

Contributions

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Can Land Reform Avoid a Left Turn? Evidence from Chile after the Cuban Revolution

Abstract: Following the creation of the Alliance for Progress in 1961, several structural reforms were implemented in Latin America in response to the political effects of the Cuban Revolution. Among these, land reform was arguably the most important policy. Using a unique dataset of land expropriations, and a plausible exogenous variation in land concentration, this paper studies the causal effects this policy had on political support for the incumbent party in the central government. In a context where the incumbent was losing political support (and the power of the left wing was rising), municipalities affected by land reform voted by 3–5 percentage points higher for the incumbent than municipalities not affected by this process. Although it did not prevent the first democratically elected Marxist government, land reform decreased the political support for the left wing party. I discuss several theoretical mechanisms that can explain this empirical result.

Keywords: land reform, political outcomes, land concentration

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1 Introduction

During the Punta del Este Conference in 1961 and via consensus of all Latin American governments, the Alliance for Progress was born. One of the main objectives of this alliance was transform historically unequal agrarian structures (Huerta 1989, p.14). To accomplish this and other goals, several loans and aid programs were granted to Brazil, Colombia, Ecuador, Paraguay and Chile, among others (Taffet 2007, see Table 3.1). In Chile, the alliance's push led to the general agreement that land reform was needed (Tello, 1965). Thus, in 1962, a small land reform process began under the right wing government of Jorge Alessandri (1958–1964) and then continued, in a more radical way,

under the government of Eduardo Frei (1964–1970), the candidate supported by the United States that defeated the Marxist candidate Salvador Allende.

This paper analyzes how land reform, a policy of redistribution mainly pushed by the Alliance for Progress in the 1960s, affected political support for the incumbent central government (Christian Democratic Party) at the 1970 presidential election.¹ To empirically analyze this relationship, I use disaggregated data at the municipality level, the smallest administrative unit, and compared how the percentage of votes for the incumbent changed after the implementation of land reform, in municipalities affected and not affected by this process. In this sense, the main contribution of this paper is not its identification strategy but its analysis on the effects of a redistributive policy (land reform) on a developing country in Latin America after the Alliance for Progress entered into the political arena as a counter-revolution to the Cuban Revolution and the increasing demand for redistribution it entailed.²

The study of how voters react to government policies is vast, and several channels through which a government policy might affect voter's political preferences have been proposed. The two most common approaches are (i) to consider voter's reactions to macroeconomic conditions like the rate of unemployment and income growth, and (ii) to consider voter's reactions to government expenditures, transfers, or redistributive policies in general.³ Both approaches appeal to a theoretical model through which people express their political preferences. This paper attempts to use insights from this theoretical literature to analyze what factors could be behind the relationship between land reform and political support for the incumbent party.

1 More than 3 million hectares were expropriated from the hands of landowners before that date, which accounts for approximately 12.5% of Chile's main agricultural area (the so-called "center valley," regions IV to X, see Figure A.1). This is big when compared to the 310 thousand hectares expropriated in Venezuela by 1973 and the 135 thousand hectares expropriated in Colombia by 1969, which represents 0.33% and 0.12% of each territory, respectively (Oliart and Araujo 1974).

2 There are better identification strategies to estimate the causal effect of a redistributive policy (typically government transfers) on political support for the incumbent (e.g. Pop-Eleches and Pop-Eleches 2010; Manacorda Miguel, and Vigortio 2011). This is mainly because they rely on more plausible identification assumptions by exploiting a manipulated regression discontinuity design.

3 See Kramer (1971), Stigler (1973), Fair (1978), Hibbs (2006) and Cerda and Vergara (2007) for the former literature and Levitt and Snyder (1997), Schady (2000), Manacorda, Miguel, and Vigortio (2011), Pop-Eleches and Pop-Eleches (2010) for the latter.

This paper is part of a nascent research agenda that empirically explores the effects of political interventions of United States in local politics.⁴ In addition, several aspects make it a contribution to the literature of redistributive policies and political support. First, we know the exact amount of land that entered into the process at each municipality from 1962 to 1970 and that there is a lot of heterogeneity in their level of land reform. This empirical fact allows us to make comparisons between municipalities affected and not affected by this policy. Second, all relevant municipalities are considered and several characteristics can be used as control variables. Third, a central institution was in charge of the agrarian reform process, not local institutions (e.g. Bardhan and Mookherjee forthcoming). This constraints the use of land reform by local governments for political reasons. In fact, the most important variable affecting land reform assignment is land concentration, which has been historically persistent at the municipal level. Fourth, there was a general agreement across political coalitions that an agrarian reform process was needed. All these reasons give my identification strategy the flavor of a quasi-experiment mainly because land concentration was determined by historical factors and is plausibly not related to the changes in the political arena during the 1960s. Thus, I use an instrumental variables strategy and find that a one standard deviation in the intensity of land reform increased the incumbent political support by 3–5 percentage points, which is around 100 voters changing their political preferences in response to this policy.

Section 2 presents the relevant historical background in order to understand the context of this research. Section 3 presents descriptive statistics of the data set and discusses land reform assignment. Results and robustness checks are presented in Section 4. Section 5 discusses potential mechanisms. Finally, section 6 concludes.

2 Historical and political background

The influence of agriculture on Chilean society is immeasurable and, in many ways, farming is much more important than mining activities such as copper

⁴ See Dube, Kalpan and Naidu (2011), Berger et al. (forthcoming) and Nunn and Qian (2012) for examples. To the best of my knowledge, the hypothesis that motivates this research, i.e. that land reform had political effects, is entirely original. Therefore, there are no prior beliefs among historians or economists about the potential answers to this question for the Chilean case.

and nitrate, the other historically important economic activities in Chile.⁵ This importance, together with Chile's high land concentration at both the national and municipal levels, are some of the most important characteristics of rural areas.⁶ These features were part of a rural equilibrium in which rural laborers worked for a landlord and had no opportunity to become landowners. This equilibrium was abruptly disturbed by the agrarian reform in the 1960s. However, before this, there was also a concern about this high concentration of property, which translated into the creation of a government institution called *Caja de Colonización Agrícola* in 1928 (Huerta 1989, p. 42–43). However this institution was not very effective and acquired only 430 thousand physical hectares between 1929 and 1958 (CIDA, 1966), a small amount in comparison with the agrarian reform process.

2.1 Beginning of land reform

The emergence of the Alliance for Progress in 1961 can be interpreted as a counter-revolution to the rise of the left wing in Latin America after the Cuban Revolution. This alliance aimed to meet the increasing demand for redistribution that was present in society.⁷ This translated into an economic cooperation between United States, represented by the President John F. Kennedy, and South America. This cooperation began informally in Venezuela (March, 1961) and it was called the Alliance for Progress. Among many goals – such as democratization, literacy, and price stability – land reform appears as the more pragmatic structural reform.

From the Great Depression to the 1960s, many events happened that made a land reform process possible. First, the increasing demand for redistributive policies, originated in a context where the Cold War was shaping economic and political policies and where the Cuban Revolution was influencing Latin

5 As McBride (1970) puts it: “Chile’s social structure was built on land bases, and the entire life of the nation had to be shaped in relation to land (...) The condition of each person was determined by the ownership or not ownership of an *hacienda*.”

6 Indeed, Conning and Robinson (2007) calculate that land gini coefficient in Chile was about 0.94 in 1965. Other land gini coefficients are: Argentina 0.79, Brazil 0.84, Bolivia 0.94, Bangladesh 0.42, India 0.62, France 0.54, and United States 0.73. Many historians hypothesized that this high land concentration has its origins in colonial times (e.g. Bauer 1975 and Baraona 1960).

7 Flores (1963) puts it clearly: “Fidel Castro has claimed to be the indirect promoter of the *Alianza* [Alliance for Progress]; and there is some truth in his boast, since without the Cuban Revolution Latin America would not be in the headlines today (...) Without Castro, few outside Latin America would care about the region’s economic stagnation [and] its political instability.”

American demands.⁸ Second, the population was growing faster than agricultural production: from 1945 to 1960 the average annual rate of growth was 1.8%, while the average annual rate of population growth was about 2.2% (Tello 1965).⁹ Third, the Church's position and the general agreement at the National Agricultural Society were that land reform was of prime necessity; these institutions seem to have had an important effect on the national debate (Huerta, 1989). Finally, the political arena was also changing: before the 1950s, politics were ruled by a group of people with too much political power who also were the majority of landowners. However, this situation changed with the introduction of the secret ballot (1958) and the female vote (1949).¹⁰ Then, the legal process for an agrarian reform was formally approved in 1962 and was characterized by its two main laws that allowed the government to expropriate plots for future redistribution.

- 1 Law #15.020: enacted in 1962 under the right wing government of Jorge Alessandri. This law created the Agrarian Reform Corporation (CORA from now on), a central government-dependent institution in charge of the expropriation of plots.¹¹
- 2 Law #16.640: enacted in July 1967 under the government of Eduardo Frei Montalva.¹² This law augmented the legal reasons for expropriation of a plot and, consequently, accelerated the agrarian reform process.

The result of these laws is that before 1967 less than 300 thousand hectares entered into the process, while by the 1970 presidential election more than 2

⁸ Taffet (2007) succinctly says: “new policies were necessary because the successes of the Cuban Revolution suggested that the entire region was vulnerable to communism.”

⁹ Chile went from being a net exporter of agricultural products in the 1930s, to a growing trade deficit at the beginning of the 1960s. Indeed, during years 1936–1938, there was a trade *surplus* in agricultural products of 1.1 million US dollars, while in 1963 the annual *deficit* was around 124 million US dollars (Chonchol 1976).

¹⁰ Huerta (1989) offers a good description of this process: “There is a total resistance to an structural Agrarian Reform before the fifties. The reason is clear, it implies transmission of power, social modifications, and more political participation. Even though the agrarian problem start as an economic issue, it soon transformed into a political problem (...) Agricultural workers have been absent as participants of the national problems, they do not have means of expression.”

¹¹ The main objectives of this law were to give access to land to agricultural workers, to improve the living standards of the rural population, and to increase agricultural production and soil productivity (Law 15.020 art. 3, *Diario Oficial* N.25, November 27, 1962).

¹² The general agreement about the need for a more intense land reform was reflected in the 94% approval rating at the Congress (Barraclough 1971).

million hectares were expropriated.¹³ We can fairly say that the agrarian reform process really started under the government of the Christian Democrat Eduardo Frei (1964–1970): approximately 12.5% of Chile’s main agricultural area, the so-called “center valley” was expropriated (see Figure A.1.).

LEFT		CENTER		RIGHT
<u>1958 Presidential Elections</u>				
Independent Luis Zamorano 3.4%	Socialists Salvador Allende 28.9%	Radicals Luis Bossay 15.4%	Christian Democrats Eduardo Frei 20.8%	Independent Jorge Alessandri 31.5%
<u>1970 Presidential Elections</u>				
Popular Front Socialists Salvador Allende 36.6%		Radicals & Others	Christian Democrats Radomiro Tomic 27.8%	Nationals Jorge Alessandri 34.9%

Figure 1: Understanding Politics in 1958 and 1970 (Collier and Sater 2004).

2.2 Political arena: The three thirds

During the sixties, there were three clearly identified political coalitions: the right, the center, and the left. The right wing was composed of the Liberal and Conservative parties between 1958 and 1965 and of the new National Party between 1967 and 1970. The center was represented by the Christian Democratic Party and the Radical Party in 1958, but only by the former in 1970.¹⁴ The left wing consisted of the union of the Socialist and the Communist Party in 1958, and after 1969, the addition of the Radical Party and other minor political parties in the so-called Popular Front.

Figure 1 shows parties and candidates at presidential elections both in 1958 and 1970, the main elections used in the empirical section to account for the period before and after land reform. This political arena is generally known by

¹³ In fact, several historians refer to these agrarian reform period of Jorge Alessandri as “*Reforma de Macetero*” (Pot Reform), in direct reference to the small amount of reformed land (e.g. Correa et al. 2001).

¹⁴ This political migration of the Radicals between 1958 and 1970 is fairly well documented by Collier and Sater (2004).

Table 1: Political competition during the 1950s and 1960s.

	Left	Center	Right
Panel A: Parliamentary Elections			
1953	People's National Front (34.6)	Ibañez' National Movement (26.5)	National Concentration (33.1)
1957	Popular Front (22.5)	Democratic Bloc (38.9)	Christian Social Federation (32.4)
1961	Popular Front (22.6)	Democratic Front (73.9)	–
1965	Popular Front (25.0)	Christian Democrats (42.9)	Radicals and Liberals (20.9)
1969	Popular Front (29.9)	Christian Democrats (30.7)	Radicals and Nationals (34.0)
Panel B: Presidential Elections			
1952	Salvador Allende (5.4)	Ibañez del Campo and Durán (66.8)	Arturo Matte (27.8)
1958	Allende and Zamorano (32.3)	Eduardo Frei (36.2)	Jorge Alessandri (31.5)
1964	Salvador Allende (38.9)	Frei and Durán (61.1)	–
1970	Salvador Allende (36.6)	Radomiro Tomic (27.8)	Jorge Alessandri (34.9)

Source: Urzúa (1992) and Cruz-Coke (1984).

Note: Percentage of votes in parentheses.

historians, politicians, and social scientists as the period of the *tres tercios* (three thirds), because voters were clearly divided between three different political tendencies (left, center, are right) in a fairly equal distribution, with each bloc obtaining approximately one-third of total votes.¹⁵

Table 1 shows another interesting pattern after the Cuban Revolution: the rise of the left wing. Although there is a sizable body of research aimed at understanding the origins of the Cuban Revolution (e.g. Thomas 1963, Pérez-Stable 1999, Farber 2006) and the effects it had on the country (see Eckstein 1986 for an empirical study), there is surprisingly little work on the contemporary

¹⁵ This pattern is clear for both the 1958 and the 1970 presidential elections (see Table 2) as well as in other elections (see Table 1). The exception is the 1964 presidential election and the 1961 parliamentary election due to the alliance of the right wing with the center due to the threat of a potential Marxist government.

effects the revolution had on other countries.¹⁶ How much of this increase is due to the Cuban Revolution? Several studies suggest that a significant part is due to the revolution and the increasing demand for redistributive politics it entailed (e.g. Wright 2000; Taffet 2007). What is most commonly suggested is the creation of the Alliance for Progress as a counter-revolution with this alliance triggering several redistributive policies during the 1960s.

I mainly use the 1958 and the 1970 presidential elections in the empirical section because (i) in 1958 the secret ballot was already implemented thus voters could express their political preference and vote-buying was minimized (see Robinson and Baland 2008), and (ii) political parties and candidates are fairly straightforward to match with the 1970 presidential elections (see Figure 1).¹⁷

3 Data and land reform assignment

Before jumping into the empirical section, it is useful to show some descriptive statistics to understand some characteristics of municipalities with and without land reform. It is also useful to explore what factors determined the *de facto* agrarian reform. Both exercises provide an empirical framework for the following results.

3.1 Descriptive statistics

Table 2 shows summary statistics for the main variables to be used in the empirical analysis.¹⁸ This sample includes all rural municipalities between regions IV and X, the main agricultural area of Chile (see Figure A.1). Several variables are included to capture the political support for different sectors. The first one measures the percentage of votes obtained by the Christian Democratic

16 Wright (2000) is an exception and argues that the revolution was indeed something desired by the majority of Latin Americans; thus, it was an immediate precedent for the *guerrillas* and revolutions that came after it.

17 As we will see, the period 1964–1970 was the most intense period of land reform and we could use the 1964 presidential election as the election *before* land reform implementation. However, a political episode known as “*Naranjazo*” greatly affected the actions of the right wing and they joined the center in order to avoid a potential government of Salvador Allende.

18 Descriptive statistics for auxiliary variables are presented in Table A.2 in the Appendix. Auxiliary variables are defined as (i) secondary controls and (ii) those used in the robustness checks.

Table 2: Summary statistics before and after land reform. Main variables.

	Before land reform (1958)				After land reform (1970)			
	All		Without mean	With mean	Difference (p-value)	All		Difference (p-value)
	Mean	SD				Mean	SD	
Politics								
Christian Democratic Party	0.174	(0.075)	0.173	0.176	0.766	0.307	(0.065)	0.310
Radical Party	0.171	(0.098)	0.199	0.150	0.000	—	—	—
Right Wing Party	0.358	(0.128)	0.342	0.370	0.111	0.359	(0.086)	0.369
Left Wing Party	0.296	(0.118)	0.286	0.304	0.287	0.334	(0.122)	0.321
Total votes	2,568	(2,547)	2,200	2,834	0.075	5,193	(6,066)	5,669
								0.182
Land reform and agriculture								
Land reform	—	—	—	—	—	0.085	(0.171)	—
Neighbor	—	—	—	—	—	0.376	(0.486)	0.377
Agricultural workers	0.212	(0.139)	0.257	0.179	0.000	0.507	(0.159)	0.506
Rurality	0.695	(0.179)	0.679	0.706	0.282	0.599	(0.188)	0.605
Land concentration	0.968	(0.029)	0.954	0.978	0.000	—	—	—
Conditions and public goods								
Education	2.653	(0.652)	2.640	2.668	0.738	3.504	(0.649)	3.505
Electricity	0.374	(0.186)	0.351	0.391	0.123	0.483	(0.188)	0.509
Hot water	0.049	(0.043)	0.051	0.047	0.589	0.084	(0.065)	0.084
Literacy	0.672	(0.066)	0.673	0.671	0.792	0.735	(0.053)	0.734
Water Supply	0.245	(0.157)	0.245	0.235	0.988	0.521	(0.155)	0.539
								0.061
Income related								
Cars	—	—	—	—	—	0.055	(0.024)	0.059
Television	—	—	—	—	—	0.046	(0.054)	0.046
Radio	0.297	(0.158)	0.282	0.307	0.248	0.638	(0.119)	0.661

Notes: Summary Statistics for 210 non-urban municipalities between regions IV and X (All). Three different samples: "All" includes 210 municipalities, "Without" includes 88 municipalities without land reform, and "With" includes 122 municipalities with positive land reform. The Left Wing Party before land reform includes votes for Salvador Allende and Antonio Zamorano in 1958. See Appendix for sources and definitions. SD, standard deviation.

Party, which is located at the center of the political spectrum. The mean of this variable in 1958 is 17.4%, smaller than the 30.7% of support the party received in 1970, reflecting the well-documented increase in support for this party (e.g. Collier and Sater 2004). The second variable measures the percentage of votes for the Radical Party, also a centrist middle-class party. The mean of this variable is 17.1% in 1958 and there is no data for the 1970 election because the party joined with the Popular Front (see Table 1 and Figure 1). The third variable measures right wing political support, i.e. votes for Jorge Alessandri both at the 1958 and the 1970 elections, which remained basically unchanged in both elections (35.8% and 35.9%). The next political variable measures left wing political support, which includes Salvador Allende in both 1958 and 1970 and Antonio Zamorano in 1958. Here, we can see increased support of the left wing, which is more pronounced at parliamentary elections, going from 29.% to 33.4% in this time period. This table clearly shows the “three thirds” in Chilean politics at the time. Finally, each municipality had (on average) 2,568 voters in 1958 nearly doubling to 5,193 in 1970. Rapid increase of total voters can create potential changes in electorate composition (Hellinger 1978, p. 255). This is why it is important to control for political participation in the regression analysis.

In order to empirically explore the relationship between land reform and our political variables, we need to have a measure of land expropriations. Fortunately, we know exactly how many plots were expropriated, their size in hectares, and the municipality at which they were located (CORA files). Thus, the land reform measure I use is an index that divides the amount of land that entered into the agrarian reform process before August 1970, one month before the presidential election, over total municipal surface (both in hectares). This variable has a mean of 0.085 (median of 0.013) with a standard deviation of 0.171 and reflects the accumulation of land reform over the sixties.¹⁹

For comparison, we need both municipalities with positive land reform and municipalities not affected by this process as potential counterfactuals. There are 88 municipalities (42%) without land reform, which serve as “control” municipalities. Nevertheless, 33 of these have at least one *neighbor* municipality with positive land reform. This is potentially a problem if they are close to each other. However, there are 55 “isolated” municipalities without land reform and

¹⁹ See Figure 2 for a graphical analysis of land reform heterogeneity at the municipal level. A bar represents the percentage of land expropriated in each of the 210 municipalities. Results are robust if I use (i) expropriation divided by agricultural surface instead of total surface and (ii) the amount of land expropriated only under the government of the Christian Democrat Eduardo Frei.

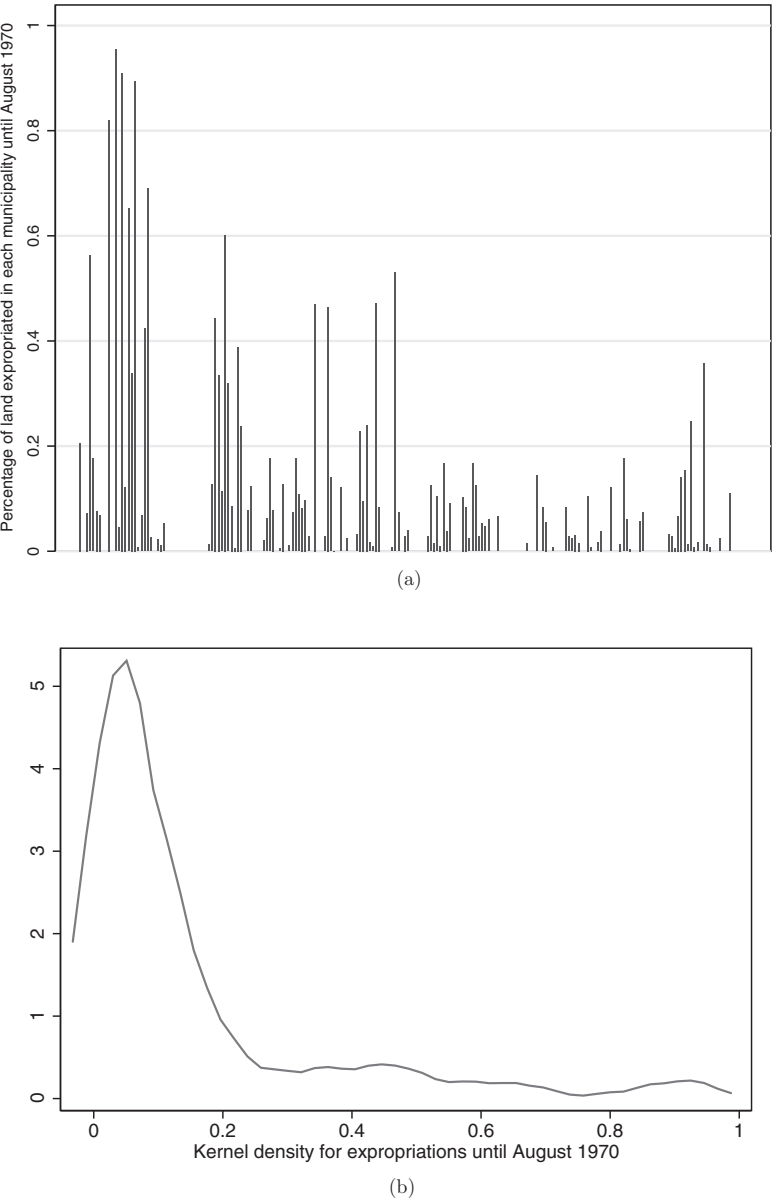


Figure 2: Expropriations until August 1970. (a) Expropriations in municipalities from north to south and (b) Epanechnikov kernel density for municipalities with positive expropriations.

without a border in common with a municipality with positive land reform. To account for these two different types of controls, and also to control for the spatial aspect of this empirical problem, I constructed a “neighbor” dummy. This variable is equal to 1 if a municipality is not affected by land reform but is a neighbor of a municipality with land reform. To control for the increasing urbanization (rural population decreased from 69.5% to 59.9% in the sixties) and changes in population composition, I use the share of agricultural workers and the share of people living in rural areas as control variables.²⁰ Municipalities also present high levels of land concentration, an aspect I will discuss later on.

Conditions and Public Goods and *Income-Related* variables are included as covariates to control for two possible effects. First, to isolate the effects of land reform, it is important to control for any other government action that might be changing people’s political preferences. If a municipality is receiving transfers from the central government in this period – taxes, subsidies, public goods, or others – this could have led to increased government support, regardless of the level of land reform. Second, voters could credit wage increases in one municipality to good economic policy by the central government, and this might change government support.²¹ These numbers show an improvement in living standards during this period, measured by increases in average education years (from 2.6 to 3.5) and literacy rate (from 67% to 73%) and increases in the percentage of houses with electricity (from 37% to 48%), hot water (from 5% to 8%), and water supply (from 24% to 52%). It also shows an increase in asset property. This is not surprising considering the economic progress of the time and serves as an indirect check for the quality of the data.

Overall this table shows that municipalities with and without land reform are roughly similar to each other. However, municipalities with positive land reform seem to show somehow less support for the Radical Party and to have more voters, a lower percentage of agricultural workers, and higher land concentration. Next, we discuss the main variables guiding land reform assignment.

20 The change in the percentage of agricultural workers is probably not accurate, as the increase from 21% to 51% seems somehow implausible. This is probably because the 1960 and the 1970 IPUMS sample did not targeted representation of different labor forces. However, this is not a problem for this particular paper because I am not comparing the change in the level of the share in the *same* municipality but rather *across* municipalities.

21 The average number of cars and the percentage of houses with television and radio are obviously a crude proxy of income. However, to the best of my knowledge, there are not any other measures of income at the municipality level for this period.

3.2 Land reform assignment

Several reasons are usually claimed to be behind the expropriation of a plot. Among these, land concentration, abandonment, and poor exploitation are the most popular reasons (Huerta, 1989). However, the *de facto* land reform could be very different from what is stated in the books.

Table 3 presents different regressions to try to determine the main factors guiding land reform assignment. This is done by taking our land reform index until 1970 and seeing what observable variables can explain it. In an ideal

Table 3: Land reform assignment.

Dependent variable: Land reform index until 1970				
	(1)	(2)	(3)	(4)
Land Gini	1.471*** (0.404)	1.315*** (0.425)	1.652*** (0.468)	1.179** (0.547)
Christian Democratic Party		−0.042 (0.152)	0.024 (0.151)	0.046 (0.150)
Left Wing Party		−0.134 (0.132)	−0.073 (0.129)	−0.105 (0.123)
Radical Party		−0.227** (0.112)	−0.197* (0.119)	−0.158 (0.113)
Log turnout		−0.005 (0.012)	0.032 (0.020)	0.075*** (0.026)
Log output per worker				0.003 (0.020)
Log agricultural population				−0.030 (0.101)
Log agricultural workers				−0.036 (0.105)
Geographic controls	Yes	Yes	Yes	Yes
Initial conditions	No	No	Yes	Yes
Municipalities	210	210	210	210
R ²	0.126	0.143	0.220	0.256

Notes: Robust standard errors in parenthesis. Christian Democratic Party, Radical Party, and Left Wing Party percentage of votes at the 1958 presidential election, land concentration (gini), output per worker, agricultural population, and agricultural workers from the 1955 Agricultural Census. Geographic controls: annual rainfall, annual average temperature, dummy for landlocked municipalities, and the logarithm of of agricultural surface (in physical hectares). Initial conditions: average years of education, percentage of people who knows to read and write, and percentage of houses with electricity, water supply, and hot water from the 1960 Housing Census. Significance level: ****p* < 0.01, ***p* < 0.05, **p* < 0.1.

setting for estimating the causal effect of land reform on voting patterns, land reform should be randomly assigned to different municipalities and there should not be any observable variable correlated with it. Unfortunately, this is not the case, as one of the main purposes of the Alliance for Progress was to address unfair agrarian structures, i.e. land concentration.

Column 1 shows us that there is a strong correlation between land reform in 1970 and land concentration in 1955 before the process started.²² This estimate is interpreted in the following way: a one standard deviation in land concentration (0.03) increases the land reform index by 0.04 (0.03×1.47 , i.e. 0.24 standard deviations). This effect is sizable, considering the distribution of land reform intensity across municipalities (see Figure 2, panel (b)) and explains around 12.5% of the variance. Column 2 checks if land reform assignment is correlated with political variables. There is a natural concern about land reform being used for political purposes, i.e. vote buying. However, column 2 shows us that land reform, mainly implemented by the Christian Democratic Party, is not correlated with its political support before the process started.²³ Column 3 controls for the initial socio-economic conditions and both results remain unchanged. Column 4 checks other *de jure* factors that might explain land reform assignment. Strikingly, neither agricultural productivity, measured by the logarithm of total agricultural output over agricultural population, agricultural population, nor agricultural worker population seem to explain any variance of the index.

Overall, I argue that the empirical evidence presented in Table 3 provides strong support for land concentration being the most important variable behind land reform assignment. This will be the basis for my IV strategy since land concentration at the municipality level has been historically persistent. I will argue that land concentration may be correlated with the *level* of political support for different parties, but there is no *a priori* reason to believe that is correlated with the *change* of this variable.

22 Land concentration is constructed with information from the 1955 Agricultural Census. This information is at the municipality level, but we know how many plots there are in each municipality and what is their approximate size (12 categories, in physical hectares). Therefore, we can construct a land gini coefficient. This coefficient equals 0 if all physical hectares in the municipality are equally divided among its entire population, and equals 1 if one person is the owner of all physical hectares.

23 Nevertheless, there seems to be a statistically significant correlation between land reform and political support for the Radical Party: a one standard deviation increase (0.10) decreases land reform by 0.02 (-0.19×0.10 , 0.12 standard deviations). If there is some political targeting, the Christian Democratic Party seems to have targeted radical voters, either intentionally or unintentionally.

4 Land reform and political outcomes

The main objective of this section is to explore the plausibility of the hypothesis that land reform affected political outcomes, i.e. it created limits to the rise of the left wing.²⁴ First, I estimate linear regressions in the spirit of a difference-in-difference strategy. This methodology shares the same benefits and pitfalls of econometric strategies where we compare a set of non-treated and treated individuals before and after the treatment was implemented. Next, I address potential endogeneity of land reform with an instrumental variables approach. I exploit the fact that the Alliance for Progress explicitly aimed to dismantle land concentration in rural areas. With this information in mind, together with the historical fact that land concentration has been highly persistent at the municipal level, I use land concentration before the sixties as an instrument for land reform.

4.1 Empirical strategy

In any empirical setting, there is always a concern that some variables are omitted, particularly those associated with both our variable of interest and our dependent variable. To deal with potential omitted variables, my empirical approach is to estimate a linear regression, in the spirit of a differences-in-differences strategy, and to control for everything *relevant* I can control for at the municipality level. Thus, I estimate

$$\Delta V_m^k = \alpha_k + \beta_k \text{Land Reform}_m + \delta_k \text{Neighbor}_m + \Delta X_m' \gamma_k + \eta_m. \quad [1]$$

Always including covariates as differences.²⁵ The dependent variable V_m^k indicates percentage of votes for party k in municipality m , where k could represent the left wing, the Christian Democratic Party, the political center (CDP plus the

²⁴ Indirectly, this empirical analysis documents a well-known stylized fact: a political migration of voters from the Christian Democratic Party (political center) to the left and right wing. This occurred after the peak of the Christian Democrats in the middle of the sixties, where they reach a political support of more than 50%.

²⁵ Alternatively, I could have used a panel dataset including the 1964 presidential election. However, I prefer this empirical strategy because (i) the instrument I use only varies between municipalities, (ii) there is no data for the control variables in 1964, thus I would have to use linear interpolations, and (iii) there is no candidate from the Right Wing Party in 1964. Nevertheless, results do not change using this alternative strategy (results available upon request).

Radicals) or the right wing. In this case, to differentiate the dependent and independent variables allows me to control for any county characteristics that are constant over time (e.g. municipality ideology) and also to capture the time changing preferences of the electorate. Therefore, the interpretation of the constant term α_k is straightforward: a negative (positive) estimate indicates that municipalities are voting relatively less (more) for the party k .

The main covariates included in the regression are the ones most likely to affect votes for different parties and are, at the same time, correlated with land reform, i.e. the change in the percentage of the agricultural labor force (Δ agricultural workers), the change in the percentage of people living in rural areas (Δ rurality), the percentage of people that voted in the elections (Δ political participation), and a dummy variable that equals 1 if a municipality has zero land reform but is located (i.e. “neighbor”) close to a municipality with positive land reform. This last variable intends to capture the spatial component of this empirical problem, mainly because some people could work in one municipality but live in a different one that is nearby.^{26,27} In this sense, I expect to find a similar but significantly smaller result (in absolute terms) in this coefficient in relation to the coefficient of land reform.²⁸ I also include two set of covariates: (i) conditions and public goods and (ii) income related. The former intends to capture potential government interventions in the municipalities and the corresponding changes in variables such as average years of education, the literacy rate, and the percentage of houses with electricity, hot water, and water supply. The latter intends to capture changes in income that may or may not be related to the implementation of land reform. Both are included in changes.

Although I am able to control for many variables that changed between the period before and after land reform, this strategy presents an additional potential flaw. This relates to the fact that some of the control variables could be channels through which land reform affects political support for some parties. For example, if land reform *causes* an initial increase in income or water availability, I might be *over controlling* and the coefficient β_k will only reflect the effect of land reform that is not explained by controls acting as channels.

²⁶ There are other empirical strategies I could have used. For example: (i) Conley (1999) spatial standard errors and (ii) the same dummy in eq. [1] weighted by the distance to a municipality with land reform. Qualitative and quantitative similar results are obtained with both strategies.

²⁷ The covariate Δ rurality also helps to control for internal rural-urban migration, which seems to be changing in a different way during the sixties (Herrick 1966, and Cerrutti and Bertoncello 2003).

²⁸ It is not straightforward to compare coefficients β_k and δ_k . We need to multiply these coefficients by the standard deviation of land reform and neighbor to be able to compare them.

This is an important reason to use an IV strategy and analyze how results change.

4.2 OLS estimates

Table 4 presents different estimates of eq. [1]. Panel A analyzes how the change in support for the CDP and the Radical Party (the Political Center, columns 1–4) and the Left Wing (columns 5–8) changed between 1970 (after) and 1958 (before) in counties with and without land reform. Panel B estimates the same specifications but columns 1–4 checks that the main result is not driven by the addition of the CDP and the Radical Party by using only the percentage of votes obtained by the CDP. Columns 5–8 in Panel B takes a different year as the benchmark before land reform implementation as an additional robustness exercise. I also report OLS and IV estimates. I will discuss the former in this section and the latter in the following one.

Columns 1 and 2 in Panel A present OLS estimates of eq. [1] using the percentage of votes for the Political Center (CDP in 1970 and CDP and Radical Party in 1958) between 1970 and 1958 as dependent variable. The difference between both columns is the inclusion of a set of covariates that aim to control for changes in income. Note that there is not available information for them in 1960, thus they are set to zero. This means that when I include these variables I am implicitly assuming that all rural municipalities had the same income level, or at least differences were small, in the initial period. These two properties make me believe that these variables might not capture changes in income and that is why I present results with and without these covariates.

The coefficient of interest β_k is estimated around 0.014–0.016 in Panel A when I use the Political Center as dependent variable. This means that a one standard deviation increase in land reform increases political support for this coalition by 1.4–1.6 percentage points.²⁹ We know that the average municipality had approximately 5,200 voters, which means that around 80 people changed their minds and voted for the political center instead of voting for another candidate. Although this coefficient is only marginally significant in columns 1 and 2 (p -values 0.107 and 0.134, respectively), it suggests a significant impact of land reform. Moreover, when we look at the coefficient of the dummy variable

²⁹ The variable land reform is normalized in order facilitate the interpretation of β_k . Thus, the coefficient of interest indicates the change, in percentage points, in the corresponding dependent variable.

Table 4: Land reform and vote shares (OLS and IV estimates).

Dependent variable: change in percentage of votes							
OLS		IV		OLS		IV	
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Panel A:							
Political Center (1970–1958)				Left Wing (1970–1958)			
Land reform	0.016 (0.010)	0.014 (0.009)	0.134*** (0.047)	0.078** (0.032)	-0.007 (0.006)	-0.006 (0.024)	-0.047** (0.019)
Neighbor	0.011 (0.019)	0.018 (0.018)	0.089*** (0.030)	0.061*** (0.023)	0.003 (0.012)	0.003 (0.011)	0.002 (0.016)
Hausman test (<i>p</i> -value)	–	–	0.010	0.037	–	–	0.082 0.913
Panel B:							
Christian Democratic Party (1970–1958)				Christian Democratic Party (1970–1964)			
Land reform	-0.000 (0.006)	-0.001 (0.006)	0.055* (0.028)	0.053** (0.026)	-0.003 (0.006)	-0.003 (0.033)	0.077** (0.031)
Neighbor	0.008 (0.013)	0.011 (0.013)	0.045** (0.019)	0.047*** (0.018)	0.004 (0.014)	0.005 (0.023)	0.058*** (0.022)
Hausman test (<i>p</i> -value)	–	–	0.047	0.029	–	–	0.008
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Conditions and public goods	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Income related	No	Yes	No	Yes	No	Yes	Yes
Municipalities	210	210	210	210	210	210	210
F-test excluded instruments	–	–	12.99	14.37	–	–	12.99 14.37

Notes: Robust standard errors in parentheses. Political Center: Christian Democratic Party and Radical Party in 1958. Controls: Δ Agricultural workers, Δ Rurality, and Δ Political Participation. Significance level: ****p* < 0.01, ***p* < 0.05, **p* < 0.1. The instrument for the endogenous variable “Land Reform” in columns 3–4 and 7–8 is “Land concentration.”

that intends to capture spatial effects, we also see a positive (but much smaller) effect of land reform.³⁰ This also suggests that there is something happening in municipalities with land reform and it spreads to locations close to these municipalities.

If some voters changed their minds and decided to vote for the Political Center, for whom did they previously vote? Columns 5 and 6 in Panel A estimate the same regressions but using the change in the percentage of votes the Left Wing obtained between 1970 and 1958. What these columns show is that about half of the effect comes from former Left Wing voters, and the other half must come (by definition) from the Right Wing. The coefficient of interest is estimated around -0.006 . However, these estimates are imprecisely estimated with p -values of 0.26 and 0.31.

Panel B checks the robustness of these results with: (i) a more direct dependent variable and (ii) using a different year as starting point for land reform. Columns 1 and 2 only use the change in the percentage of votes the CDP obtained between 1970 and 1958 (excluding the Radicals). The impact of land reform is now estimated around zero, and thus, it suggests that the people who decided to vote for the political center in response to the policy originally voted for the Radical Party in 1958, which switched from being part of the Political Center to the Left Wing by 1970. Therefore, if land reform avoided a left turn in politics, this result suggests this occurred simply by avoiding a political migration of Radicals from the Political Center to the Left Wing. Finally, columns 5 and 6 in Panel B estimate the main regression using the change in the percentage of votes the CDP obtained in the presidential elections of 1964 and 1970. Results are now not statistically different from zero. However, this could be due to the fact that (i) these elections were different because there was not a Right Wing candidate and most of Right Wing voters voted for the CDP candidate or (ii) most of the land reform effect is captured in the control variables. This is why it is important to pursue an IV strategy to identify the effect of interest.

4.3 Econometric issues: Instrumental variables

An instrumental variables approach is useful for many reasons. I might be over controlling so that some of the effects of land reform are captured by changes in

³⁰ A one standard deviation increase (0.486) increases political support for the Political Center by 0.5 percentage points (0.486×0.011). In all specifications hereafter, the effect is larger based on the closeness of the neighbor municipalities, but never as bigger as the direct effect, and zero when they are far away from each other. I use centroids to calculate distances. Results not shown for parsimony but available upon request.

the control variables. Second, there could be some omitted variables correlated with land reform that, at the same time, affect *changes* in political support for different parties. These variables could be observable or unobservable, but are changing over this approximately 10-year period *and* affect different municipalities in different ways, otherwise these are taken into account in the fixed effects. Finally, land reform could be measured with error, which causes an attenuation bias if it is randomly distributed.³¹

The endogenous variable is land reform and the instrument I use is land concentration. One of the objectives of the Alliance for Progress was to structurally reform the countryside by eliminating large landowners. Land concentration before land reform implementation was particularly high and, accordingly to available historical evidence, highly persistent at the municipality level since the colonial period.³² Therefore, the identification assumption in my strategy is that land concentration did not affect *changes* in voting patterns in the sixties other than through land reform implementation.³³ The first stage in this empirical setting is strong, with an *F*-test over the excluded instrument of 12.99 and 14.37, with and without the set of covariates related to income.³⁴

Table 5 presents the reduced form regressions in columns 1–6, and the first stage regressions in columns 7–9. In addition, columns 1 and 5 present the partial correlation between land concentration and the change in the Political Center's vote share and in the Left Wing's vote share. Column 7 presents the partial correlation between land concentration and land reform. The purpose of presenting these columns is to show how robust the correlation is between the variables of interest. The variable land concentration has been normalized for presentation purposes. The correlation between the instrument (i.e. land

31 The first two are valid concerns, but the last one is not because only 12 out of the 5,422 expropriations have missing date of expropriation and, thus, are missing in the data set. Among these, only six were bigger than 100 physical hectares.

32 Bauer (1975), for example, states that "From the 17th century there was a tendency to have large *haciendas*, and these were notably stable until the nineteenth century." The translation is mine.

33 Next subsection provides evidence supporting this assumption. Figure 3 shows the persistence of land concentration at the municipality level by plotting the logarithm of total exploitations at the municipality level in 1920 and in 1955. The main idea is that, because a municipality's territory is constant over time, a persistent land concentration should be translated into a positive correlation between the number of plots with agricultural activities in two different points in time.

34 This suggests an absence of a weak instrument problem (Hahn and Hausman, 2003) according to the statistical tables in Stock, Wright, and Yogo (2002).

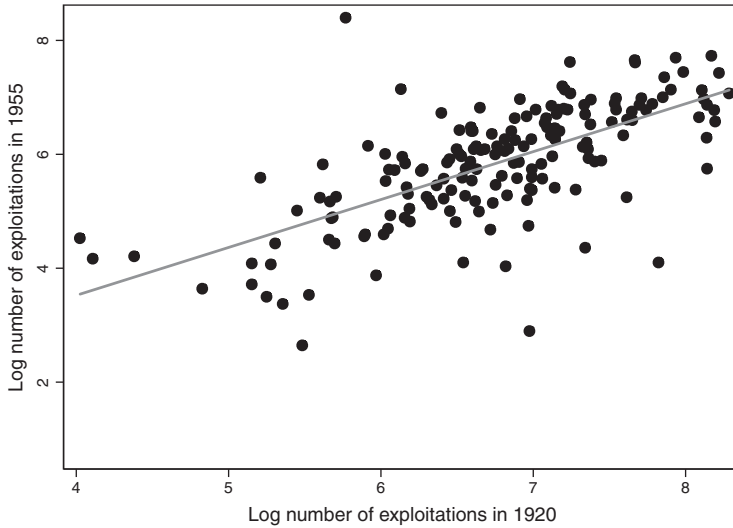


Figure 3: Historical persistence of land concentration at the municipality level.
 Notes: An exploitation is a plot with agricultural activities.

concentration) and the change in political support for the Political Center is positive and statistically significant at the 1% level in all cases, while the correlation between the instrument and the change in political support for the Left Wing is negative and statistically significant at the 1% level with no covariates, at the 5% level with covariates, and statistically insignificant when income-related variables are included. On the other hand, the first-stage coefficients are all positive and statistically significant at the 1% level and imply that a one standard deviation increase in land concentration increases land reform intensity by 0.28–0.35 standard deviations.

The IV estimates in Table 4 support an economically significant effect of land reform on political support for the Political Center and a negative effect on the left wing. This evidence cannot reject the hypothesis that land reform avoided a left turn after the increasing demands for redistribution following the Cuban Revolution. Estimates in Panel A columns 3 and 4 suggest that land reform increases support for the Political Center by 7–13 percentage points. Columns 7 and 8 show that land reform *decreases* the percentage of votes for the left wing by 1–5 percentage points. However, in comparison to the OLS benchmark results, these estimates are relatively high. This is probably because land reform assignment is correlated with political support for the Radicals, threatening my identification strategy. Thus, from now on I use the share of the

Table 5: First-stage and reduced-form estimates.

	Dependent variable is:								
	Change in percentage of votes (reduced-form)				Land Reform (first-stage)				
	Political Center (1970–1958)				Left Wing (1970–1958)				
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Land concentration	0.046*** (0.010)	0.038*** (0.011)	0.028*** (0.010)	−0.018*** (0.006)	−0.013*** (0.006)	−0.003 (0.007)	0.313*** (0.061)	0.286*** (0.079)	0.354*** (0.093)
Controls	No	Yes	Yes	No	Yes	Yes	No	Yes	Yes
Conditions and public goods	No	Yes	Yes	No	Yes	Yes	No	Yes	Yes
Income related	No	No	Yes	No	No	Yes	No	No	Yes
Municipalities	210	210	210	210	210	210	210	210	210
F-test excluded instruments	—	—	—	—	—	—	26.45	12.99	14.37
R ²	0.133	0.211	0.290	0.049	0.170	0.248	—	—	—

Notes: Robust standard errors in parentheses. Political Center: Christian Democratic Party and Radical Party in 1958. Controls: Δ Agricultural workers, Δ Rurality, and Δ Political Participation. The variable “Land concentration” has been normalized to facilitate the interpretation of coefficients. Significance level: ****p* < 0.01, ***p* < 0.05, **p* < 0.1.

CDP as the main dependent variable. Columns 3 and 4 in Panel B show that land reform increases support for the CDP by 5 percentage points, but it does not increase the baseline political support. Columns 7 and 8 show that political support for the incumbent increases by 7 percentage points when we use the period with the most intense land reform (between 1970 and 1964).

Overall, OLS and IV estimates support the hypothesis that land reform implementation prevented a political migration of voters from the political center to the left wing. Moreover, a traditional Hausman test suggests that land reform is endogenous, thus I use IV estimates for the rest of the paper. The most conservative estimates suggest that a one standard deviation increase in land reform avoided a political migration of 5% of the voters in a municipality (approximately 80 voters per municipality). These empirical results show that in the absence of land reform half of these “swing voters” would have voted for the left wing — some because the Socialist Party was in that coalition and some because the Radical Party was part of it — and the other half would have been Right Wing voters.

4.4 Identification assumption: Plausible exogeneity

The identification assumption behind the IV strategy is that land concentration affects the *change* in political support for the Christian Democratic Party between 1958 and 1970 *only* through land reform. Although this assumption is not testable, particularly in the absence of extra instruments to apply an over-identification test, this section tries to provide evidence to support it.

First, to check whether land concentration is historically persistent at the municipality level, I take information from the 1920 Housing Census about the number of landowners in each municipality to analyze the correlation of this variable with the number of exploitations also at the municipality level in 1955.³⁵ Figure 3 presents this exercise and the correlation between these variables is positive and strong, with a coefficient of 0.84 and is precisely estimated with a standard deviation of 0.07 (*t*-test 11.8 and *p*-value 0.00). Because each municipality has the same territory in 1920 and 1955, this means that municipalities

³⁵ An exploitation is a plot with agricultural activities. The 1920 variable is therefore interpreted as a proxy for number of exploitations. This variable also incorporates landowners in the urban areas and it is only available for 172 municipalities out of the 210. However, it is the best available measure for land concentration at the municipality level before 1955. To the best of my knowledge there are no other measures at the municipality level prior to this period.

Table 6: Indirect evidence for the identification assumption (IV estimates).

	Dependent variable: Change in percentage of votes			
	(1)	(2)	(3)	(4)
	Non-left		Christian Democrats	
	1961–1953 ^a	1964–1958	1970–1958	
Land Reform	–0.005 (0.014)	0.001 (0.021)	2.221 (1.910)	0.086** (0.034)
Neighbor	–0.004 (0.011)	–0.020 (0.018)	0.047* (0.026)	0.065*** (0.024)
Land reform index year	1970	1970	1964	1970–1964
Controls	Yes	Yes	Yes	Yes
Conditions and public goods	Yes	Yes	Yes	Yes
Income Related	Yes	Yes	Yes	Yes
Municipalities	210	207	210	210
F-test excluded instrument	14.37	15.25	1.637	14.09

Notes: Robust standard errors in parenthesis. ^aParliamentary Elections. Controls: Δ Agricultural workers, Δ Rurality, and Δ Political Participation. Significance level: *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$. The instrument for the endogenous variable “Land Reform” in all columns is land concentration in 1955.

with relatively high land concentration in 1920 are the ones where land is relatively more concentrated in 1955.

Column 1 in Table 6 shows results from a falsification exercise that tests (i) the presence of different trends before land reform was implemented, and/or (ii) anticipatory effects on voters. This is to empirically see an increase in the votes for some party in the sixties because of a trend that started before land reform. This is a threat to my empirical strategy because in this case it is not land reform causing the change in voting patterns but some other phenomena that started previously.

Another interpretation would be that voters knew where land reform was going to take place and, therefore, they incorporated this into their voting patterns before it was implemented. However, this does not seem to be the case as land reform is not correlated with the change in votes for the non-left wing before 1961.³⁶

³⁶ Ideally I would like to look at the change in the CDP vote share between the 1952 and 1958 presidential elections. However, there is not clear distinction of left, center, and right wing and the CDP did not exist in 1952. This is why I use non-left wing and parliamentary elections in 1953 and 1961. This non-left wing is called *Falange Nacional* and is actually the main political force from the center of the political spectrum during the 1950s.

Column 2 also shows similar evidence but now uses voting changes for the non-left at the presidential elections of 1958 and 1964 as dependent variable.³⁷ The rationality behind this estimate is that the most intensive period of land reform started under the government of Eduardo Frei (1964–1970). Therefore, we should not expect any effect of land reform before that year. This is exactly what we see from the data. This provides further evidence that the instrument land concentration is probably affecting voting patterns through land reform implemented by Eduardo Frei. This is confirmed in columns 3 and 4, where I show that (i) land reform index before Frei does not affect the change in votes (column 3) and (ii) land reform index in the period 1964–1970 has almost twice the impact on the dependent variable (8.6 percentage points). This documents the historical difference between Alessandri's and Frei's land reform.

However, the possibility that another variable from Frei's government that is affecting our dependent variable still remains. A final way to provide indirect evidence for the identification assumption is to use the reasoning by Conley, Hansen, and Rossi (2010). The authors allow violations to perfect exogeneity, i.e. that the instrument affects the dependent variable through other variables besides the endogenous one, by assuming a numerical range of possible values for the relation between the instrument and the dependent variable in the structural equation (second stage in the IV approach). The estimating equations are

$$\begin{aligned}\Delta V_m^k &= \alpha_k + \beta_k \text{LandRef}_m + \delta_k \text{Neighbor}_m + \theta_k Z_m + \Delta_k X'_m \gamma + \eta_m, \\ \text{LandRef}_m &= \zeta + \pi Z_m + \xi \cdot \text{Neighbor}_m + \Delta X'_m \varrho + \varepsilon_m,\end{aligned}$$

where now the instrument Z affects the dependent variable V_m^k through land reform by π and directly by θ_k .³⁸ The idea behind this strategy is to assume values for θ_k from prior beliefs and check how $\hat{\beta}_k$ changes. Implementing two different approaches, both in the spirit of this strategy, provides further evidence for the identification assumption.³⁹

³⁷ I use non-left here because at the 1964 presidential elections, the right and the political center were represented by only one candidate. This happened mostly due to the fear of the right wing of a left wing government (Collier and Sater 2004). See Table 1 for details.

³⁸ When $\theta_k \neq 0$ a violation to perfect exogeneity has taken place. Until now I have *assumed* that $\theta_k = 0$, but it is not a testable assumption.

³⁹ A local to zero approach, i.e. $\theta_0 \neq 0$ but $\theta_0 \approx 0$, results in a $\hat{\beta}_k = 0.460$ and a confidence interval of $[0.137, 0.782]$ (without normalization). Using different support assumptions for Θ , with $\theta_0 \in \Theta$, I find out that θ_0 must be $|\theta_0| = 0.3$ in order to have a zero effect of land reform on voting patters. I argue that because this is a large effect this provides further evidence for the IV approach.

4.5 Robustness checks

The most conservative IV estimates (Table 4, Panel B column 4) also have the strongest first stage (F -test 14.37), suggesting a change of 5 percentage points at the 1970 polls in response to an increase of one standard deviation in land reform. I now turn to analyze the robustness of this result.

Table 7 shows estimates of different specifications of the most conservative IV estimate previously mentioned to analyze the sensibility of this result. Panel A estimates exactly the same regression, also with the same instrument, but excluding a cluster of municipalities in each columns. Regions are the biggest administrative unit in Chile and are composed of several counties. They are also very different from each other.⁴⁰ This difference arises from three factors. First, there are climate differences from north (region IV) to south (region X): average annual temperature and annual rainfall ranges from 21.6°C and 71 mm in region IV, to 9.7°C and more than 3,000 mm in region X. Second, factor endowments also vary from north to south: land tends to be more suitable for growing fruits in regions IV and V, for crops in regions V, VI, VII, and VIII, and for livestock in IX and X (see Cuesta, Gallego, and González 2011). Finally, there are important historical differences: regions VIII, IX, and X are located at the south of the Bio-Bío river, where indigenous people are located. This is a potential issue if indigenous people were doing something different in the sixties (riots, for example) that is correlated with land reform.

Both geographic and historical differences are explicitly controlled for in the empirical analysis (fixed effects). But these differences are potentially a problem if they are correlated with land reform or with another relevant unobservable variable. However, the coefficient is fairly stable in columns 1 and 8 (Panel A), providing evidence of a robust estimate of β .

Panel B in Table 7 present results from three different exercises. First, column 1 excludes six counties that changed its geographic size during the period of interest. Second, column 2 estimates the same regression but uses clusters at the province level.⁴¹ Standard errors are a little higher but the statistical significance remains at conventional levels. Finally, columns 3–6 use the entire sample but with a different measure of land concentration as an instrument: logarithm of the number of total exploitations in column 5, total

⁴⁰ Regions are historically named by a roman number: region I, II, III, and so on until region XII. The exception is the metropolitan region (MR), the capital. My analysis is on the geographic area named Central Valley, were regions IV, V, VI, VII, VIII, IX, X, and MR are located.

⁴¹ Provinces are administrative units bigger than municipalities but smaller than regions. Currently, there are 15 regions, 54 provinces, and 345 municipalities in Chile.

Table 7: Robustness check through sensibility analysis (IV estimates).

Dependent variable: Change in percentage of votes CDP (1970–1958)								
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	
Panel A: Excluding region								
IV	V	VI	VII	VIII	IX	X	M.R.	
Land reform	0.126*** (0.041)	0.052* (0.028)	0.047* (0.028)	0.052* (0.028)	0.034 (0.022)	0.060** (0.024)	0.058* (0.032)	0.051* (0.027)
Neighbor	0.088*** (0.023)	0.039** (0.018)	0.040** (0.018)	0.044** (0.020)	0.052*** (0.018)	0.053*** (0.019)	0.054** (0.023)	0.043** (0.018)
Municipalities	196	181	180	184	172	187	178	192
F-test excluded instrument	17.07	12.83	10.91	12.08	13.20	15.66	12.97	12.78
Panel B								
	Cluster		Different instruments					
	Not grouped							
Land reform	0.053** (0.027)	0.053* (0.030)	0.072** (0.032)	0.036 (0.023)	0.035 (0.021)	0.034 (0.023)		
Neighbor	0.049** (0.019)	0.047** (0.019)	0.061*** (0.023)	0.036* (0.019)	0.035* (0.019)	0.035* (0.020)		
Municipalities	204	210	210	210	210	197		
F-test excluded instrument	13.49	18.79	8.537	13.27	12.57	13.14		
Controls	Yes	Yes	Yes	Yes	Yes	Yes		
Conditions and public goods	Yes	Yes	Yes	Yes	Yes	Yes		
Income related	Yes	Yes	Yes	Yes	Yes	Yes		

Notes: Robust standard errors in parentheses except in Panel B column 4 where clusters at the group level are used. CDP: Christian Democratic Party. Controls: Δ Agricultural workers, Δ Rurality, and Δ Political Participation. Significance level: ***p < 0.01, **p < 0.05, *p < 0.1. The instrument for the endogenous variable “Land Reform” in columns 3–4 and 7–8 in Panel A columns 1–8 and Panel B columns 1–4 is land concentration. OThe instrument in Panel B columns 3–6 is log number of exploitations, number of exploitations over political participation in 1970, over political participation in 1958, and over total population in 1970.

exploitations over political participation in 1970 (column 6) and in 1960 (column 7) and over population in 1970 (column 8). The coefficient of interest is estimated to have an impact of 3.5 percentage points and it is statistically significant at the 10.9%, 10.2%, and 14.1% levels, respectively. I prefer to use land gini coefficient as a measure of land concentration because it exploits the plot size information available at the Agricultural Census (1955), while other measures using total exploitations do not use this source of information.

5 Discussion of potential mechanisms

All expropriations had a clear objective: to be redistributed among peasants. This redistribution could be either to an individual or to a community. However, between the expropriation and the redistribution of plots there was an intermediate step. This transitional stage was denominated *asentamiento* (settlement). Most expropriated plots were at this stage during the 1970 presidential election.⁴²

At the *asentamientos*, peasants provided labor and animals and the CORA provided land, water, capital, and technical assistance. Profits from the exploitation of expropriated plots were distributed 70–90% among peasants and the rest to the CORA. Around 826 *asentamientos* were created between 1964 and 1970; comprising more than 2.3 million hectares and benefiting more than 26.8 thousand people (Echenique 1970, Huerta 1989). If we consider the fact that more than 3.5 million hectares were expropriated during this period (Echenique 1970; Barraclough and Fernández 1974), around 65% of total expropriations were transformed into *asentamientos* by the time of the presidential election and 35% remained under CORA's administration.

That land reform implementation has political effects is consistent with several different theories that aim to explain how people evaluate different political candidates. The next sub-section discusses some theoretical channels I can test empirically; sub-section 5.2 evaluates how relevant other theories could be in explaining the patterns we see in the data, but that I cannot test empirically due to data restrictions, and sub-section 5.3 tests if results can be explained by a strategic behavior of the government.

⁴² The main *de jure* objective at this stage was to: (i) efficiently exploit the expropriated land, (ii) prepare peasants to assume their responsibilities as owners and agricultural entrepreneurs, (iii) guide and promote the community's development, (iv) promote agricultural activities as the main source of income among peasants, (v) build the minimum infrastructure necessary for the exploitation of the plot.

5.1 Internal migration and turnout

Internal migration, i.e. migration between municipalities, could have been affected by land reform. For example, if the expected value of agricultural worker’s future income changes with land reform, we should expect migration patterns to change in response, as suggested by Kennan and Walker (2011). This could be a mechanism explaining the link between land reform and political outcomes if the group that is migrating has a certain political preference. Indeed, according to Petras and Zeitlin (1970), agricultural workers voted relatively more for the Christian Democrats. Therefore, if land reform increases agricultural worker’s expected future income, land reform could have caused a migration of agricultural workers to municipalities with land reform. In turn, this migration would be affecting political outcomes.

Table 8: Land reform and (i) migration and (ii) turnout (OLS estimates).

	Dependent variable is					
	Δ Rurality		Δ Agric. workers		Δ Turnout	
	(1)	(2)	(3)	(4)	(5)	(6)
Land Reform	−0.012*** (0.005)	−0.011*** (0.004)	0.012 (0.010)	0.014 (0.011)	−0.005 (0.004)	−0.001 (0.005)
Neighbor		−0.008 (0.007)		0.034* (0.019)		0.008 (0.017)
Δ Rurality				0.438** (0.177)		−0.065 (0.135)
Δ Agric. workers		0.064** (0.026)				0.056 (0.097)
Δ Turnout		−0.014 (0.026)		0.082 (0.100)		
Conditions and Public Goods	No	Yes	No	Yes	No	Yes
Observations	210	210	210	210	210	210

Notes: Robust standard errors in parentheses. Significance level: ***p < 0.01, **p < 0.05, *p < 0.1.

Using information from the 1970 and 1960 IPUMS censuses, I estimate OLS regressions to analyze the relationship between land reform and internal migration. Columns 1 and 2 in Table 8 show that land reform is negatively correlated with the change in the percentage of people living in rural areas, and positively correlated with the change in the percentage of agricultural workers, although this last correlation is not statistically significant. The first result cannot reject the hypothesis that land reform encouraged a ruralurban migration, but rejects the idea of a migration of agricultural workers to municipalities with land reform.

Another potential mechanism linking land reform and political outcomes is turnout. For example, some people might have punished the government because of a poor expropriation process (negative reciprocity), or some might have formed organizations to support the government in places with high expropriation process (positive reciprocity).⁴³ In both cases, we should see a positive correlation between land reform and turnout. However, this is not what we observe in columns 5 and 6 of Table 8.

5.2 Pocketbook voting, reciprocity, and collective action

The most traditional view is the theory of pocketbook voting. This theory states that people evaluate different candidates according to their personal economic circumstances.⁴⁴ In this case, it is possible that *asentamientos* raised peasant's income and, because they were financially better-off, some of them voted for the Christian Democrat candidate Radomiro Tomic. Unfortunately, there is not detailed data on income or production at the municipality level to test this hypothesis.

On the other hand, it is also possible that individuals respond to land reform because of intrinsic or instrumental reciprocity. The former refers to a situation where a person sacrifices his own material well-being in order to increase (or decrease) the payoff of someone who has been kind (or unkind) to him (Sobel 2005; Cox, Friedman, and Gjerstad 2007; Finan and Schechter 2011). The latter refers to reciprocity motivated by forward-looking self-interest, i.e. people vote for a certain candidate because they think it will be somehow beneficial for them in the future. In both cases, people experience pleasure by increasing the material payoffs of the politician or party who has helped them (in this case the Christian Democratic Party).

Finally, it might also be the case that a collective action among peasants in the *asentamientos* led to a change in voting patterns. This could be the case if peasants acted collectively in municipalities affected by land reform but not in

⁴³ I would like to thank an anonymous referee for mentioning this potential mechanism.

⁴⁴ However, empirical support for this theory is mixed, with some studies finding positive and other modest or insignificant results. The empirical evidence is equally mixed in the United States, Western Europe, and developing countries. See Pop-Eleches and Pop-Eleches (2010) for a review.

other locations. In this sense, we could think of land reform as a government policy that decreased the costs of acting collectively (e.g. coordination or information costs), and, because peasants are now working together in the *asentamientos*, they also voted in a coordinated way. The obvious empirical problem to test this hypothesis is that people in *asentamientos* are likely to be different from other Chileans.⁴⁵ *Asentamientos* might also influence in the voting turnout, as in Freeman (2003).⁴⁶ However, there is no detailed data of *asentamientos* at the municipality level to be able to test these hypotheses.

5.3 Is the government buying votes?

Another potential mechanism linking land reform and voting patterns is related to government behavior. This is a threat to my identification strategy if the government, represented by the CORA, is targeting certain municipalities in order to affect voting patterns. There are two sources of potential endogeneity that could affect this. First, that the CORA is implementing land reform in municipalities where certain voters live. Second, that the CORA is implementing land reform immediately before elections in order to maximize its political effects.

As already discussed, Table 3 aims to understand if the government was targeting certain municipalities with political intentions. In a context where the left wing was becoming more popular, the incumbent party might be worried about losing its political support. Therefore, it seems rational to believe that the government should target municipalities more likely to vote for the Christian Democratic Party in order to avoid their political migration. However, in this table, we can see that the government was not targeting municipalities with higher (or lower) votes for any particular party. The only economic and statistically significant political variable that can explain land reform implementation is the percentage of votes that the Radical Party obtained in the 1958 presidential election. But it seems odd to believe the Christian Democrats would target municipalities with *lower* support for the Radicals, because this political party

⁴⁵ Leigh (2006) tries to disentangle socioeconomic and unions effects with panel data and finds evidence of a union-effect. However, the author does not explain why this pattern is found.

⁴⁶ However, Freeman (2003) is not able to disentangle the voting effects of being unionized from just being different in socio-economic aspects, because workers in unions are different from those who are not.

is precisely the one where voters are migrating to the left (see Figure 1). Thus, if anything, one should expect the Christian Democrats target places with *higher* support for the Radicals, in order to avoid this migration. In this table, we also check that the government is not targeting in places with higher agricultural population or with more agricultural workers.⁴⁷ These results restate that land concentration is the most important variable affecting the implementation of land reform and, because its variation at the municipal level is historically persistent, it is exogenous to the political arena in the 1960s.

The second concern relates to the timing of land reform. Although variation at the municipal level is plausible exogenous, the government could implement land reform a few months before the election in certain municipalities and after the election in other municipalities. To check whether this is a problem I estimate the following regression in the spirit of a regression discontinuity design:

$$y_{mc} = \alpha + \xi_c + \sum_{m=-5}^{m=5} \gamma_m T_m + f(\text{Trend}_m) + \varepsilon_{mc} \quad , \quad [2]$$

where the dependent variable is the logarithm of physical hectares expropriated in month m at municipality c , ξ_c is a municipality fixed effect, T_m is a dummy for month m , $f(\text{Trend})$ is a trend polynomial, and ε_{mc} is clustered by municipality. The omitted month dummy is the month of the election $m = 0$. The sample is limited to 5 months before and after the election. For parsimony I estimate [2] for municipalities with higher and lower support for the Christian Democrats, instead of using interaction terms.⁴⁸ Figure 4 plots the coefficient of month dummies γ_m for the two set of municipalities. We can see that there seems to be a common trend of higher land reform implementation before the election and lower after it. However, there are not statistically significant differences in the timing of the implementation between the two set of municipalities. This is strong evidence against the idea that the government is using land reform timing to buy votes.

Overall, Table 3 and Figure 4 strongly reject the idea that the government (i) was using land reform to target certain voters or (ii) is implementing it before the elections in a different way across municipalities to buy votes.

⁴⁷ There is research arguing that agricultural workers and rural areas voted relatively more for the Christian Democratic Party (e.g. Petras and Zeitlin 1968, 1970)

⁴⁸ Higher support for the Christian Democrats is defined as those municipalities with more than 17% of votes (the median) for Eduardo Frei in the 1958 presidential election. Results are robust to different definitions.

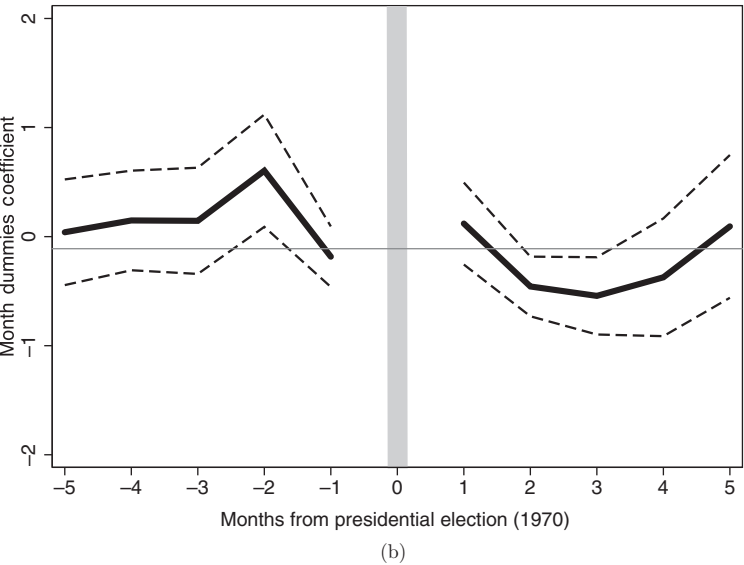
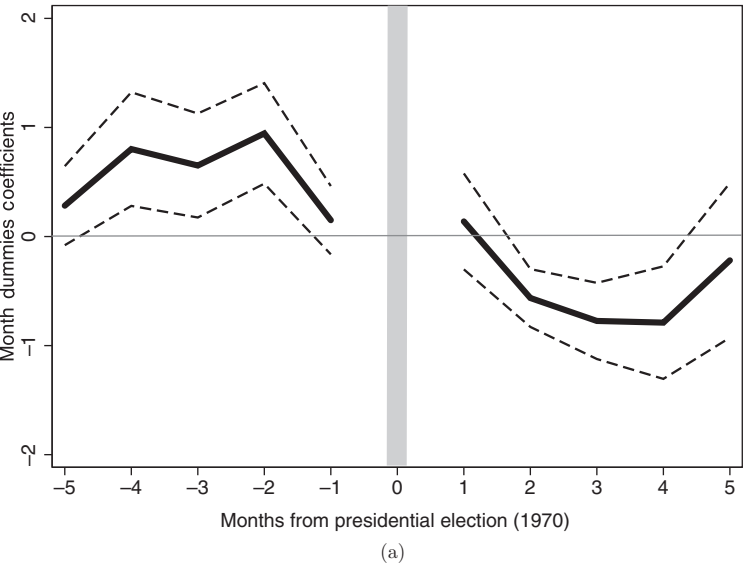


Figure 4: Vote buying. RD estimates for log expropriations around the 1970 presidential election. (a) Municipalities with higher political support for the CDP and (b) Municipalities with lower political support for the CDP.

6 Concluding remarks

The political and economic intervention of United States in Latin America during the 1960s is well documented: Chile, for example, received more than 743 million US dollars of economic aid through the Alliance for Progress to explicitly avoid presidency of the Marxist Salvador Allende (Taffet 2007). To accomplish this purpose, the United States helped the Christian Democratic Party to win the 1964 presidential election. Then, several structural reforms were implemented in order to address the increasing demand for redistributive policies and Marxism. Land reform was arguably the most visible policy to come out of these reforms.

In this paper, I have tried to explore a potential causal relationship between land reform implementation and subsequent political outcomes. To empirically analyze this relationship I exploited the fact that land reform was highly heterogeneous at the municipality level and it was implemented by the central government in order to address highly persistent land concentration. The interaction between the fact that (i) the central government was taking land concentration into mind when deciding how to implement land reform and (ii) land concentration at the municipal level has been historically persistent, give my identification strategy a feeling of a quasi-experiment.

In the more conservative estimates, I found that a one standard deviation in land reform seems to have avoided a 3–5% decreased in political support for the Christian Democratic Party. Thus, in the absence of land reform, around 80 voters in the municipality would have not voted for the CDP, with half of them supporting the right wing and the other half the left wing Party. Although the Alliance for Progress did not prevented the first democratically elected Marxist government, it did diminished the political support for the Left Wing through the implementation of land reform.

Appendix

Table A.1: Definition and sources.

Definition and source	
Main variables	
Christian Democratic Party	Percentage of votes for Eduardo Frei 1958 and for Radomiro Tomic in 1970 (Electoral Service, SERVEL).
Radical Party	Percentage of votes for Luis Bossay in 1958 (Electoral Service, SERVEL).

(Continued)

Table A.1: (Continued)

	Definition and source
Right Wing Party	Percentage of votes for Jorge Alessandri in 1958 and 1970 (Electoral Service, SERVEL).
Left Wing Party	Percentage of votes for Salvador Allende and Antonio Zamorano in 1958 and only for Salvador Allende in 1970 (Electoral Service, SERVEL).
Political participation	Number of voters in t over population. Data from the Electoral Service (SERVEL).
Land Reform	Expropriations over agricultural county surface (both in physical hectares) from the Agrarian Reform Corporation (CORA) files.
Neighbor	Identification of borders across municipalities with Cartographica (GIS) using data from GIS Chile (http://www.rulamahue.cl/mapoteca/catalogos/chile.html).
Agricultural workers	Percentage of “Skilled agricultural workers” over labor force from the 1970 and 1960 Housing Census (IPUMS).
Rurality	Percentage of people living in rural areas from the 1970 and 1960 Housing Census (IPUMS).
Land concentration	Gini coefficient using information about agricultural population, agricultural surface, agricultural workers and number and size of exploitations (1955 Agricultural Census).
Left wing votes	Percentage of votes for Salvador Allende and Antonio Zamorano in 1958 and percentage of votes for Salvador Allende in 1970 (Electoral Service, SERVEL).
Conditions and Public Goods	Average years of education, percentage of people who know how to read and write, and percentage of houses with electricity, water supply, and hot water (1970 and 1960 Housing Census, IPUMS).
Income Related	Percentage of houses with at least 1 car and 1 television (1970 Housing Census, IPUMS) and with at least 1 radio (1960 and 1970 Housing Census, IPUMS).
Auxiliary variables	
Parliamentary elections	Information available by political party (Electoral Service, SERVEL)
Presidential election 1964	The Christian Democratic Party and the Right Wing Party are represented by Eduardo Frei. The Left Wing Party is represented by Salvador Allende (Electoral Service, SERVEL).

(Continued)

Table A.1: (Continued)

	Definition and source
Geography	Annual rainfall and average temperature from <i>Dirección Meteorológica de Chile</i> (Meteorological Directorate of Chile) . Identification of landlocked municipalities with Cartographica (GIS). Agricultural surface from the 1955 and 1965 Agricultural Census
Exploitations in 1920	Number of landowners by municipality (1920 Housing Census, available at: www.INE.cl).
Exploitations in 1955	Number of plots with agricultural activities by municipality (1955 Agricultural Census)
Agricultural output	Own construction using all the available information on production from the 1955 Agricultural Census. Also used in Cuesta et al. (2011).
Log agricultural workers	Total agricultural workers (1955 Agricultural Census).
Log agricultural populations	Total agricultural population (1955 Agricultural Census).

Table A.2: Summary statistics for auxiliary variables.

	Mean	Standard deviation	N
Politics			
Parliamentary election 1953: Christian Democratic Party	0.375	(0.104)	210
Presidential election 1964: Christian Democratic Party	0.540	(0.113)	210
Presidential election 1964: Radical Party	0.063	(0.043)	210
Parliamentary election 1965: Christian Democratic Party	0.375	(0.104)	210
Geography			
Annual rainfall	1,031	(727)	210
Average temperature	13.43	(1.45)	210
Landlocked	0.743	(0.438)	210
Agricultural surface	71,777	(68,280)	210
Agriculture			
Log agricultural output 1955	12.95	(0.680)	210
Log agricultural workers 1955	7.61	(0.766)	210
Log agricultural population 1955	7.91	(0.844)	210
Exploitations 1920	1,149	(876)	172
Exploitations 1955	519	(512)	210

Notes: See Table A.1 for sources and definitions.

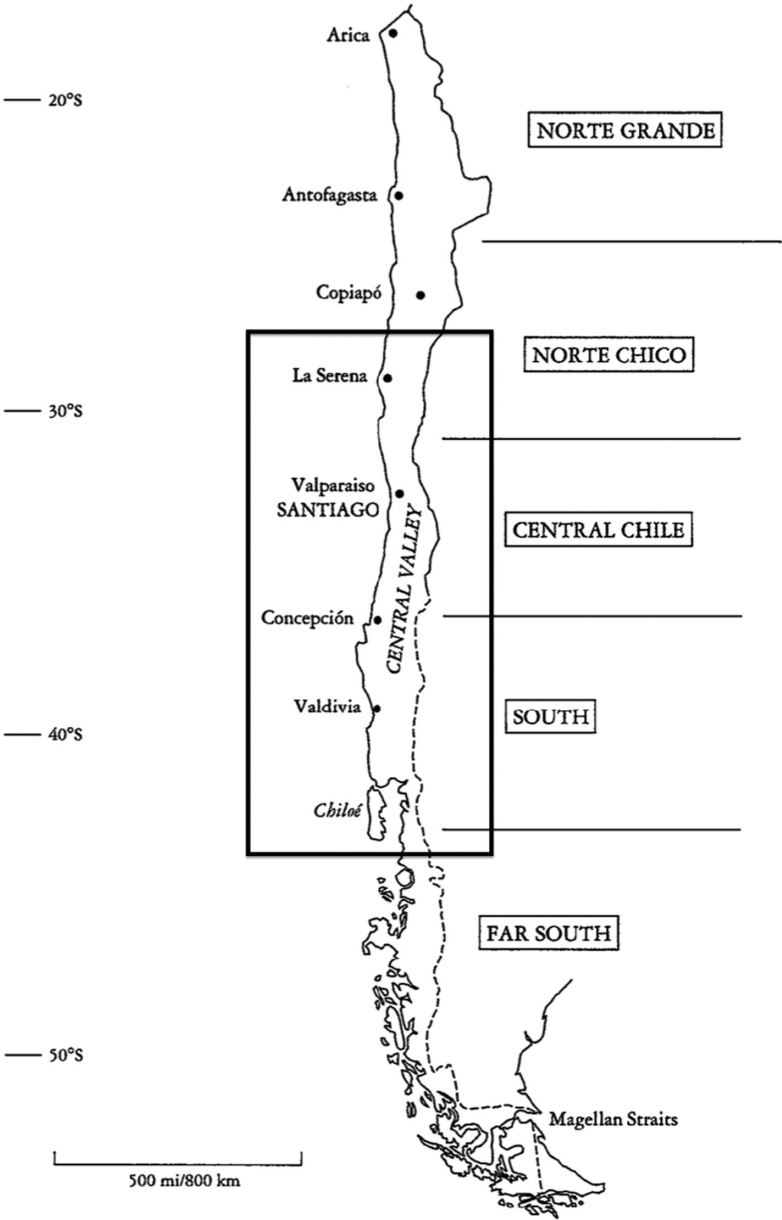


Figure 5: General sketch map of Chile. Within the square are located regions IV to X (Collier and Sater 2004).

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