Land and Power: Theory and Evidence from Chile*

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October 2004

*We are grateful to Mauricio Benitez-Iturbe and Sebastián Mazzuca for their outstanding research assistance. Our greatest debt is to Jonathan Conning who persevered through at least three previous versions, pointing out all the mistakes and confusions. He enormously improved the paper. We have also benefitted from the suggestions and advice of Siwan Anderson, Arnold Bauer, Michael Carter, Eduardo Fajnzylberg, Jeff Frieden, Tu Jarvis, François Maniquet, Dina Mesbah, Sripad Motiram, Andrew Newman, Thomas Piketty, Timothy Scully, Bill Summerhill, Werner Troesken, and seminar participants at APSA, Yale, Boston University, the Universidad de Los Andes, LSE, MIT, Montreal CIRPEE 2004 conference, and Stanford, particularly Timothy Besley, Alberto Diaz-Cayeros, Esther Duflo, Jim Fearon, Dilip Mookherjee, Jeff Nugent, T.N. Srinivasan and Barry Weingast. We also thank S. Laurent for his econometric advice, Jean-Marie Baland would like to thank the MacArthur network on Inequality and Economic Performance, the CRED for financial support and the Belgian Program on Inter-University Poles of Attraction initiated by the Belgian State, Prime Minister's office, Science Policy Programming.

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Abstract: In this paper we investigate the effect of the absence of a secret ballot on electoral outcomes and resource allocation. Once voting behavior is observable, votes can be bought and sold in a 'market for votes'. We distinguish between direct vote buying, where individuals sell their own votes to political parties, and indirect vote buying, where people also sell the votes of others and we characterized the circumstances in which vote buying changes the electoral outcome.

We then provide a microfoundation for indirect vote buying, which usually takes the form of employers selling the votes of their employees. This can occur when the employment relationship involves rents since employers can use the threat of withdrawal of these rents to control the political behavior of their workers. This increases the demand for labor and generates an added incentive to own land, increasing the price of land.

We test the predictions of the model by examining in detail the effects of the introduction of the secret ballot in Chile in 1958. We show that this change in political institutions had implications for voting behavior and land prices which are consistent with the predictions of our model.

JEL Classification Number: D72, O54, Q15.
Keywords: Political institutions, elections, land prices.

> "It is the most cruel mockery to tell a man he may vote for A or B, when you know that he is so much under the influence of A, or the friends of A, that his voting for B would be attended with the destruction of him. It is not he who has the vote, really and substantially, but his landlord, for it is for his benefit and interest that it is exercised in the present system." David Ricardo ([1824], 1951-1973, p. 506)

1. Introduction

Modern political economy tries to explain variation in democratic policy outcomes by investigating how different political institutions create different incentives for politicians (e.g. Cox, 1997, Persson and Tabellini, 2000, 2003, Acemoglu and Robinson, 2005). This work assumes that there are freely contested elections where all adults can express their preferences through a secret ballot. In consequence it does not investigate the specific details of the voting and balloting procedure. Most would agree that a foolproof secret ballot is a key prerequisite for democracy, yet in many democracies balloting is not completely secret. In the United States voting was not secret until the late 1880's when the Australian ballot was introduced.[1] In Britain, significant liberalization of the political system took place with the Reform Acts of 1832 and 1867, but until 1872 voting was open, not secret. In Latin America, Chile was long regarded as the sub-continent's most democratic country, yet the Australian ballot was not introduced until 1958 and in Colombia, the country which has the longest experience of formal democracy in Latin America and where the military has played the most marginal of political roles, the equivalent of the Australian ballot was legislated only in 1988 and introduced first in 1990.

In this paper we investigate the effect of the absence of a secret ballot on electoral outcomes and its implications for resource allocation. One can imagine that without a secret ballot and where voting is observed, individuals could buy

[1]The 'Australian ballot' has become synonymous with perfectly secret voting and refers to a situation where all political alternatives are on a single government produced ballot paper. It derives its name from the fact that the first use of such a ballot was in Australia in 1856.

and sell votes freely, perhaps to other people or to political parties. We can conceptualize this as the existence of a 'market for votes.' Such practices have even been argued to promote social efficiency (Buchanan and Tullock, 1962). However, when voting can be observed other, more sinister, forces may come into play. For example, people may be coerced into voting against their will, or people may use the existence of other types of market or social relationships to induce people to vote against their preference. More generally, various types of 'corrupt practices' may emerge.

We try to develop an understanding of the role and some of the implications of a market for votes and an effective secret ballot. Though the importance of vote buying and selling has not been investigated by economists, there is a large case study literature on this topic by other social scientists. While there are recorded instances of a market operating where people freely buy and sell their votes in the absence of a secret ballot, the main stylized fact which emerges from this literature is the importance of indirect control of votes. Typically, rather than individuals selling their votes to politicians, others, usually employers, supply the votes of their employees in exchange for money, favors or policies. More specifically, as discussed by Ricardo (1824), employers are usually landlords.

That landlords control the political activities of their workers has historically been a pervasive characteristic of agrarian economies.[2] In Britain, before the introduction of the secret ballot, this factor was critical in determining the outcome of rural elections. As observed by Lord Stanley in 1841,

> "when any man attempted to estimate the probable result of a county election in England, it was ascertained by calculating the number of the great landed proprietors in the county and weighing the number of occupiers under them."[3]

[2] As Malefakis (1970, p. 98) summarized the situation in nineteenth century rural Andalucía, "a man's job depended on his vote."

[3] Quoted in Kitson-Clark (1951, p. 112). O'Gorman (1989, p.20) estimates that by 1807 this resulted in the outcomes of 300 parliamentary seats being a foregone conclusion. He describes in detail the system of patronage linking high politicians such as Walpole with members of parliament, typically Whig 'oligarchs,' who controlled the local electorate.

Throughout the nineteenth century radicals and reformers complained about the lack of a secret ballot in Britain (see Kinzer, 1982, Cox, 1987 and Gash, 1977). In Germany, despite the fact that a democratic parliament was introduced in 1848 there is a mass of evidence that rural voters were controlled by landed interests. Bismarck even supported an extension of voting rights in 1871 because he thought that the control exercised by landlords over rural voters would offset the rising influence of urban workers (Bendix's, 1964, p. 97, Hamerow 1974, pp. 299-300).

Landlords control over rural elections was greatly facilitated where balloting was open (see Goldstein, 1983, p. 15). However, even when there was a supposedly secret ballot (and not open voting), strategies were found to keep voting under control. Thus, in the German case, political parties often printed their own ballots: "given that ballots had to be obtained from the candidates themselves or from their agents, it was often physically impossible for a poor man to vote for anyone but the squire's choice." (Anderson, 1993, p. 1467)[4] Even countries, such as France which moved early to universal male suffrage (after 1848) and free elections (after 1871) only introduced an effective (though non-Australian) secret ballot in 1913. Before this "the ballots frequently had subtle but distinct marks, such as paper thickness, colour and size, from which the election officials could deduce a voter's decision. This information was then passed on to notables who could easily punish such wayward voters since they frequently were his tenants or employees," (Kreuzer 1996, p. 108).

Similar tactics were used and remain up to the present day in democratic third world countries.[5] Nowhere is the evidence about landlord control of elections so conclusive as in Latin America. Following independence most Latin American countries adopted liberal constitutions committing themselves to regular elections, yet, with few exceptions Latin American societies did not become consolidated democracies with free regular elections contested by all adults until the 1980's.[6] In Chile the control of voting by landowners was very frankly discussed in the debate

[4]For further evidence on the German case see Blackbourn (1988) and the section on Germany in Gibson and Blinkhorn (1991).

[5]For evidence from India see Kohli (1990, pp. 227-228) and Breman (1974).

[6]See Engerman and Sokoloff (2001) and Hartlyn and Valenzuela (1998). For Brazil see Pang (1973), Graham (1990) and Martins (1996).

leading up to the introduction of the secret ballot in 1958 in language strikingly similar to that used by Lord Stanley quoted above. For example, Socialist senator Martones argued in favor of introducing the secret ballot because,

> "if that law [the old electoral law without a secret ballot] did not exist, instead of there being 9 Socialist senators there would be 18, and you [the Conservatives] would be reduced to 2 or 3 ... [laughter] you laugh, but the truth is that there would be not 2 Conservative senators from O'Higgins and Colchagua, which corresponds exactly to the number of *inquilinos* in the fundos which belong to the Conservative hacendados in that region. Conservatives would have only one or perhaps none."[7]

Thus apart from trying to investigate the implications of a market for votes on electoral outcomes, it is important to understand why this market functions as it does.

We first analyze in Section 2 how a 'market for votes' might work where individual votes are contractible and may be bought and sold, a process we call *direct vote buying*. We study the circumstances under which this changes the political equilibrium relative to a situation where there is no market for votes, a situation we associate with an effective secret (usually Australian) ballot. Second, we study *indirect vote buying*, where some individuals control and sell the votes of others. Initially we treat the incidence of such control as exogenous and study its implications. We show that buying votes indirectly may be cheaper for political parties and this helps to explain why it is so prevalent in reality.

We then provide in Section 3 a microfoundation for why indirect vote buying might be possible. We argue that employment and political control are deeply connected when the employment relationship concedes rents to workers. We show that the fact that landlords already concede rents to their workers for some other reason gives them a comparative advantage in the control of their political activities. We thus demonstrate that employment does not simply generate income, it also gives *power* to control the political behavior of others.

[7] A "fundo" is a large farm and a "hacendado" a large landowner and an *inquilino* was a permanent worker on such farms. Quoted in *El Mercurio*, Saturday May 19, 1958, p. 20.

Having shown that the way the market for votes functions depends on the employment relationship, we then study the implications of this phenomenon for the functioning of the land market. Being able to sell the votes of their workers induces landlords to hire workers and consequently attempt to buy more land, as land and labour are complements in production. In equilibrium, land prices incorporate the political rents that follow from the control of the votes of the workers employed on it.

Our analysis suggests two avenues through which a market for votes may lead to inefficiencies. First, under indirect vote buying, the agent who controls and sells the votes of others ignores their political preferences. Second, a market for votes provides incentives to accumulate assets as an instrument to control the political behavior of others.

The predictions of the model about electoral outcomes, employment and land prices can be tested by investigating the impact of the introduction of an effective secret ballot. Such an institutional reform closes down the market for votes, removes the incentive to employ people to control their voting, and reduces the demand for land. In consequence, we should observe changes in voting behavior, since workers whose votes were previously controlled and sold can now vote freely, and a fall in the price of land.

We examine these implications by considering the introduction of the secret ballot in 1958 in Chile. We show in section 4 that the empirical predictions of our model are highly consistent with the data. We first demonstrate that before 1958 control of voting was endemic in the traditional 'oligarchic' provinces of the so-called North and Urban Central Valley provinces. More precisely, we show that, before the reform, the support for right-wing parties was substantially higher but that it also fell substantially more thereafter in precisely those municipalities where *inquilinos* formed a larger share of the electorate. We also show that land prices also fell after 1958 in a way consistent with our theory since this fall was larger in the oligarchic provinces. We also present a variety of other pieces of evidence which support our interpretation.

To our knowledge, nobody has developed a model of a market for votes with indirect vote buying or systematically studied its implications for resource alloca-

tion. The social science literature focuses very much on coercion and corruption but does not make clear predictions about how vote buying influences the economy. Moreover, it has not tackled the key question of why vote controlling exists and if it implies different things from simply vote buying or coercion. Piketty (1999, 2000) developed a model of the market for votes and showed that when voters have private information about the socially efficient policy, the exchange of votes may be inefficient because people who are well informed, but uncertain of this, may sell their votes to people who are badly informed. These exchanges stop valuable information being revealed. Scholars such as Snyder (1991) and Grossman and Helpman (1996) have looked at interest groups buying politicians with 'campaign contributions' but this work also focuses on very different issues than those we study. An important distinction is that these scholars, and most others in the political economy literature, focus on the efficiency of government policy. We focus on the way in which the presence of vote buying and vote controlling affects the way the economy is itself organized. Most closely related to our research, Summerhill (1995) developed a simple model of the idea that political rents accrue to landowners and tried to estimate the impact of electoral reform on the economy using data from nineteenth century Brazil.

2. The Political Market

2.1. The Fundamentals

Consider a model with two parties, left and right, competing for votes in the rural sector. There are n agents in this sector, n_L are left-wing and n_R are right-wing: $n_L+n_R = n$. All agents have utility functions of the form $y+\delta_i\sigma$ for $i = L, R$, where y is income and $\delta_i \in \{0, 1\}$. Here σ is called the ideological bias, and corresponds to the utility that an individual of type i gets in voting for his preferred party where $\delta_i = 1$ if he votes for such a party and $\delta_i = 0$ if he does not.

We assume that the only instrument available to parties to gain power is buying the votes of people in the agricultural sector.[8] We assume that the sale

[8]Our focus in this paper on the implications and microfoundations of vote controlling and

of a vote for money is a contract that can be enforced in the absence of a secret ballot, which implies that an individual cannot sell his vote to one party while voting for another and still receive the money. We let ΔW_k, $k = R, L$ represent the maximum price party k is willing to pay for a vote.[9]

We distinguish between two situations: direct vote buying, where parties can directly buy votes from the individual agents, and indirect vote buying where the votes of some agents can be bought through another agent. Under direct vote buying the price that a party offers for the vote of an agent will in general depend on the ideological type of the agent: let p_j^i be the price paid by party j to an individual of type i.[10] To break ties, we assume that if indifferent between offers, an individual accepts the offer of the party he prefers from an ideological standpoint.

Under indirect vote buying, some agents sell the votes of others. (Later in the paper we will relate this 'control' to the nature of the employment relation, but for now we simply take the existence of this 'control' as given and study how it impacts equilibrium in the vote market.) We assume that if one agent sells the vote of another then they may sell the vote of this person to whichever party they wish and their only aim is to maximize their income. We focus on a situation where the votes of some of the left-wing agents are sold by some of the right-wing agents.

We use the notation c ('controlled') to denote a left-wing agent whose vote

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the functioning of the market for votes means that we abstract from other potentially important issues, particularly the impact of vote buying and vote controlling for public policy. A rigorous justification would be that while other policies exist, the parties have no technology for commiting to them (Alesina, 1988, Osborne and Slivinski, 1996, Besley and Coate, 1997). Then the σ terms in the utility functions just represent the utility of citizens from the ex post policies of the parties.

[9] In Baland and Robinson (2004) we develop a full electoral model with proportional representation. In that model parties value all votes as they increase chances of participating to the government.

[10] Though we focus our analysis on situations where political parties directly purchase votes (a very common political phenomenon, historically in Europe and in contemporary Latin America, Asia and Africa), the model is consistent with other interpretations. For example, instead of buying votes, parties may offer policies which favor particular individuals, or give individuals employment in the public sector.

is controlled. There are $n_L(c)$ such agents, and letting $n_L(f)$ be the number of uncontrolled left-wing agents ('free') we have $n_L(c) + n_L(f) = n_L$. With respect to right-wing agents, we let $n_R(f)$ denote the number of free ones, who are neither controlled nor who control others, and $n_R(\ell)$ denote right-wing agents who control the votes of others. We shall refer to them as 'landlords'. Here, $n_R(f) + n_R(\ell) = n_R$. Since the votes of left-wing agents are controlled by right-wing agents we assume that ties with respect to the vote of the controlled agent are broken in favor of the ideological orientation of the right-wing agent.

The political parties can now offer prices to free agents for their votes, to agents who control the votes of others for their own vote, or to such agents for the votes they control. Under indirect vote buying, we let $p_j^k(x)$ be the price offered by party j to a voter of ideological type i and status $x = f, c, \ell$.

We now describe the timing of the game. First, the political 'market for votes' opens, with parties non-cooperatively announcing a price at which they will purchase votes from each type of rural agent. Agents then sell votes to the political parties. Voting takes place, and political parties observe voting behavior. Finally, rents are distributed by the political parties and consumption takes place.

2.2. The Political Equilibrium

We first consider the situation in which the ideological bias of the voters is small, so that $\Delta W_R > \sigma$ and $\Delta W_L > \sigma$. As we shall see, this assumption implies that, in equilibrium, all votes are bought. Our first result refers to the situation with direct vote buying. The equilibrium depends crucially on whether the value of a vote varies significantly across parties. If it differs a lot, the party that values votes most can always outcompete the other party by offering a higher price for the votes. When this is true the presence of vote buying will alter the outcome of the election compared to a situation with no market for votes. If both parties have relatively similar valuations of the votes, the difference in the prices offered is never sufficient to change the voting behavior of an agent. Vote buying in this case does not alter the outcome of the election. We obtain:

Proposition 1: *When the ideological bias is small, the existence of direct vote buying does not influence the outcome of the election if and only if* $|\Delta W_R - \Delta W_L| \leq \sigma$*, so that no party values votes sufficiently more than another.*

Proof: under direct vote buying, if $\Delta W_L + \sigma \geq \Delta W_R \geq \Delta W_L$, there is a unique (Bertrand) equilibrium which has the following form

$$\text{Party } R \text{ offers } \begin{cases} p_R^R = \Delta W_L - \sigma \\ p_R^L = \Delta W_R \end{cases} \text{ and } L \text{ offers } \begin{cases} p_L^R = \Delta W_L \\ p_L^L = \Delta W_R - \sigma \end{cases} \tag{2.1}$$

First, note that the most the left-wing party would be willing to pay for the vote of a right-wing agent is ΔW_L. The right-wing party can get that vote by offering a price $\Delta W_L - \sigma$, since such a person intrinsically prefers to vote for the right-wing party. If $p_L^R = \Delta W_L$ and the right-wing party were to offer $p_R^R = \Delta W_L - \sigma - \varepsilon$ for $\varepsilon > 0$ then all right-wing people would vote left. Offering a price $p_R^R = \Delta W_L - \sigma$ secures all the right-wing votes for the right-wing party, so that offering a higher price is not optimal. For the left-wing party, $p_L^R = \Delta W_L$ is weakly optimal, since offering $\Delta W_L + \varepsilon$ for a right-wing vote would imply paying more for the vote than its worth, while offering $\Delta W_L - \varepsilon$ fails to buy any right-wing votes, leaving its payoff unchanged. Similar types of arguments suffice to derive the other prices. Hence the above prices constitute an equilibrium as neither party can deviate and increase its payoff.

If $\Delta W_R > \Delta W_L + \sigma$, the right-wing party values the votes sufficiently more than the left-wing party that it will find it optimal to buy the votes of left-wing people, even if it has to compensate them for the disutility of voting right. There is therefore a unique equilibrium of the following form.

$$\text{Party } R \text{ offers } \begin{cases} p_R^R = \Delta W_L - \sigma \\ p_R^L = \Delta W_L + \sigma + \eta \end{cases} \text{ and } L \text{ offers } \begin{matrix} p_L^R = \Delta W_L \\ p_L^L = \Delta W_L \end{matrix} \tag{2.2}$$

where $\eta > 0$ and small. The result is that R buys all the votes in equilibrium. Clearly, the two cases above have symmetric cases where $\Delta W_L > \Delta W_R + \sigma$ and $\Delta W_R + \sigma > \Delta W_L > \Delta W_R$ and the results in these cases follow in a straightforward way. ■

We now consider the equilibrium in the market for votes when some people sell the votes of others. Our first observation follows from the fact that, with vote control, parties do not have to compensate those whose votes are sold for the disuility of voting against their preferred party. Only the preferences of the agent who controls the votes matter, and we assumed that he places no ideological preference on the votes he sells. (Note that all of these results would hold *a fortiori* if we allowed right-wing landlords to get utility from the fact that they force/induce left-wing agents to vote right.) For instance, if the right-wing party wishes to purchase the vote of a left-wing agent, under direct vote buying, it has to pay more than the price announced by the left-wing party. Under indirect vote-buying, the right-wing party only has to match this price and the landlord who controls the vote is willing to supply the vote. We obtain the following result:

Proposition 2: *When the ideological bias is small, it is cheaper to buy votes indirectly than to buy votes directly from individuals.*

Proof: if $\Delta W_L + \sigma \geq \Delta W_R \geq \Delta W_L$, the equilibrium prices under indirect vote buying are.

$$R \text{ offers } \begin{cases} p_R^R(\ell) = p_R^R(f) = \Delta W_L - \sigma \\ p_R^L(c) = \Delta W_L \\ p_R^L(f) = \Delta W_R \end{cases} \text{ and } L \text{ offers } \begin{cases} p_L^R(\ell) = p_L^R(f) = \Delta W_L \\ p_L^L(c) = \Delta W_L \\ p_L^L(f) = \Delta W_R - \sigma \end{cases} \tag{2.3}$$

If $\Delta W_R > \Delta W_L + \sigma$, the equilibrium prices are:

$$R \text{ offers } \begin{cases} p_R^R(\ell) = p_R^R(f) = \Delta W_L - \sigma \\ p_R^L(c) = \Delta W_L \\ p_R^L(f) = \Delta W_L + \sigma + \eta, \end{cases} \text{ and } L \text{ offers } \begin{cases} p_L^R(\ell) = p_L^R(f) = \Delta W_L \\ p_L^L(c) = \Delta W_L \\ p_L^L(f) = \Delta W_R \end{cases} \tag{2.4}$$

where $\eta > 0$ and arbitrarily small. The results follow by comparing (2.1) to (2.3), and (2.2) to (2.4). Once again, the analysis of the symmetric cases where $\Delta W_L > \Delta W_R + \sigma$ and $\Delta W_R + \sigma \geq \Delta W_L \geq \Delta W_R$ follows in a straightforward way. ■

Proposition 2 has two implications. First, it cannot be profitable for an agent to become a political entrepreneur, buying votes from individuals and selling them

to parties, since he would have to compensate individuals for their ideological bias. Second, the introduction of indirect vote buying into a situation where previously there was just direct vote buying can change the political equilibrium, since it is cheaper to buy votes indirectly. In particular, when parties valuations do not differ much, it is never optimal under direct vote buying for one party to buy the other party's votes because they are too expensive relative to their value. However, when votes can be bought indirectly at a lower price than before, a party can now find it optimal to buy the votes of those controlled. Interestingly, it is precisely when direct vote buying does not alter the outcome of the political equilibrium that indirect buying does, and vice versa. We have:

Proposition 3: *When the ideological bias is small, the existence of indirect vote buying in addition to direct vote buying changes the outcome of the election if and only if* $|\Delta W_L - \Delta W_R| \leq \sigma$.

Proof: the result follows directly from a comparison of the equilibrium prices under the two situations, as given by equations (2.1), (2.3), (2.2) and (2.4). ■

We now turn to the situations that arise when the ideological bias is large: $\Delta W_R < \sigma$ and $\Delta W_L < \sigma$.[11] Under direct vote buying, the price offered by the competing party is never sufficient to induce voters to change their votes. However, this is not the case under indirect vote buying, since parties do not have to take into account the ideological bias of the controlled voters. As a result, when the ideological bias is large, political control and indirect vote buying create the necessary conditions for the existence of electoral corruption:

Proposition 4: *When the ideological bias is large* ($\sigma > \Delta W_k$)*, no votes are bought under direct vote buying. Indirect vote buying creates a market for the controlled votes, and changes the outcome of the elections.*

Proof: the result follows from a comparison of the equilibrium prices under the two situations. Under direct vote buying, the equilibrium prices announced

[11] The case where $\Delta W_R > \sigma > \Delta W_L$ is similar to the case where ideological bias is small.

by the parties become:

$$\text{Party } R \text{ offers } \begin{cases} p_R^R = 0 \\ p_R^L = \Delta W_R \end{cases}, \text{ Party } L \text{ offers } \begin{cases} p_L^R = \Delta W_L \\ p_L^L = 0 \end{cases} \tag{2.5}$$

so that, in equilibrium, right-wing voters vote right, and left-wing voters vote left, but they receive nothing in exchange for their votes (i.e., the price paid to each voter is zero). Under indirect vote buying, the equilibrium prices become:

$$R \text{ offers } \begin{cases} p_R^R(\ell) = p_R^R(f) = 0 \\ p_R^L(c) = \Delta W_L \\ p_R^L(f) = \Delta W_R \end{cases}, \ L \text{ offers } \begin{array}{c} p_L^R(\ell) = p_L^R(f) = \Delta W_L \\ p_L^L(c) = \Delta W_L \\ p_L^L(f) = 0 \end{array} \tag{2.6}$$

so that only the votes of individuals who are controlled are sold.■

We now investigate the social efficiency of these different equilibrium outcomes. In doing so we use total surplus as the criterion for efficiency since direct and indirect vote buying are not comparable under the Pareto criterion. A tradition in economics dating back to Buchanan and Tullock (1962) argues that what we call vote buying must promote efficiency because it takes advantage of gains from trade. This intuition is true in our model when political parties only buy votes directly from individuals. In such a situation an exchange only takes place when the party values the vote more than the individual selling it. This must make both better off. However, this argument has to be modified when we allow for indirect vote buying. Indeed, under indirect vote buying, a controlled vote is sold to the other party when the ideological bias is larger than the value of the vote for the party (Proposition 4), or if it is larger than the difference in the values of votes across parties (Proposition 3). Hence,

Proposition 5: *While direct vote buying is socially efficient, indirect vote buying is socially inefficient in exactly the circumstances where it influences the outcome of the election.*

Proposition 5 has severely negative implications for the idea that being able to buy and sell votes promotes efficiency. In the absence of a secret ballot we expect indirect vote buying to quickly emerge, as is consistent with the historical and

case study literature, and in this case there can be no presumption that 'political exchanges' promote social welfare.

Finally, we consider the impact of the introduction of a secret ballot which stops both vote buying and vote controlling.[12] This happens because the vote-buying contract is enforceable only when voting can be observed. With a secret ballot, nothing stops an individual from promising to vote for the party that offers him a higher price and then voting for the party of his choice. This means that a political party can never buy the vote of someone who intrinsically prefers the other party. Hence the market for votes collapses. The implications of this are summed up in the following result.

Proposition 6: *The introduction of a secret ballot closes the market for votes. It changes the outcome of the political equilibrium in all circumstances except under direct vote buying when* $|\Delta W_L - \Delta W_R| \leq \sigma$.

3. Employment and Power

The results of the above section showed that the possibility of buying votes indirectly can have important effects on the political equilibrium. We now develop a model of how votes can be controlled by relating it to the nature of the employment relationship. To keep the discussion focused, we assume that the right-wing party values votes (weakly) more than the left-wing party: $\Delta W_R \geq \Delta W_L$. Equations (2.3), (2.4) and (2.6) then show that the price paid for a controlled vote is equal to ΔW_L.

In the agricultural sector, there are L units of land, owned by right-wing agents. To simplify the notation we assume in what follows that all right-wing

[12]There is no single institutional recipe which delivers uncorrupt elections. In France, individuals are able to vote freely today even though parties have their own ballot papers, in Chile before 1958 this was not the case. In reality, particular balloting procedures interact with other institutions to determine how secret voting is hence an Australian ballot may be sufficient but not necessary. The comparative statics however refer to institutional changes which improve the secrecy of the ballot, they do not rely on their being a necessary and sufficient solution to electoral corruption.

agents are landowners endowed with the same amount of land l, with $l = L/n_R$.[13] The production function of a farm using l units of land and employing m workers is $F(l, m)$, which is strictly increasing in both arguments, concave and exhibits constant returns to scale. We let $f(\frac{l}{m}) = F(l, m)/m$ stand for the output per worker on such a farm. Left-wing agents own no land and have no access to the capital market. All agents have the option to be self-employed and earn a real income of $\underline{w}$.

We assume that when working for a landlord, workers earn a real wage, w, which is higher than their reservation wage, $\underline{w}$. Such rents may arise for a variety of reasons, for instance to induce workers to exert the optimal level of effort when working. (A complete model describing how moral hazard in conjunction with limited liability can lead to vote control is provided in Baland and Robinson, 2004). Let R denote the amount of labor rent that a landlord must concede to each of his workers: $R = w - \underline{w}$.[14]

We now argue that the threat taking away a worker's rents can be used by the landlord to control his vote. For this to be true, the worker should find it optimal to work for the landlord and vote the way he wants him to, which implies that the utility he gets is (weakly) greater than his utility as a self-employed agent who sells his vote to whichever party he wishes:

$$\underline{w} + R \geq \underline{w} + \max\{p_R^L(f), p_L^L(f) + \sigma\} \tag{3.1}$$

Note that, as a free agent, he may prefer to sell his vote to the right-wing party if it offers him a price for his vote which is sufficiently greater than the price offered by the left-wing party. In this case he gets a utility benefit from voting of $\max\{p_R^L(f), p_L^L(f) + \sigma\}$. In the following, we assume that equation (3.1) always holds, so that it is costless for the landlord to control the political behavior of his workers: the threat of terminating the contract is sufficient to induce them to vote the way he wants them to.

[13] This assumption is irrelevant to the results described below as we assumed constant-returns to scale. Under decreasing returns to scale, access to the capital market by right-wing agents would make the distribution of land equal across farms.

[14] For a more detailed model of the labor contracts offered to *inquilinos* see Sadoulet (1992).

We now consider how the presence of vote buying influences market clearing. We first consider the optimal demand for labor in a farm of size l with m workers. Profits are,

$$f\left(\frac{l}{m}\right)m - wm + \Delta W_L m \tag{3.2}$$

The first term in (3.2) is revenues since we assume that the produced good is the numeraire, the second the expected wage bill, and the third the political rents that the landlord gets from selling the votes of his m workers at the price ΔW_L, which is the equilibrium price for a worker's vote. The optimal demand for labor is determined by the first-order condition with respect to m,

$$\left(f\left(\frac{l}{m}\right) - f'\left(\frac{l}{m}\right)\frac{l}{m}\right) - w + \Delta W_L = 0 \tag{3.3}$$

The equation (3.3) implicitly defines the optimal demand for labor as a function of parameters, which we write $m(l, \Delta W_L, w)$. The equilibrium price of a plot of land must now adjust so that profits are zero or,

$$\left(f\left(\frac{l}{m(l, \Delta W_L, w^h)}\right) - w + \Delta W_L\right)\frac{m(l, \Delta W_L, w^h)}{l} = \pi \tag{3.4}$$

Equation (3.4) implies the following result.[15]

Proposition 7: *In equilibrium the price of land incorporates political rents.*

Acquiring land is desirable not only for productive purposes, but also for the political rents attached to the political control of the workforce employed on it. Equilibrium prices on the land market reflect this mechanism. Moreover, a political reform with stops votes being bought and sold, such as the introduction of an effective secret ballot, removes the ability of landlords to sell the votes of their workers and has interesting economic implications:

Proposition 8: *The introduction of a secret ballot leads to a fall in employment, a fall in the price of land and a fall in the vote share of the right-wing party.*

[15]For simplicity, we assume here that in equilibrium, $m.n_R \leq n_L$ so that $n_L(f) \geq 0$, implying that some left-wing workers end up self-employed in equilibrium.

To see these results, note that political reforms remove the price of votes from (3.3) and (3.4). The introduction of a secret ballot stops both types of vote buying and therefore the vote share of the right-wing party always falls, as follows from section 2.

We are now in a position to discuss some of the assumptions made. First, note that when condition (3.1) does not hold, the labor rents are not large enough to enable the landlord to control voting behavior. To elicit the appropriate voting behavior the landlord must raise the wage further. However, as long as labor rents are positive, this increase in wages is lower than the price received for a worker's vote, so that landlords still enjoy a comparative advantage in controlling their workers' votes. In this situation, political reforms which stop vote buying lead the wage rate to fall.

If all agents had access to capital markets then there would be no land concentration and all land would be farmed by smallholders with no votes being controlled. To see this note that the price a self-employed agent is willing to pay for a plot of land, denoted π_s, is equal to $f(1) - \underline{w}$. The price that a landlord would be willing to pay, π_ℓ, is given by (3.4). From section (2), in equilibrium, $\max\{p_R^L(f), p_L^L(f) + \sigma\} \geq \Delta W_L$. Condition (3.1) can then be rewritten as

$$w - \Delta W_L \geq \underline{w}.$$

A smallholder's profits per unit of land must be higher than for a landlord, since his labour cost is lower ($\underline{w}$ instead of $w - \Delta W_L$), and one gets:

$$\pi_s \equiv f(1) - \underline{w} \geq f(1) - w + \Delta W_L \geq \pi_\ell.$$

The fact that, with perfect capital markets, smallholders are always willing to outbid landowners for land follows from the fact that the labor rents that landlords transfer to workers exceed the political rents they receive from parties. Therefore, even though it is still true that the ability of landlords to sell votes increases their demand for land, land is still more valuable to smallholders.[16] The interaction of

[16]The inefficiency here stemming from imperfections in the capital market is related to the results of Banerjee and Newman (1993), Legros and Newman (1996), Mookherjee (1997) and Banerjee, Gertler and Ghatak (2002)

the market failures is thus crucial. With imperfect capital markets but without labour rents, electoral corruption would not affect the price of land, as workers would then have to be fully compensated for the control of their votes. At the same time, with labor rents but no capital market imperfections there is no inefficiency either, since workers can then become smallholders.

Lastly, it is useful to emphasize that although we have discussed the model in terms of a price per-vote, in reality there are a variety of benefits to landowners from controlling votes. These include employment in the public sector, influence over policies (such as those with respect to the ability of trade unions to organize) and electoral positions for themselves and their relatives. For instance Heise (1982) calculates that until the end of the parliamentary period (1925) in Chile, more than 90% of political leaders are large landowners.

4. A Study of Land and Power: Chile

4.1. The political impact of the 1958 electoral reform: an overview

Like most Latin American countries, upon gaining independence from Spain, Chile adopted republican institutions. These became institutionalized in the 19th century and elections determined presidential succession without military or other intervention. Universal literate male suffrage was introduced in 1874 but voting was not secret. Interestingly, the 1874 suffrage extension in Chile was opposed by some more progressive Chileans as they "fully realized that in a predominantly rural society with traditional landlord-peasant ties, the Conservatives would overwhelm their opponents at the polls." (J. Samuel Valenzuela, 1985, see also Bauer, 1995, p. 30). The nineteenth century democracy collapsed in 1924 and the following period saw five military coups before democracy was restored in 1932. The intervening period was dominated by Colonel Carlos Ibáñez. After 1932 democratic stability was based on an explicit compromise between the growing power of urban groups and the power of the traditional landed elites. [17]

[17]The Chilean pact is discussed in more detail in Valenzuela (1978), Collier and Collier (1991, pp. 565-73) and Scully (1992, pp. 108-109).

4.1.1. Mechanisms of Control of Rural Votes

"Throughout the history of the Republic, the political influence of the rural sector in Chile was disproportionately greater than its size relative to the urban sector. Congressional representation was heavily weighted in favor of rural districts where the peasantry historically formed a pliable and controllable mass base for conservative and reactionary groups" (Hellinger, 1978, p. 272). Landlords systematically controlled rural voting until the late 1950's. There is relative consensus amongst historians, political scientists and sociologists about how this system functioned (see Kaufman, 1972, Bauer, 1975, Loveman, 1976, Petras and Zeitlin, 1968, and Scully, 1992, ch. 4): "There was an absolute control of peasants by their patrones, and elections in rural communes depended on the political preferences of the landowners. They relied on an electoral clientele formed by the *inquilinos*, peones and small landholders (*pequenos proprietarios*); this last group had ... a strong relationship with the latifundistas due to credit, crop trade, lease of money and materials, and personal relations" (Millar, 1981, p. 172). Large landlords usually registered all their employees, by teaching them how to sign their names (as literacy was a condition for vote registration). The day of the election, the employer would go vote with all their employees. "This type of control is pervasive ... The situation was publicly accepted, and it was even used as an argument in electoral legal complaints, particularly in order to show that any result against the preferences of the latifundistas was fraudulent, or to justify an unanimous electoral result in a rural locality" (Millar, 1981, p. 173). Part of the political pact which developed after the 1930's also involved the banning of agricultural unions, a policy which allowed severe labor repression to be carried on in the countryside, often backed by the police (Bauer, 1995, p.32).

In line with our model, the control of rural votes by landlords was made possible by the relatively good working conditions of the *inquilinos* compared to the possible alternatives: "They were free ... but they had no defence in the face of expulsion; indeed, the threat of being cast out into the subproletariat of migratory workers was the most powerful weapon at the landowner's disposal. Most *inquilinos* families undoubtedly judged their welfare on the estate superior

to life outside or in the nitrate fields of the northern desert." (Bauer, 1995, p. 28). The patron-client relationship was very developed (see in particular Bauer, 1995). Thus, "anyone seen visiting the home of a resident laborer would be immediately approached and questioned by the owner, who reserved the right to expel him from the property" (Swift, 1971, p. 37).

4.1.2. The political equilibrium in the 1950's

By the 1950's the political landscape in Chile was dominated by several main parties. There were the traditional nineteenth century parties, the Conservatives, Liberals and Radicals. The Conservatives and Liberals were furthest to the right and united in most things except in their attitudes to the Church (the Conservatives were closely associated with the Catholic Church while the Liberals tended to be anti-clerical). The Radicals were more towards the center politically and were strongly anti-clerical. Also in the center, though very small in the 1950's, were the Christian Democrats. To the left were the Socialists and then the Communists (the latter were officially banned between 1948 and 1958 though they competed under different names). The landed oligarchy provided the traditional constituency of the two right-wing parties, the Conservative and the Liberal (see, e.g., Gil, 1966 and Sinding, 1972). The existing party system was shocked however by the return of the former dictator Carlos Ibáñez as a populist presidential candidate in 1952. Ibáñez formed a very heterogenous coalition of mostly leftist groups and capitalized on the general disillusionment with the traditional parties.

Chilean electoral institutions in this period were based upon the D'Hondt system of proportional representation for all elections, under the 1925 Constitution (for more details, see Gil, 1966, Chapter 5, and Morodo, 1968). The constituencies broadly coincided with the boundaries of Chile's provinces. Deputies were elected for four year terms, senators for eight with half of the Senate being replaced every four years. Prior to the reforms of 1958, parties issued their own ballot papers and a closed list system was used. Thus to vote for the Socialist party, a voter had to request the Socialist ballot which made it relatively easy to determine his

voting behavior.[18]

4.1.3. The introduction of the secret ballot in 1958

There were several important electoral reforms undertaken in Chile in the late 1950's and early 1960's. The most important was Law 12.889 promulgated on May 31st 1958, amending the basic electoral law of 1925 (see Castro, 1941, p. 35 and Cruz Coke, 1984, pp. 27-29 for a discussion of this law) and its most important aspect was the introduction of the cédula única (the unified ballot). After 1958, the voter received a single, official ballot, which contained all party slates for any single type of election in his district and an open list system was adopted so that voters did not have to respect any official ordering of candidates. Another important law of 1958 banned electoral pacts between parties for deputies and councilmen (a 1962 electoral law extended this prohibition to senatorial elections).

The introduction of the secret ballot had an immediate impact on the balance of political power in Chile. Loveman (1976, p. 219) notes, "The introduction of a public ballot meant that landowners could no longer effectively control the votes of rural labor. The electoral hegemony of the Right in the countryside thus gave way to forces that advocated social change in the rural areas ... In 1958 the performance of the FRAP (Socialists and Communists) in rural districts left little doubt that landowners' control over rural votes had considerably declined."

If the lack of secret balloting had played an important role in guaranteeing democratic stability in Chile since the 1930's, why was the secret ballot introduced in 1958? Though this issue appears not to have been researched by political scientists, the most plausible reason for this is a deliberate attempt to disrupt the existing political equilibrium. As we noted above, the election of Ibáñez in 1952 was based on a heterogenous coalition and an 'anti-politics' platform. Ibáñez intended to forge a new political movement and though he failed in this, it seems likely that the introduction of the secret ballot with its easily anticipated effects on voting in the countryside, was a calculated gamble. It may also have been part

[18]Loveman (2001, pp. 222-3) provides a detailed discussion of how party provision of ballots before 1958 facilitated electoral corruption.

of a deal which he made with some of his key supporters, the Agrarian Labor party (Agrario Laboristas) and the Popular Socialist party (Partido Socialista Popular) both of which would have had an interest in mobilizing rural voters.

Interestingly however, despite these changes, the Conservative Jorge Alessandri won the presidential election in 1958, principally on a platform emphasizing conservative monetary policies which were a response to the populism of the Ibáñez regime.[19] Under Ibáñez per-capita GDP had fallen by 2% and inflation had averaged 45%, peaking at an annual rate of 76% in 1955 (see Ffrench-Davis, 1973, p. 242 and Table 35). However, the right began to disintegrate during the 1960's with the rise of the centrist Christian Democrats (whose candidate Eduardo Frei won the presidency in 1964) and in 1966 the Conservatives and Liberals merged to form the National Party.

4.2. Agrarian relations and electoral results across provinces

We collected data from the 1957, 1961 and 1965 electoral registries and the agricultural census of 1955 and 1965 (see the Appendix). The data were collected at the *communa* (municipality) level, which corresponds to the lowest level of electoral district. As census units do not always strictly match the electoral districts, and changed definition over time, we had to exclude all the *communas* for which we could not be certain of the correspondence, which left us with a sample of 246 *communas* (out of 295). (This also explains why we do not use data over a longer interval of time.) The main variables used throughout the analysis are described in the Appendix (table A1).

We focus on the 1957 parliamentary (all of the congress and half of the senate) elections, as it allows a more direct comparison to the parliamentary elections that occurred after 1958, and in particular the 1961 and 1965 elections.[20] We describe

[19]Though he polled only 33,416 votes (out of 1,235,552 cast) more than Salvador Allende, the candidate for the Socialist and Communist alliance. Antonio Zamorano, a leftist defrocked priest, deprived Allende of a victory by gaining 41,304 (3.3%) left-wing votes.

[20]We do not take the 1953 congressional and senatorial elections because they were very exceptional. After the election to the presidency of Carlos Ibáñez in 1952, the 1953 elections saw a transient collapse in the right-wing vote in the face of the Ibáñista bandwagon. Scully (1992, p. 126) notes "The disruption of familiar patterns of party competition was also reflected

in Table 1 the main trends at the level of the provinces.[21] In the table, we report the information over the three Central Valley regions, its two neighboring regions, the Frontier and the Little North, and the other regions.

INSERT TABLE 1 HERE

The relationship between agrarian relations and electoral outcomes is striking. In 1957, the landed oligarchy in Chile dominated the Urban and the North Central Valley provinces: the proportion of *inquilinos* in the number of registered voters in 1957 is 18.9 percent in the North Central Valley, and 17.2 in the Urban Central Valley, but 11.2 in the Frontier and Little North, and 8.2 in the other provinces. Unsurprisingly, the share of right-wing votes in 1957 in the North Central Valley was 50.0 percent, and 40.8 percent in the Urban Central Valley, much higher than in the other provinces.[22]

After 1958, the fall in the right-wing votes occurs in provinces with a larger proportion of *inquilinos* per worker (across provinces, the correlation coefficient between the two is equal to -0.67). The fall in right-wing votes is dramatic in the Central Valley provinces. Even the absolute number of right-wing votes fell in those areas, in spite of an increase in registered voters. The fall is very pronounced in some provinces, such as Colchagua (-48.1%) from an absolute majority of 70.2%

in the extreme fragmentation by the party system in the congressional elections of 1953. In that year, 25 party organizations presented candidates, and 19 achieved representation. Party proliferation weakened Chile's traditional parties. Whereas in the congressional elections of 1949 the Conservative, Liberal, and Radical parties combined received more than 60% of the vote, in 1953 they received barely on third." This was just a temporary phenomena however. Scully goes on to add (1992, p. 126) "Though Ibáñez had put the leadership of traditional parties on the defensive in 1953, the situation was reversed between 1953 and 1957." Focusing on 1953 therefore has a tendency to underestimate the fall in conservative support after 1958. Moreover the definition of electoral circonscriptions changed through time, which would further restrict our sample.

[21] We provide in the Appendix a map of Chile, which indicates the location of its 25 provinces, as well as their grouping into 8 main regions.

[22] The relationship between right-wing votes in the 1957 elections and land concentration is less clear however. This is due to the fact that in the arid, semi-arid and infertile provinces to the north and to the south of the Central Valley (including the Frontier), land concentration tends also to be high, as a result of the technological constraints on agriculture in these provinces (ranching instead of farming).

of the votes in 1957 to barely 22.5 % in 1965.[23]

4.3. The political impact of the 1958 electoral reform: a test

4.3.1. The empirical strategy

The empirical strategy pursued in this paper can be described as follows. Before the 1958 reform, the share of right-wing votes should be higher in *communas* with more *inquilinos* since their votes are then controlled. However, after the reform, the influence of *inquilinos* on electoral results should disappear, so that the difference in voting patterns across the two types of *communas* should disappear. In table 2 below, we report the electoral results in 1957, 1961 and 1965 for *communas* with less and more *inquilinos* than the median.

INSERT TABLE 2 HERE

Over the period, right-wing votes in *communas* with less *inquilinos* fell by -17.0% while it fell by -29.7% in *communas* with more *inquilinos*. The impact of the loss of control over *inquilinos* votes on the fall in right-wing votes corresponds to the difference between these two figures, -12.7%. The model below aims to estimate this impact more precisely.

In Figure 1, we present simple OLS scatter plot of the relationship between right-wing votes and the proportion of inquilinos in each *communa*. The pattern is striking, as the impact of inquilinos on right-wing votes is significantly diminished after 1958.

INSERT FIGURE 1 HERE

4.3.2. The empirical model

We now present the model used in the empirical analysis. We let $RV_{i,t}$ represent the number of votes in favour of the right-wing party, $V_{i,t}$, the total number of voters, and $V_{i,t}^h$, the total number of voters of type h at time t in *communa* i.

[23] Hellinger (1978) analyzed electoral change in the Chilean countryside for the two presidential elections of 1958 and 1970, based on correlations from a restricted (and biased) sample of municipalities. He points out the gradual erosion of support for the Right as the correlation between the vote for the Nationalists as the proportion of inquilinos in the agricultural workforce fell. He however fails to provide a consistent explanation for this change in rural voting pattern.

Voters can be of three different types: $h = inq$ if the voter is an *inquilino*, $h = agr$ if the voter is not an *inquilino* but works in agriculture, and $h = na$ if he is not an agricultural worker. We can then write:

$$RV_{i,t} = (\theta_i + \rho_{I,t} + \tau_t^{inq})V_{i,t}^{inq} + (\theta_i + \rho_{I,t} + \tau_t^{agr})V_{i,t}^{agr} + (\theta_i + \rho_{I,t} + \tau_t^{na})V_{i,t}^{na} + \varepsilon_{i,t}V_{i,t} \quad (4.1)$$

where θ_i is a *communa* specific fixed effect, which represents the time-invariant propensity to vote for the right-wing party in that *communa*, $\rho_{I,t}$ is a provincial level fixed effect at each time period which represents the propensity to vote for the right-wing party in province I at time t, and τ_t^h represents the specific propensity for a voter of type h to vote for the right-wing party at time t. The error component, $\varepsilon_{i,t}$, satisfies the usual conditions. Rearranging equation (4.1) above, and using the fact that $V_{i,t} = V_{i,t}^{inq} + V_{i,t}^{agr} + V_{i,t}^{na}$, we obtain:

$$RV_{i,t} = (\rho_{I,t} + \tau_t^{na})V_{i,t} + (\tau_t^{inq} - \tau_t^{na})V_{i,t}^{inq} + (\tau_t^{agr} - \tau_t^{na})V_{i,t}^{agr} + (\theta_i + \varepsilon_{i,t})V_{i,t}.$$

Dividing both sides of the equation by $V_{i,t}$, one gets:

$$\frac{RV_{i,t}}{V_{i,t}} = (\rho_{I,t} + \tau_t^{na}) + (\tau_t^{inq} - \tau_t^{na})\frac{V_{i,t}^{inq}}{V_{i,t}} + (\tau_t^{agr} - \tau_t^{na})\frac{V_{i,t}^{agr}}{V_{i,t}} + (\theta_i + \varepsilon_{i,t}), \quad (4.2)$$

that potentially can be directly estimated. However, we have no information on the number of voters per category of occupation, $V_{i,t}^h$. In particular, it is unlikely that the proportion of registered *inquilinos* in the voting population is equal to the proportion of *inquilinos* in the total population in a particular *communa*. Moreover, even between 1957 and 1965, the number of registered voters in the population varied.

To address this issue, we assume that, in each *communa* i, the proportion of *inquilinos* who are registered to vote at time t is proportional to the proportion of *inquilinos* who are registered to vote at time t_0. Letting $N_{i,t}^{inq}$ and $N_{i,t}^{agr}$ represent the number of *inquilinos* and the number of other agricultural workers in *communa* i at time t, we then have:

$$\frac{V_{i,t}^{inq}}{N_{i,t}^{inq}} = \frac{V_{i,t}}{V_{i,t_0}}\frac{V_{t_0}^{inq}}{N_{t_0}^{inq}} \Leftrightarrow \frac{V_{i,t}^{inq}}{V_{i,t}} = \frac{V_{t_0}^{inq}}{N_{t_0}^{inq}}\frac{N_{i,t}^{inq}}{V_{i,t_0}}.$$

We therefore allow for the variation through time in the proportion of voters in a *communa* to differ across *communas*: $\frac{V_{i,t}}{V_{i,t_0}}$ is specific to *communa* i. However, to be able to identify the model, we assume that at time t_0, the probability that an *inquilino* is registered as an elector is identical across all *communas*. This is our major identification restriction. We similarly make that restriction for the other agricultural workers (though our main tests do not require this), so that:

$$\frac{V_{i,t}^{agr}}{V_{i,t}} = \frac{V_{t_0}^{agr}}{N_{t_0}^{agr}} \frac{N_{i,t}^{agr}}{V_{i,t_0}}.$$

Using these two expressions in equation (4.2), and rearranging those terms, we obtain:

$$\frac{RV_{i,t}}{V_{i,t}} = (\rho_{I,t}+\tau_t^{na})+\left((\tau_t^{inq}-\tau_t^{na})\frac{V_{t_0}^{inq}}{N_{t_0}^{inq}}\right)\frac{N_{i,t}^{inq}}{V_{i,t_0}}+\left((\tau_t^{agr}-\tau_t^{na})\frac{V_{t_0}^{agr}}{N_{t_0}^{agr}}\right)\frac{N_{i,t}^{agr}}{V_{i,t_0}}+(\theta_i+\varepsilon_{i,t}), \tag{4.3}$$

which represents the basic equation to be estimated. For further interpretation, it is convenient to rewrite the latter by introducing explicitly provincial dummies, D_I, (which is equal to 1 if *communa* i belongs to province I and zero otherwise) and time dummies for the three periods considered, 1957, 1961 and 1965. We then have:

$$\begin{aligned}\frac{RV_{i,t}}{V_{i,t}} &= \sum_I \rho_{I,\Delta 61} D_I t_{61} + \sum_I \rho_{I,\Delta 65} D_I t_{65} + \tau_{57}^{na} + \tau_{\Delta 61}^{na} t_{61} + \tau_{\Delta 65}^{na} t_{65} \\ &+\beta_{57}\frac{N_{i,t}^{inq}}{V_{i,t_0}} + \beta_{\Delta 61}\frac{N_{i,t}^{inq}}{V_{i,t_0}} t_{61} + \beta_{\Delta 65}\frac{N_{i,t}^{inq}}{V_{i,t_0}} t_{65} \\ &+\gamma_{57}\frac{N_{i,t}^{agr}}{V_{i,t_0}} + \gamma_{\Delta 61}\frac{N_{i,t}^{agr}}{V_{i,t_0}} t_{61} + \gamma_{\Delta 65}\frac{N_{i,t}^{agr}}{V_{i,t_0}} t_{65} + (\alpha_i + \varepsilon_{i,t}),\end{aligned} \tag{4.4}$$

where $\alpha_i = \theta_i + \sum_I \rho_{I,55} D_I$, represents the (total) *communa* level fixed effect. The basic test we want to carry out is the following. Before the secret ballot was introduced, $\beta_{57} > 0$ and $\beta_{57} > \gamma_{57}$ so that the right-wing party gets more vote in a *communa* with more *inquilinos* compared to other voters. The main impact of the electoral reform is that, after 1958, *inquilinos* can vote freely. We therefore expect $\beta_{\Delta 61} < 0$ and $\beta_{\Delta 65} < 0$, as the influence of *inquilinos* on the electoral results of

the right-wing party should fall significantly after 1958. Moreover, we may have $0 > \beta_{\Delta 61} \geq \beta_{\Delta 65}$ since it is likely that all political adjustments might not be instantaneous (we refer to this as the *persistence* effect). However, by 1965, we expect however that the *inquilinos* in 1965 vote like the other agricultural workers, so that $\beta_{57} + \beta_{\Delta 65} = \gamma_{57} + \gamma_{\Delta 65}$. This last expression represents our main empirical test.

4.3.3. The basic results

The information we have on *inquilinos* is only for the two agricultural census years 1955 and 1965. While the number of *inquilinos* in 1955 is a good proxy for the number of inquilinos in 1957, it is harder to make such an inference for the 1961 election. As a result, we shall first present our main estimates for the elections of 1957 and 1965 only, using the proportion of *inquilinos* in 1955 in the number of voters in 1957, and the proportion of inquilinos in 1965 in the number of voters in 1965 (and similarly for the other agricultural workers) as the R.H.S. variables. The results of the panel estimations, with a *communa* fixed effect, are given in the first three columns of Table 3 below. (The fixed effect technique was chosen because of the potential correlation between the *communa* fixed effect and the other explanatory variables.)

INSERT TABLE 3 HERE

Column (2) in the table corresponds exactly to equation (4.4) above. This equation allows provincial effects to vary with time. However, though this is useful as a robustness check, it is not clear that such effects should be time varying. We therefore chose to also estimate the model by imposing homogeneity on the evolution of the votes across provinces (electoral results vary in the same way in all provinces and are therefore picked by the year dummy), so that $\rho_{I,\Delta 61} = \rho_{I,\Delta 65} = 0, \forall I$. The results of the estimates under this assumption are presented as column (1) in the table, and in the following, we shall refer to the latter as the basic model. In column (3), we assume similar voting behavior from non-*inquilino* agricultural workers and all other voters in the commune, thereby imposing: $\tau_t^{agr} = \tau_t^{na}$. Columns (4) and (5) present the corresponding estimates obtained through pooled

OLS with a province fixed effect.

The results are striking, as they tend to confirm all the hypotheses made above. First, *communas* with more *inquilinos* are more likely to display stronger support in favour of the right-wing party in 1957. Thus, in 1957, in a *communa* where the share of *inquilinos* in the number of voters is greater by one standard deviation, 0.150, the expected share of the right-wing party is higher by 4.1%. This represents an relative increase in the right-wing votes of more than 12 % (=0.04/0.33).

Moreover, this influence completely disappears in 1965. The coefficient estimated, $\beta_{\Delta 65}$, is negative and significant, and $\beta_{57} + \beta_{\Delta 65}$ does not differ from $\gamma_{57} + \gamma_{\Delta 65}$ the corresponding coefficients for the other agricultural workers, nor from those of the other voters (i.e., 0). The imposition of secret ballot therefore had an important and significant effect, as the impact of *inquilinos* on right-wing votes vanishes in the 1965 elections. [24]

It must be noted here that the number of registered voters increased during those years. Our identification assumption implies that the proportion of *inquilinos* in the voting population of the municipality does not change over time. However, if it did change, because non *inquilinos* are much more likely to be registered in 1965 than in 1957, this can then potentially introduce a bias in our estimates if the registration of non-*inquilinos* is negatively correlated with the proportion of *inquilinos* in the voting population at time t_0. In this case the 1965 effect we are capturing may simply be the effect of an increase in registration that is biased against *inquilinos*. This is a difficult issue, to which we cannot provide a simple answer.[25] We have however tested an alternative model, where we assume that, across all *communas* and across time, the proportion of *inquilinos* who vote

[24] Although not reported here, the provincial dummies attached to the 'oligarchic' provinces of O'Higgins, Aconcagua and Colchagua are always significant for the 1965 elections (equal to -0.16, -0.19 and -0.27 respectively, all significant at the 1% level). (While we cannot estimate the provincial fixed effect for 1957 with the panel regressions, the corresponding estimates obtained with the pooled OLS for 1957 are 0.16, 0.27 and 0.34, all significant at the 1% level).

[25] Note however that what this argument points out is that the effect of the electoral reforms on the 1965 elections may be over-estimated. But it leaves unbiased the coefficients associated with the *inquilinos* before the reform.

remain constant. As a result, any increase in the proportion of registered voters takes place among non-*inquilinos* (an extreme version of the above argument). Assuming $V_{i,t}^{inq} = \phi N_{i,t}^{inq}$, and neglecting the potential difference in voting behavior between the two other classes, equation (4.3) becomes:

$$\frac{RV_{i,t}}{V_{i,t}} = (\rho_{I,t} + \tau_t^{ninq}) + \left((\tau_t^{inq} - \tau_t^{ninq})\phi\right) \frac{N_{i,t}^{inq}}{V_{i,t}} + (\theta_i + \varepsilon_{i,t}). \tag{4.5}$$

(Alternatively, with some additional assumptions, one can also reintroduce the agricultural workers as a separate category of voters.) The equation above can also be directly estimated, since the RHS variable is simply the number of *inquilinos* at time t divided by the number of voters at time t (instead of at time t_0 as in the basic model). We present the results of this alternative model in Table A3 in the Appendix, which again fully support our basic results.

The above estimates excluded the 1961 elections. The strategy we follow is then to use the proportion of *inquilinos* in 1955 as a good proxy for the number of *inquilinos* in all three elections. It also offers the advantage, since it predates the elections, of being (potentially) less endogenous than the 1965 data. In table 4 below, we report the panel estimates with a *communa* fixed effect on the right-wing party electoral outcomes, using the number of *inquilinos* in 1955. We once again ran three different estimates, reported as equations (4), (5) and (6), with similar alternative restrictions. We also report the results obtained using the pooled OLS technique. Note however that, with a panel fixed effect, we cannot estimate the coefficients attached to variables which remain constant over time, in particular that attached to the proportion of *inquilinos* in the number of registered voters in 1957. (It can be estimated with pooled OLS, but is potentially biased).

The results support the former estimates. The coefficients, and their standard errors, associated with the 1965 estimates are almost identical. For the 1961 elections however, the results are less conclusive, as the coefficient $\beta_{\Delta 61}$ associated with the *inquilinos* in 1961 is negative but is not systematically significant. This is probably due to the *persistence* effect, as one expects the impact of the electoral reform to develop more fully in 1965 than in 1961. (The coefficients associated with the 1961 election are indeed about one half of the corresponding 1965 values).

We also ran estimates for each election separately, using a simple OLS, the results of which are given in the Appendix (Table A2). There again, the coefficient associated with *inquilinos* in 1965, though still slightly positive, is significantly lower than the corresponding one for the 1957 election.

Finally, to further test the robustness of the above results, we also allowed for other indicators of the strength of patron-client relationships and of political control by a traditional landed oligarchy. Instead of using the proportion of voters of different types in the voting population, we used the proportion of *inquilinos* in the agricultural labour force in 1955 and 1965 (for the smaller sample excluding the 1961 electoral results) or 1955 (for the larger sample), as a measure of the intensity of the patron-client relationships in the *communa*, and a measure of land concentration, the share of area owned by farms larger than 200 hectares in the total agricultural area of the *communa* (again in 1955 and 1965 for the smaller sample, and in 1955 for the other).[26] We report the results of these estimations in table 4 below. The estimates, though less precise than in the basic model, are once again entirely consistent with our main hypotheses. It must however be noted that many coefficients associated with land concentration or agrarian relations in 1965 loose their significance when interacted time and provincial dummies are included in the model, though they remain consistently negative. This once again may be partly attributed to the multicollinearity with the interacted time and provincial dummies, as well as to the less precise nature of the indicators used.

INSERT TABLE 4 HERE

4.3.4. Christian-democrat and left-wing votes

We ran similar regressions using the vote share of left-wing parties as the dependent variable. One can indeed think that, after the introduction of the secret ballot, *inquilinos* are more likely to vote for those parties than for the more con-

[26]These land concentration measures are imprecise however, as the censuses only report at the communa level the number of farms per size category. By taking the median of each size class, we computed an estimate of the areas, that we used to compute the shares in area.

servative parties, which includes the right-wing parties and the Radical Party.[27] The estimates are given in table 5 below, and the results are once again supportive of our hypothesis. While, before 1958, the *communas* with a higher proportion of *inquilinos* tend to vote less in favour of the left-wing parties, this impact weakens in 1961, and completely disappears in 1965. The estimates are very robust from one model to another, and are almost all significant at the 1% level. Moreover, these results continue to hold even when alternative explanatory variables, such as land concentration or the share of *inquilinos* in the agricultural labor force are used (see columns (3), (4), (7), and (8)).

INSERT TABLE 5 HERE

4.3.5. The Impact of the 1958 Ballot Reform on Labor Contracts

As can be seen from Table 2 above, between 1955 and 1965, the proportion of *inquilinos* in the labour force fell by about one third from an average of 0.118 in 1955 to an average of 0.076 in 1965. The proportion of *inquilinos* in the voting population similarly fell from 0.126 in 1955-57 to 0.088 in 1965. Part of this fall might be part of a declining trend in long-term patron-client relationships in the countryside. However, the 1958 ballot reform plausibly reduced the attractiveness of such relationships, and undermined the strength of the landed oligarchy. In this respect, the correlation of those phenomena across provinces is significant. In the province of O'Higgins, right-wing votes fell from 47.4 to 21.8% of the votes, the area controlled by large farms fell from 73.6% to 53.1%, and the proportion of *inquilinos* in the agricultural labor force fell from 20.2 to 11.0. Or, in Colchagua, also located in the North Central Valley, right-wing votes fell from 70.2% in 1957 to 22.1% in 1965, while the proportion of *inquilinos* in the labour force fell from 20.4 to 12.0%. However, we could not develop a more formal test here as the impact of the electoral reform was not distinguishable from long term trends in

[27] This procedure also provides us with a test of our categorization of political parties (which we borrowed from Valenzuela, 1978), since estimates including the Radical Party as a right-wing party would be exactly the opposite of the ones reported here. We also ran regressions with the proportion of votes accruing to the Socialist and Communist Parties as the dependent variable, with similar results.

agrarian relations, nor from a 'reversal to the mean' effect.

4.4. The Economic Impact of the 1958 Ballot Reform: Land Prices

Our model also predicts that the electoral reforms of 1958 should lead to a fall in the price of land.[28] To examine this issue, we collected data from the most important national Chilean newspaper, *El Mercurio*, from August 1956 to December 1960. This newspaper has a large advertisement section each week which provides nation-wide announcements of farms offered for sale. While the content of the advertisements vary widely, we restricted our sample to those advertisements which explicitly provide the size of the farm (above 50 hectares), its price and its province of location.[29] We thus gathered information on 1117 farms proposed for sale over this period.

This procedure is subject to sample selection biases: the characteristics of the farms announced in *El Mercurio* might not correspond to the usual farms for sale in the countryside, and our collection strategy (farms advertised with enough information and larger than 50 hectares) might make the selection bias even more pronounced. Another concern is that inflation was high during this period, and we only had at our disposal the annual consumer price indices (or the index of agricultural prices which follows a very similar pattern). We therefore had to compute within each year (from 1 of July of year t to the 1 of July of year $t+1$) the average weekly inflation rate. We constructed a weekly consumer price index, which was then used to deflate the nominal price of land (1/7/56=100) to obtain the real price of land (real price per hectare), the variable of interest here.

Since the electoral reform law was promulgated on May 31, 1958, we first looked at the average price of one hectare of land before and after 31/5/58 according to the province of location. Table 6 summarizes this information. Note first that

[28]We found two published studies of the behavior of land prices in Chile over this period (CIDA, 1966, p. 343, and Hurtado et al., 1979) both of which find, as we do, significant falls in land prices after 1958. We do not emphasize the results of these studies because their samples and methodologies are unclear.

[29]Sizes came in two different measures, the hectare and the Chilean cuadra. We assumed here that one cuadra was equal 1.44 hectare. We attempted to avoid repeated announcements by deleting identical announcements within 18 months of the first announcement.

most land sales tend to be concentrated in the Urban Central Valley, the North Central Valley and the Frontier, which together represent 72 percent of the sales, though only 11 out of 25 provinces. This is a bit unfortunate, as to test the hypothesis that the price of land fell more in the Central Valley, we would ideally need enough observations from the other regions, such as the Great North, the Little North and the Canals regions (which together make up only 3.2 percent of the sales) to highlight contrasting patterns across regions.

This being said, land prices in real terms fell after 1958, from 170.9 pesos per hectare before 1958 to 108.8 pesos per hectare after. It is worth noting however that the fall is much more pronounced in the Urban Central Valley and the North Central Valley compared to the other regions.[30] Also noticeable is the hierarchy in land prices, with land being the most expensive in the Urban Central Valley followed by the North Central Valley.

INSERT TABLE 6 HERE

In Table 6, however, we do not properly control for the size of the farm and for the possibility of a time trend in land prices. We therefore ran regressions in order to investigate the existence of a structural break on the 31st of May, 1958. The basic model we estimated is the following:

$$P_i = \beta_0+\beta_1 X_i+\beta_2 X_i^2+\sum \beta_{3j} R_j+\sum \gamma_t T_t+\delta_0 D_i+\delta_1 X_i D_i+\delta_2 X_i^2 D_i+\sum \delta_{3j} R_j D_i+\varepsilon_i \tag{4.6}$$

where P_i stands for the price of land per hectare, X_i for the size of the farm in hectares, and X_i^2 for its square. R_j is a vector of regional dummies, which takes the value 1 if the farm belongs to the area j and zero otherwise, T_t is a year dummy, which takes the value one if the sale takes place in year t, and D_i is the reform dummy, which takes the value 1 if the sale is advertised after May 31, 1958, and zero otherwise. We once again used fixed effects, at the provincial level, so that we effectively compare the change in land prices within the same province.

The results of the estimation are given in Table 7, where model 1 just tests the overall fall in land prices after the reform, with province and year fixed effects.

[30] We leave out the case of the Little North as the trend there is driven by a couple of extreme observations.

It therefore imposes that $\delta_{3j} = 0$, for all j. Two results are worth emphasizing. First, there is a structural break in farm prices before and after May 31, 1958. The estimated fall in land prices is rather large, and equal to -67.0 pesos per hectare, a figure very close to the one obtained from Table 6. With a pre-1958 price of about 170 pesos, this implies that, after the reform, price fell by about one third, after controlling for the year and the province fixed effect. Second, farm size is irrelevant when it is interacted with the reform dummy, which can be explained by the fact that parcelling out for sale is always an available option.

INSERT TABLE 7 HERE

Models 2, 3 and 4 correspond exactly to the specification described above in equation (4.6). In model 2, we introduce a dummy for each of the 8 regions in Chile, interacted with the reform dummy (since we cannot estimate coefficients which are time invariant, such as the one attached to the regional dummy). From this it emerges that the post reform fall in land prices was not uniform across regions, but tended to be concentrated in the Urban Central Valley and the North Central Valley, the two regions we already singled out as the heart of the landed oligarchy. In models 3 and 4, we introduced instead the provincial fixed effect interacted with the reform dummy. Model 4 was estimated on a reduced set of observations, where we eliminated all farms below 200 hectares (there were 452 of them) and all farms above 5000 hectares (47 observations). In model 5, we used the same model as in 3, but with the log of farm size, instead of a quadratic specification. The results obtained are stable across these various alternative estimations.[31] Falling land prices tend to concentrate mostly in the provinces of Santiago, Curico and Talca (all three from the North Central Valley), and to a lower extent in O'Higgins, Linares, Nuble, Colchagua (all four in the Central Valley), and also Valdivia, Bio-Bio and Coquimbo (though, as we pointed out earlier, the latter estimate is unreliable, and rests upon a couple of extreme observations.). In these ten provinces, the average proportion of *inquilinos* in 1955 with respect to the number of voters in 1957 is 19.9%, while in the other 10

[31]Similar results were obtained when we introduced cubic and quartic terms in farm size, or a weekly trend, with no appreciable changes in the other coefficients.

provinces (for which we had at least one transaction recorded), it is only 11.1%.[32] It appears that the 1958 electoral reform had a stronger impact on the Central Valley provinces.

4.5. Alternative Hypotheses

It seems hard to imagine that there is a plausible alternative story which can explain the behavior of voting and land prices in Chile before and after 1958. However, there may be other possible interpretations of part of this evidence. Clearly, it is possible that real land prices might have fallen for several reasons apart from the fact that the secret ballot removed the political rents which had previously accrued to land ownership (and were capitalized in its value).

There is one other obvious main alternative hypothesis that accepts the fact that before 1958 electoral corruption stopped rural voters expressing their political preferences, but it emphasizes different mechanisms linking electoral reform to the data. This idea is that after electoral reform, a left-wing president and government was much more likely. Such a government would aim at redistributing income and assets, particularly land. Such redistribution, once anticipated, would clearly tend to reduce the attractiveness of holding land, thus leading to a fall in land prices. This hypotheses seems all the more convincing because we know ex post that agrarian reform became such an important political issue in the late 1960's and early 1970's in Chile.

We argue that this mechanism, though possibly present, is not really plausible, nor in fact consistent with all of our evidence. Since this hypothesis accepts the importance of voter control before 1958, it is however consistent with the empirical evidence we have shown connecting the right-wing vote share to the presence of *inquilinos*. Moreover, this hypothesis does seem able to predict falling land prices after 1958.

There are two main problems with it. Firstly, the Alessandri government between 1958 and 1964 was Conservative and did not adopt a redistributive agenda at all. Therefore the politics of this government cannot account for the fall in real

[32]This percentage falls to 7.7% if we take all the 15 provinces that were not listed in the text.

land prices. A clear piece of evidence on this is that after the 1958 election, the stock market actually rose! The real value of stocks declined continuously from the 1930's through to the coup of 1973, reaching its nadir with the election of Salvador Allende in 1970, most likely due to the increased intervention of the government in the economy (see Figure 2, as follows from Couyoumdjian, Millar, and Tocornal, 1992, p. 309) except in 1958, where the index increased slightly, before resuming its fall around 1966. This is directly contrary to the claim that asset prices were falling because of the anticipation of socialism. If this were true one would have expected a more rapid fall, not a rise.

INSERT FIGURE 2 HERE

Moreover, while agrarian reform had been occasionally discussed in Chile since the early 1920s, in the early 1960s, land redistributions were explicitly targeted towards unused or abandoned estates (under the 1962 Law 15020). Very little land was redistributed during this period, and 70% of the land thus affected came from abandoned state farms (40% from a single large state farm in Talca). As Kaufman underlines, "the Alessandri administration did initiate some legislation dealing with peripheral issues in the land-tenure problem ... But it pointedly avoided any approach to the question of expropriating and redistributing large private estates" (Kaufman, 1967, p. 9; see also Loveman, 1976). Land reform based on the size of properties only became a real issue in 1964-66 with the success of the Cuban revolution and the counterrevolutionary drive of United States foreign policy, particularly Kennedy's Alliance for Progress (see the discussion in Loveman, 1976, p. 220). The law was however voted only in July 1967, and its implementation started only in 1969. It is very unlikely that the anticipation of land reform could have been the factor depressing land prices in the late 1950's (see Swift, 1971, p. 68).

The second problem with this alternative hypothesis is that land concentration actually rose in 9 provinces between 1955 and 1965. It was only in the Central Valley provinces where the traditional oligarchy and patrón-*inquilino* relations were concentrated that land distribution became more egalitarian. This observation is important because the land reform legislation in 1967 in no way discriminated against the Central Valley provinces. While our theory does not explain why land

concentration increased in some provinces like Tarapacá, it is perfectly consistent with the fact that concentration went up (for example because of changes in technology). It seems implausible however that in provinces where land concentration was already extremely high, people anticipating land reform would purchase more land and form larger farms.

One can think of other hypotheses consistent with parts of our story. First, there might be a secular falling trend in land prices (though actually the evidence in Hurtado et. al., 1979, shows that deflated land prices rose steadily from the 1930's until the late 1950's). Our results show a negative trend in land prices (though over a very short period). Yet, that the fall tends to be more pronounced in exactly those provinces dominated by the landed oligarchy, directly supporting our hypothesis. Second, the fall in land prices after 1958 might be due to the fact that land was held as a hedge against inflation and, under the Alessandri government, the post 1958 period enjoyed much more monetary stability than the years before. As a result, landholders may have decided to sell the land they accumulated during the inflationary period, so that a general fall in land prices should occur after 1958. Once again, we cannot entirely disprove this other hypothesis, even though the fact that fewer land transactions occurred after 1958 argues against it (see Table 6).

5. Conclusions

In this paper we have investigated the effect of the absence of a secret ballot on electoral outcomes and its implications for resource allocation. Though political economists have begun to study the implications of political institutions for political and economic outcomes, no attention has been paid to the implications of the secrecy of the ballot. Once voting behavior is observable, votes can be bought and sold and we conceptualized this as the creation of a 'market for votes'. We distinguished between direct vote buying, where individuals sell their own votes to political parties, and indirect vote buying, where people also sell the votes of others. We showed that buying votes indirectly is cheaper for political parties because they do not have to compensate people for the disutility of voting against their

preference and we characterized the circumstances in which vote buying changes the electoral outcome. Further, we demonstrated that while direct vote buying is socially efficient, indirect vote buying is inefficient precisely because parties ignore the preferences of those whose votes they buy indirectly.

We then provided a microfoundation for why some individuals can sell the votes of others. The rents conceded by employers to workers gives the former a comparative advantage in controlling the political activities of the latter. This increases the demand for labor and generates an added incentive to own land, driving up its price. We tested the predictions of the model by examining in detail the effects of the introduction of the secret ballot in Chile in 1958. We show that, consistent with our theory, the political reforms led to large changes in voting behavior and reductions in land prices.

Our evidence suggests that political reformers are correct to worry about the secrecy of the ballot because it has first-order implications for resource allocation, political outcomes and social efficiency.

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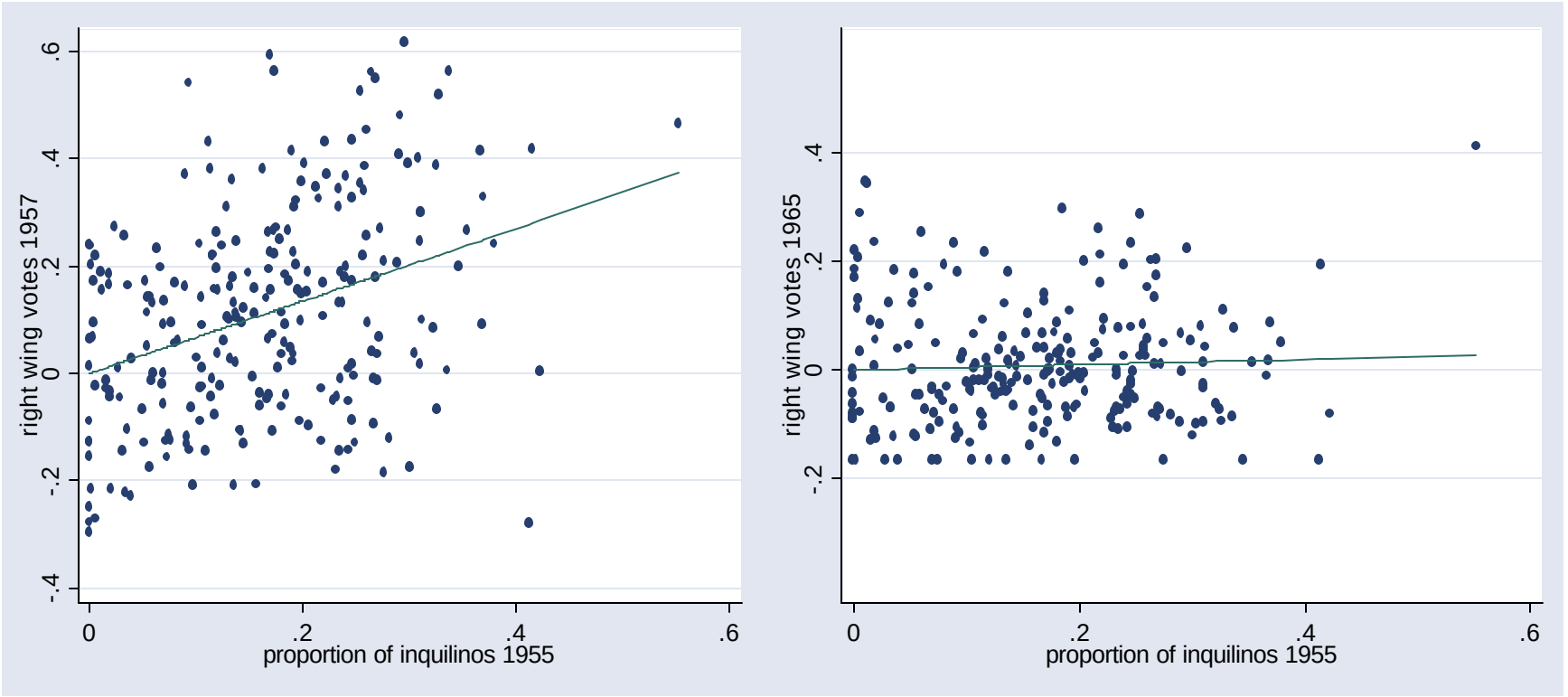
Appendix 1 Sources and methodology

'Agricultural workers' and 'inquilinos' are the total number of agricultural workers and the total number of *inquilinos* working in the agricultural sector in 1955 and 1964-5 respectively. Source: III Censo Nacional Agricola Ganadero, 1955, Vol. 1-6, Servicio Nacional de Estadistica y Censos, Republica de Chile; IV Censo Nacional Agro-pecuario 1964-65, Vol. 1-26, Direccion de Estadistica y Censos, Republica de Chile. 'Right-wing votes' is the proportion of votes in favor of the 'Conservador', 'Conservador Tradicionalista' and 'Liberal' parties in the total number of valid votes, in the parliamentary elections of 1957, 1961, and 1965 respectively; 'radical' refers to the proportion of votes in favor of the 'Radical' and 'Radical Doctrinario' parties in the total number of valid votes, in the parliamentary elections of 1957, 1961, and 1965 respectively; 'christian democrat' is the proportion of valid votes in favor of the 'Falangia Nacional' in 1957 and the 'Democrata Christiano' party for the years 1961, 1965 and 1969. The 'left' includes the proportion of valid votes in favor of the 'Communista', 'Socialista' and 'Socialista Popular' parties in 1957, 1961 and 1965 respectively. The regrouping of the political parties was made according to the methodology followed by Valenzuela (1978). The number of voters is the number of valid votes in the 1953 and 1957 elections. We chose parliamentary elections only because of their comparability across years and the stability of the major parties over the years. Presidential and Municipal elections in those years followed very closely the pattern followed by the parliamentary elections. Sources: Direccion del Registro Electoral, Election ordinaria de senadores y diputados al Congreso Nacional (periodo constitucional 1953-7), Chile; Direccion del Registro Electoral, Variacion Porcentual de los Partidos Politicos, 1957-1971, Chile.

Figure 1: Right-wing votes in 1957 and 1965 and the ratio of inquilinos to registered voters in 1955
(scatter plot and simple regression line)



Right57 = 0.319+ 0.523 Inq/voter55
(0.017)(0.078)

Right65 = 0.149+0.145 Inq/voter55
(0.010)(0.047)

Table 1: Agrarian relations, land concentration and electoral results in Chile

Region	Share of total area operated by farms over 200 has in 1930 (%)	Share of total area operated by farms over 200 has in 1955 (%)	Proportion of inquilinos in the labour force in 1955 (%)	Proportion of inquilinos in the labour force in 1965 (%)	Proportion of inquilinos in the number of registered voters (1955-57) (%)	Proportion of right-wing votes in 1957 elections (%)	Proportion of right-wing votes in 1961 elections (%)	Proportion of right-wing votes in 1965 elections (%)	Proportion of christian-democrat and left-wing votes in the 1957 elections (%)	Proportion of christian-democrat and left-wing votes in the 1965 elections (%)
North Central Valley (O'Higgins, Colchagua, Curico, Talca)	86.4	75.7	19.6	12.0	18.9	50.0	36.2	17.3	12.4	61.6
Urban Central Valley (Valparaiso, Santiago, Aconcagua)	93.3	88.5	19.1	11.8	17.2	40.8	35.0	16.0	17.7	67.2
South Central Valley (Maule, Linares, Nuble)	72.5	60.1	12.7	8.2	14.6	40.5	31.4	17.2	8.9	48.4
All Central Valley Provinces	84.3	74.9	17.4	10.8	17.1	44.4	34.4	16.9	13.1	59.3
Frontier and Little North Provinces (Concepcion, Bio-bio, Arauco, Malleco, Cautin, Atacama, Coquimbo)	85.7	68.9	10.8	5.9	11.2	31.2	25.7	11.8	22.3	59.4
All other provinces (Valdivia, Osorno, Llanquihue, Chiloe, Aysen, Magallanes, Tarapaca, Antofagasta)	82.2	69.4	5.7	5.2	8.2	26.6	26.5	15.1	24.4	57.9
Chile (average across all provinces)	84.0	71.4	11.8	7.6	12.6	35.0	29.4	14.8	19.2	58.9

Note: For the Santiago province, we excluded the four exclusively urban disctricts of the city of Santiago. The averages are computed by giving an equal weight to each province.

Table 2: Impact of agrarian relations on right-wing votes before and after the 1958 electoral reform

	1957	1961	1965	Difference 65-55
Ratio of inquilinos to the number of registered voters in 1955 below median (<0.134)	0.336	0.318	0.166	-0.170
Ratio of inquilinos to the number of registered voters in 1955 above median	0.478	0.386	0.181	-0.297
Difference	0.132	0.068	0.015	**-0.127**

Table 3: Impact of agrarian relations on right-wing votes: the basic model

Dependent variable is	the proportion of votes for the right-wing parties in the 1957 and 1965 congressional elections (standard errors under brackets)					the proportion of votes for the right-wing parties in the 1957,1961 and 1965 congressional elections (standard errors under brackets)				
	Panel, communa fixed effect			Pooled OLS		Panel, communa fixed effect			Pooled OLS	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(8)	(9)
Inq/voter	0.270** (0.134)	0.198* (0.116)	0.190* (0.114)	0.533*** (0.061)	0.451*** (0.062)					
Inq/voter* 1965dummy	-0.386*** (0.081)	-0.271*** (0.083)	-0.286*** (0.067)	-0.318*** (0.118)	-0.245*** (0.091)					
Inq/voter55						___	___	___	0.530*** (.060)	0.452*** (0.064)
Inq/voter55* 1961dummy						-0.220*** (0.062)	-0.131** (0.063)	-0.101* (0.059)	-0.217*** (0.077)	-0.133 (0.091)
Inq/voter55* 1965dummy						-0.428*** (0.062)	-0.274*** (0.063)	-0.270*** (0.059)	-0.426*** (0.077)	-0.276*** (0.091)
Agnoninq/voter	-0.082*** (0.025)	-0.013 (0.024)	No	-0.022** (0.010)	-0.002 (0.011)					
Agnoninq/voter* 1965dummy	0.047*** (0.011)	0.004 (0.012)	No	0.045*** (0.013)	0.002 (0.013)					
Agnoninq/voter55						___	___	___	-0.019* (0.010)	-0.002 (0.011)
Agnoninq/voter55* 1961dummy						0.025*** (0.010)	0.014 (0.011)	No	0.026** (0.012)	0.014 (0.016)
Agnoninq/voter55* 1965dummy						0.041*** (0.010)	0.002 (0.011)	No	0.042*** (0.012)	0.002 (0.016)
Time dummy:1961	___	___	___	___	___	-0.045*** (0.016)	-0.059 (0.040)	-0.048 (0.040)	-0.046** (0.020)	-0.058 (0.059)
Time dummy:1965	-0.198*** (0.019)	-0.159*** (0.046)	-0.161*** (0.044)	-0.208*** (0.019)	-0.168*** (0.057)	-0.205*** (0.016)	-0.164*** (0.040)	-0.162*** (0.040)	-0.206*** (0.020)	-0.164*** (0.059)
Provincial dummies	___	___	___	Yes	Yes	___	___	___	Yes	Yes
Provinc.*time dummies	No	Yes	Yes	No	Yes	No	Yes	Yes	No	Yes
# obs.	492	492	492	492	492	738	738	738	738	738
R^2 adj	0.707	0.834	0.834	0.620	0.681	0.624	0.780	0.779	0.567	0.621

Note: ***indicates significance at the 1% level, ** at the 5% level and * at the 10% level. For panel fixed effect estimates, we report the within R-square.

Table 4: Impact of agrarian relations on right-wing votes: alternative models

The dependent variable is:	the proportion of votes for the right-wing parties in the 1957 and 1965 congressional elections (panel, communa fixed effect, standard errors under brackets)				the proportion of votes for the right-wing parties in the 1957,1961 and 1965 congressional elections (panel, communa fixed effect, standard errors under brackets)			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Inq/agric	0.544*** (0.134)	0.176 (0.127)						
Inq/agric* 1965dummy	-0.766*** (0.176)	-0.259 (0.178)						
Inq/agric55					___	___		
Inq/agric55* 1961dummy					-0.350*** (0.086)	-0.149 (0.094)		
Inq/agric55* 1965dummy					-0.630*** (0.086)	-0.207** (0.094)		
Large farms			0.182* (0.096)	0.046 (0.084)				
Large farms* 1965dummy			-0.181*** (0.051)	-0.010 (0.050)				
Largefarms55							___	___
Largefarms55* 1961dummy							-0.131*** (0.043)	-0.034 (0.042)
Largefarms55* 1965dummy							-0.181*** (0.043)	-0.017 (0.042)
Time dummies	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Provincial dummies	___	___	___	___	___	___	___	___
Time dummies *provincial dummies	No	Yes	No	Yes	No	Yes	No	Yes
# obs	492	492	492	492	738	738	738	738
within R^2	0.698	0.824	0.665	0.821	0.621	0.772	0.596	0.769

Note: ***indicates significance at the 1% level, ** at the 5% level and * at the 10% level.

Table 5: Impact of agrarian relations on christian-democrat and left-wing votes

Dependent variable is	the proportion of votes for the christian-democrat and the left-wing parties in the 1957 and 1965 congressional elections (panel, communa fixed effect)				the proportion of votes for the christian-democrat and the left-wing parties in the 1957,1961 and 1965 congressional elections (panel, communa fixed effect)			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Inq/voter	-0.196 (0.129)	-0.104 (0.194)						
Inq/voter*1965dummy	0.338*** (0.078)	0.205*** (0.074)						
Inq/voter55*1961dummy					0.136** (0.058)	-0.035 (0.057)		
Inq/voter55*1965dummy					0.314*** (0.058)	0.150*** (0.057)		
Inq/agric			-0.384*** (0.127)					
Inq/agric* 1965dummy			0.781*** (0.167)					
Inq/agric55* 1961dummy							0.223*** (0.081)	
Inq/agric55* 1965dummy							0.536*** (0.081)	
Large farms				-0.167* (0.091)				
Large farms* 1965dummy				0.149*** 0.048				
Largefarms55* 1961dummy								0.080** (0.040)
Largefarms55* 1965dummy								0.150*** (0.040)
Agnoninq/voter*time dumy	Yes	Yes	___	___	Yes	Yes	___	___
Time dummy:1961	___	___	___	___	0.169*** (0.015)	0.196*** (0.037)	0.133*** (0.016)	0.110*** (0.031)
Time dummy:1965	0.412*** (0.018)	0.363*** (0.041)	0.317*** (0.019)	0.0302*** (0.037)	0.413*** (0.015)	0.359*** (0.037)	0.327*** (0.016)	0.301*** (0.031)
Provincial *time dummies	No	Yes	No	No	No	Yes	No	No
# obs.	492	492	492	492	738	738	738	738
Adj R^2	0.885	0.943	0.884	0.873	0.840	0.912	0.839	0.831

Note: standard errors under brackets, ***indicates significance at the 1% level, ** at the 5% level and * at the 10% level.

Table 6: Real price per hectare before and after the electoral reform (May 1958)

	Land prices before the reform (standard errors between brackets)	Land prices after the reform (standard errors between brackets)	Average proportion of inquilinos in 1955 in the number of registered voters in 1957	Number of observations before the reform	Number of observations after the reform
Great North (Tarapaca, Antofagasta) and Little North (Atacama, Coquimbo)	173.4 (219.9)	46.5 (58.9)	0.041	17	10
Central Urban Valley (Valparaiso, Santiago, Aconcagua)	312.7 (311.8)	213.3 (210.0)	0.172	136	117
North Central Valley (Ohiggins, Colchagua, Curico, Talca)	220.0 (220.0)	119.6 (125.0)	0.189	138	152
South Central Valley (Maule, Linares, Nuble)	119.3 (120.9)	79.7 (59.1)	0.146	84	69
The Frontier (Concepcion, Bio-bio, Arauco, Malleco, Cautin)	70.9 (68.7)	58.8 (98.6)	0.125	157	109
The Lakes (Valdivia, Osorno, Llanquihue) and the Canals (Chiloe, Aysen, Magallanes)	56.4 (52.9)	31.9 (45.3)	0.108	53	75
Chile	170.9 (217.1)	108.8 (144.3)	0.126	585	532

Table 7: Real Prices per hectare before and after the reform (May 1958)

	Real Prices per hectare before and after the reform (May 1958) Panel estimate with a province fixed effect				
	(1)	(2)	(3)	(4)	(5)
Farm size	-0.020*** (0.003)	-0.019*** (0.003)	-0.019*** (0.003)	-0.085*** (0.017)	LOG -60.48*** (4.66)
Farm size*reform dummy	0.007* (0.004)	0.007 (0.005)	0.006 (0.005)	0.009 (0.027)	LOG 15.9** (7.19)
Square of farm size	2.38e-07*** (4.77e-08)	2.25e-07*** (4.81e-08)	2.21e-07*** (4.87e-08)	11.8e-06*** (4.31e-06)	___
Square of farm size*reform dummy	-1.02e-07 (7.38e-08)	-8.51e-08 (7.51e-08)	-7.59e-08 (7.64e-08)	2.35e-06 (7.24e-06)	___
Reform dummy	-67.0*** (19.0)				
Little North*reform dummy (Coquimbo only)		-132.6* (74.9)			
Coquimbo*reform dummy			-127.1* (75.1)	-122.8** (56.9)	-177.9** (83.0)
Central Valley Urban*reform dummy		-108.4*** (25.0)			
Aconcagua*reform dummy			-66.9 (71.9)	-79.6 (58.7)	-150.4* (80.4)
Valparaiso*reform dummy			33.4 (62.3)	-43.2 (58.2)	-81.7 (68.9)
Santiago*reform dummy			-129.1*** (26.7)	-140.6*** (25.9)	-215.7*** (43.6)
North Central Valley*reform dummy		-88.6*** (25.4)			
O'Higgins*reform dummy			-67.7 (46.9)	-120.8*** (41.1)	-167.3*** (58.8)
Colchagua*reform dummy			-61.6 (51.2)	23.2 (41.9)	-173.1*** (60.5)
Curico*reform dummy			-79.9** (39.5)	-34.1 (32.2)	-144.4*** (53.3)
Talca*reform dummy			-105-6*** (36.0)	-102.5*** (29.2)	-198.6*** (51.7)
South Central Valley		-40.3			

***reform dummy**		(31.5)			
Maule			-13.5 (66.7)	-31.1 (56.9)	-128.7* (73.2)
Linares			-89.6 (54.9)	-164.5*** (45.1)	-148.2** (63.0)
Nuble			-18.6 (39.1)	-66.2** (29.4)	-113.8** (54.8)
The Frontier*reform dummy		-7.8 (26.2)			
Concepcion*reform dummy			-4.3 (59.3)	-29.1 (39.1)	-84.6 (67.5)
Bio-Bio*reform dummy			-35.9 (41.6)	-57.0* (30.2)	-128.3** (57.6)
Arauco*reform dummy			-104.0 (131.4)	-30.5 (79.2)	-165.1 (130.3)
Malleco*reform dummy			41.1 (40.8)	-47.2 (32.2)	-62.0 (57.5)
Cautin*reform dummy			-7.9 (45.7)	-42.5 (31.6)	-106.0* (60.8)
The Lakes*reform dummy		-39.6 (34.8)			
Valdivia*reform dummy			-32.7 (39.2)	-42.8 (29.9)	-118.7** (59.6)
Osorno*reform dummy			-41.9 (74.0)	-60.3 (45.5)	-127.1 (82.8)
Llanquihue*reform dummy			-28.1 (104.5)	-29.0 (67.2)	-131.2 (108)
The Canals*reform dummy (Chiloe only)		-8.7 (13.51)			
Chiloe*reform dummy			-1.26 (171.6)	-30.4 (97.4)	-152.8 (167.4)
Year dummies	Yes	Yes	Yes	Yes	Yes
Number of observations	1117	1117	1117	618	1117
Within R-square	0.106	0.120	0.129	0.240	0.244

Figure 2. Chilean Real Stock Market Index, 1928-1978

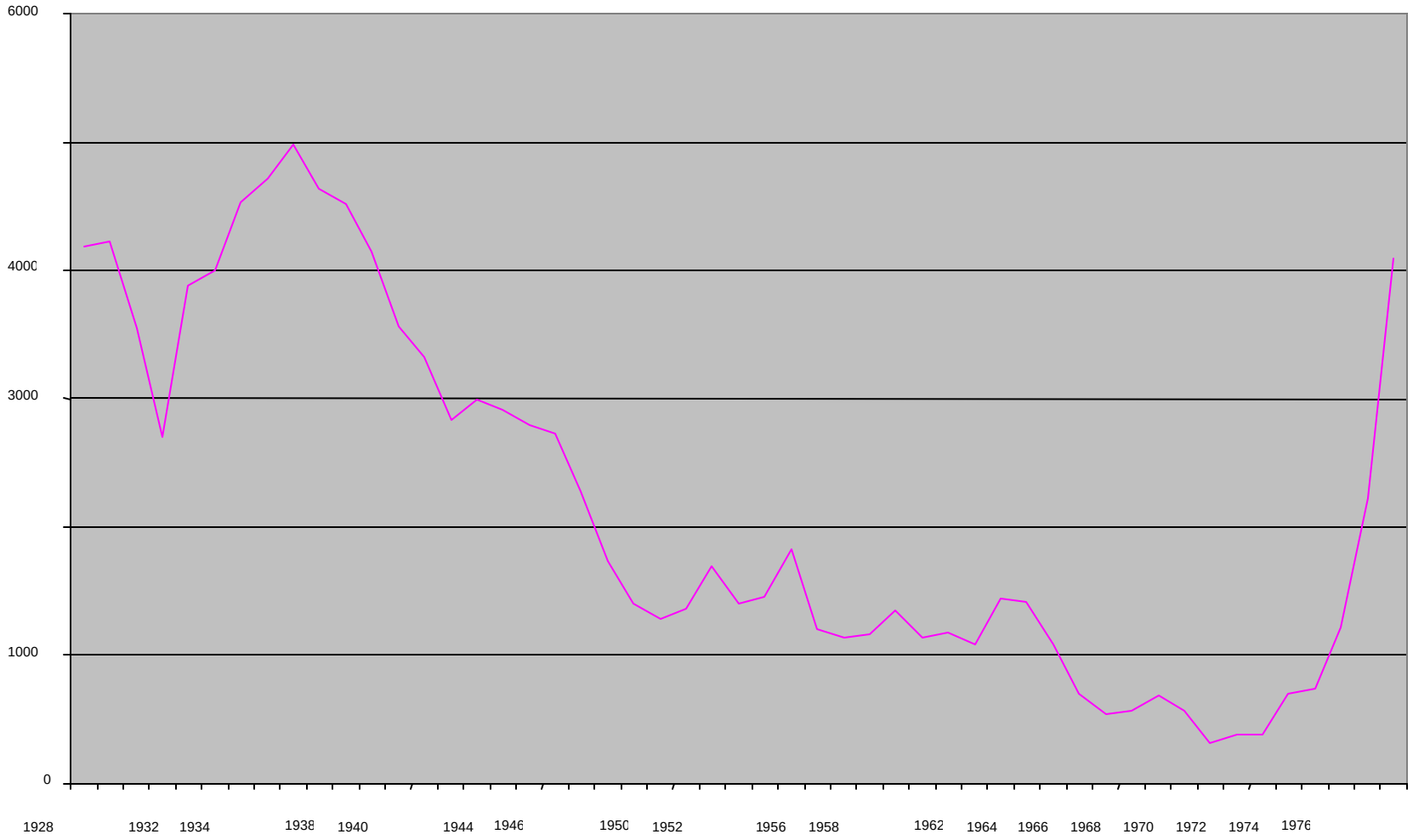


Table A1: Description of the main variables used in section 5

Variable	# obs.	Mean	Standard Dev.	Median	Minimum	Maximum	Variable name
Right-wing votes in 1957	246	0.407	0.195	0.399	0	0.914	Right57
Right-wing votes in 1961	246	0.352	0.160	0.337	0	0.846	Right61
Right-wing votes in 1965	246	0.174	0.111	0.156	0	0.577	Right65
Left and Christian-Democrat votes in 1957	246	0.161	0.141	0.123	0	0.778	Left57
Left and Christian-Democrat votes in 1961	246	0.330	0.134	0.330	0.041	0.792	Left61
Left and Christian-Democrat votes in 1965	246	0.575	0.140	0.492	0.212	0.891	Left65
Ratio of inquilinos in 1955 to the number of registered voters in 1957	246	0.168	0.147	0.134	0	0.761	Inq/voter55
Ratio of inquilinos in 1965 to the number of registered voters in 1957	246	0.153	0.150	0.114	0	1.116	Inq/voter65
Ratio of inquilinos in 1955 and 1965 to the number of registered voters in 1957	492	0.160	0.148	0.123	0	1.116	Inq/voter
Proportion of inquilinos in the agricultural labour force in 1955	246	0.162	0.104	0.167	0	0.552	Inq/agric55
Proportion of inquilinos in the agricultural labour force in 1965	246	0.088	0.059	0.078	0	0.327	Inq/agric65
Ratio of other agricultural workers in 1955 to the number of registered voters in 1957	246	1.069	0.929	0.833	0.000	6.572	Agnoninq/voter55
Ratio of other agricultural workers in 1965 to the number of registered voters in 1957	246	1.743	1.278	1.495	0.007	8.065	Agnoninq/voter65
Ratio of other agricultural workers in 1955 and 1965 to the number of registered voters in 1957	492	1.406	1.166	1.131	0.000	8.065	Agnoninq/voter
Share of total area operated by farms over 200 has in 1955	246	0.749	0.217	0.800	0	1.000	Largefarms55
Share of total area operated by farms over 200 has in 1965	246	0.706	0.223	0.756	0	0.998	Largefarms65
Share of total area operated by farms over 200 has in 1955 and in 1965	492	0.728	0.221	0.784	0	1.000	Largefarms

Table A2: Impact of agrarian relations on electoral results for each separate election (OLS, standard errors under brackets)

	Right-wing votes in 1957		Right-wing votes in 1961		Right-wing votes in 1965		Change in right-wing votes between 1965 and 1957	
	(A1)	(A2)	(A3)	(A4)	(A5)	(A6)	(A7)	(A8)
Inq/voter55	0.537***	0.452***	0.320***	0.319**	0.112**	0.176***	-0.426***	-0.276***
	(0.080)	(0.079)	(0.067)	(0.068)	(0.047)	(0.040)	(0.071)	(0.070)
Agnoninq/voter55	-0.013	-0.002	0.0133	0.012	0.029***	-0.000	0.042***	0.002
	(0.013)	(0.014)	(0.011)	(0.012)	(0.007)	(0.007)	(0.011)	(0.012)
Provincial dummies	No	Yes	No	Yes	No	Yes	No	Yes
# obs.	246	246	246	246	246	246	246	246
Adj R^2	0.152	0.477	0.094	0.414	0.087	0.588	0.146	0.474

Note: ***indicates significance at the 1% level, ** at the 5% level and * at the 10% level.

Table A3: Impact of agrarian relations on right-wing votes under an alternative identification restriction

The dependent variable is the proportion of votes for the right-wing parties in the 1957 and 1965 congressional elections (standard errors under brackets) Panel, communa fixed effect				
	(A9)	(A10)	(A11)	(A12)
$Inq_t/voter_t$	0.335*** (0.124)	0.274*** (0.104)	0.350*** (0.126)	0.267** (0.108)
$Inq_t/voter_t$ * 1965dummy	-0.428*** (0.137)	-0.270** (0.124)	-0.530*** (0.154)	-0.313** (0.147)
$Agnoninq_t/voter_t$			-0.034* (0.020)	0.006 (0.020)
$Agnoninq_t/voter_t$*1965dummy			0.045*** (0.027)	0.006 (0.015)
Time dummy:1965	-0.169*** (0.016)	-0.162*** (0.044)	-0.207*** (0.019)	-166*** (0.046)
Provincial*time dummies	No	Yes	No	Yes
# obs.	492	492	492	492
R^2 adj	0.683	0.834	0.701	0.834

Note: ***indicates significance at the 1% level, ** at the 5% level and * at the 10% level. For panel fixed effect estimates, we report the within R-square.


PERU
BOLIVIA
TARAPACA
GREAT NORTH
ANTOFAGASTA
ATACAMA
ARGENTINA
LITTLE NORTH
PACIFIC OCEAN
COQUIMBO
ACONCAGUA
VALPARAISO
CENTRAL URBAN•
SANTIAGO
COLCHAGUA
O'HIGGINS
NORTH CENTRAL
CURICO
MAULE
TALCA
LINARES
SOUTH CENTRAL
CONCEPCION
ÑUBLE
BIO-BIO
ARAUCO
MALLECO
THE FRONTIER
CAUTIN
VALDIVIA
THE LAKES
OSORNO
LLANQUIHUE
CHILOE
AISEN
THE CANALS
MAGALLANES