	(1.69)
Subsidies (Instrumented)	0.66**	0.74**	0.72**	0.71**	0.68**
	(3.26)	(3.38)	(3.23)	(3.17)	(3.09)
Demographics	No	Yes	Yes	Yes	Yes
Output Gap			0.29	0.29	0.27
			(1.57)	(1.57)	(1.52)
Poverty				-0.09	-0.07
				(-0.56)	(-0.45)
Mayor					5.65**
					(2.73)
Time-effects	Yes	Yes	Yes	Yes	Yes
R2 Overall	0.4450	0.4614	0.4650	0.4626	0.5278
Within	0.7494	0.7439	0.7507	0.7515	0.7673
Between	0.1078	0.1244	0.1233	0.1195	0.1977
Observations	380	380	380	380	380
Groups	227	227	227	227	227

Demographics include average age and fraction of females. T statistics in parenthesis.
** indicates significant at 5% and * significant at 10%.

We next decided to separate government subsidies into in-kind subsidies and monetary subsidies, as we would like to know if people react differently to the different types of subsidies. We made, as per above, two estimations: FE and IV-FE estimation. Table 9 reports the FE results while table 10 reports the IV-FE results.

The results are quite similar to the ones obtained above. However, the coefficient of both types of subsidies differs considerably, the one on monetary subsidies being statistically not significant while the one related to in-kind statistics was positive and statistically significant. The result seen for monetary subsidies (that are statistically not significant) might be explained because those types of subsidies are highly regulated and, therefore, the incumbent has less power to unilaterally increase their amount. Indeed, monetary subsidies are more focalized in the sense that they reach specific segments of the population (the very poor, the elderly and the disabled). As these benefits are taken for granted, they should not influence voters' behavior. In addition, it is likely that a large proportion of the people who receive monetary subsidies do not vote in political elections (as a significant fraction is either old or disabled). We therefore suspect that voters do not evaluate their political authorities on this ground.

In-kind subsidies, on the other hand, reach a larger fraction of the population than monetary subsidies. For instance, the school meal program reaches 33% of the school students in the country.[13] This implies that it reaches a large fraction of the families and of the voters. The same is true for the food program for small children in health care institutions. In fact, 30.1% of the population receives at least one of the in-kind subsidies available while only 16.2% of the population receives monetary subsidies. Furthermore, the percentage of the population that receives in-kind subsidies have increased by thirteen percentage points in the last decade while the percentage of the population that receives monetary subsidies has increased by only six percentage points in the same period.

Thus, the evidence for Chile in this period suggests that the vote is more linked to in-kind subsidies. The results of Table 10 indicate that the percentage of the population receiving in-kind subsidies between the elections of 1993 and 1999 increased the vote

[13] As schools usually complement the government subsidy, the amount of the benefit perceived by the beneficiary is greater than the direct government subsidy. This is not the case for monetary subsidies. Hence, the difference in cost for the government of both types of subsidies underestimates the real difference perceived by the beneficiaries.

for the incumbent by 2 percentage points. Hence, this was an important factor in the 1999 election and it offset, to some degree, the effect of the recession of that year.

Table 9
FE effect estimation

Dependent variable: electoral votes, %, by county

	Equation 1	Equation 2	Equation 3	Equation 4	Equation 5
Unemployment	-1.44**	-1.42**	-1.23**	-1.23**	-1.11*
	(-2.48)	(-2.39)	(-2.09)	(-2.08)	(-1.95)
Unemployment, squared	0.050**	0.048**	0.043*	0.044*	0.038*
	(2.23)	(2.12)	(1.91)	(1.93)	(1.76)
Monetary Subsidies	0.107	0.102	0.084	0.086	0.043
	(0.96)	(0.90)	(0.75)	(0.77)	(0.40)
In-kind Subsidies	0.39**	0.41**	0.37**	0.38**	0.36**
	(2.25)	(2.26)	(2.06)	(2.08)	(2.03)
Demographics	No	Yes	Yes	Yes	Yes
Output Gap			0.41**	0.41**	0.39**
			(2.38)	(2.36)	(2.32)
Poverty				-0.05	-0.023
				(-0.35)	(-0.16)
Mayor					6.69**
					(3.45)
Time-effects	Yes	Yes	Yes	Yes	Yes
R2 Overall	0.4663	0.4860	0.4920	0.4886	0.5521
Within	0.7610	0.7616	0.7704	0.7706	0.7880
Between	0.0977	0.1111	0.1110	0.1074	0.2049
Observations	384	384	384	384	384
Groups	228	228	228	228	228

Demographics include average age and fraction of females. T statistics in parenthesis.
** indicates significant at 5% and * significant at 10%

Table 10
2SLS - FE estimation

Dependent variable: electoral votes, %, by county

	Equation 1	Equation 2	Equation 3	Equation 4	Equation 5
Unemployment	-1.96**	-1.98**	-1.81**	-1.77**	-1.61**
	(-2.77)	(-2.56)	(-2.36)	(-2.35)	(-2.27)
Unemployment, squared	0.06**	0.065**	0.06**	0.060**	0.052*
	(2.44)	(2.22)	(2.08)	(2.10)	(1.94)
Monetary Subsidies	-0.33	-0.54	-0.56	-0.48	-0.42
	(-0.83)	(-1.14)	(-1.18)	(-1.04)	(-0.99)
In-kind Subsidies	1.30**	1.73**	1.67**	1.61**	1.52**
	(2.59)	(2.73)	(2.68)	(2.64)	(2.66)
Demographics	No	Yes	Yes	Yes	Yes
Output Gap			0.36*	0.35*	0.32*
			(1.71)	(1.71)	(1.65)
Poverty				-0.09	-0.078
				(-0.53)	(-0.44)
Mayor					6.91**
					(2.94)
Time-effects	Yes	Yes	Yes	Yes	Yes
R2 Overall	0.3434	0.3476	0.3564	0.3622	0.4251
Within	0.7138	0.6645	0.6752	0.6896	0.7207
Between	0.0638	0.0713	0.0719	0.0711	0.1202
Observations	380	380	380	380	380
Groups	227	227	227	227	227

Demographics include average age and fraction of females. T statistics in parenthesis.
** indicates significant at 5% and * significant at 10%

5. CONCLUSIONS

The purpose of this paper has been to investigate the effect of government subsidies on voters' decisions in presidential elections in Chile during the period 1989-2000. Our results indicate that government subsidies have a positive effect on the votes obtained by the incumbent.

We face a potential endogenous problem. Indeed, while subsidies may determine electoral performance, the expected electoral performance may also influence the amount of subsidies granted by the government in power. This effect produces a downward bias in the coefficient of this variable. To correct for this endogenicity, we use 2SLS. As instrumental variables, we use the average real income of the county and the percentage of the population of the county in the first two deciles of the income distribution. Both are related to subsidies, as relatively poorer counties receive greater

benefits, but they are not related to electoral performance other than by aggregate economic factors that are also included in the electoral performance equation. The coefficient for government subsidies remains positive and significant, but it is much larger than without correcting for endogenicity, confirming the downward bias that is introduced by not correcting for this effect.

When separating in-kind and monetary subsidies, we find that only in-kind subsidies appear to influence voters. One possible explanation for this asymmetry is that in Chile, monetary subsidies are more focalized in the sense that they reach a specific segment of the population (the very poor, the elderly and the disabled). These benefits are taken for granted by these people. They are viewed as more dependent on objective variables, and as such, less dependent on government decisions. Hence, they should not influence voters' behavior. In addition, it is likely that a large proportion of the people who receive monetary subsidies do not vote in political elections (as a significant fraction is either old or disabled). Furthermore, in-kind subsidies reach a much larger proportion of the population than monetary subsidies.

We also conclude that the business cycle, and specifically, the unemployment rate, have a significant effect on the votes earned by the incumbent. These results allow us to estimate that the worsening of the economic conditions between the presidential elections of 1993 and 1999 reduced the vote for the incumbent while the increase in government in-kind subsidies partially offset this effect.

Our estimations also indicate that demographics variables as well as the political party of the mayor have an influence on the vote.

How much does a vote cost the incumbent? The results from Table 10 indicate that an incumbent willing to increase his/her electoral performance by 1 percentage point should increase the fraction of the population receiving in-kind subsidies between 1.3 and 1.5 percentage points. For instance, a reasonable expenditure in the food program is around US$300 per person a year. Therefore, in a population of 15 million people, the government should provide free food to between 195,000 and 225,000 more people at a cost of between US$58.5 million and US$67.5 million. For a vote of about 7 million cast, this means that each vote costs between US$840 and US$960. If we correct by the PPP, this is equivalent to between US$1,680 and US$1,920 in the USA. This figure is much lower than the US$14,000 that Levitt and Snyder (op.cit) found that a vote for the House of Representatives cost in the USA.

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