

Strategic Registration of Voters: The Chilean Case

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Abstract

In this paper we study the incentives for electoral registration in a system in which registration is costly. We argue that, if the voting behavior of some voters is controllable, then more easily controlled voters are also more likely to be registered resulting in a large impact of vote controlling on election results. Reducing the control on votes (for instance with the adoption of a secret ballot) only partially reduces the bias in registration, as scarcely motivated voters will be always easy to control. We test the predictions of the model by examining in detail the effects of the introduction of the secret ballot in Chile in 1958.

JEL classification: D72, D82, J41, K39

1 Introduction

In this paper we investigate the connection between employment and political control. In particular, we explore the role played by electoral registration in this nexus. Many employment relationships concede rents to workers, for instance, when worker's effort is imperfectly observable by the employer. It has been shown that these rents may allow employers, depending on the political institutions in place, to control their voting behavior (Baland and Robinson, 2008). This occurs particularly in the absence of a secret ballot. When voting is not secret, it becomes feasible to coerce votes. Several cases have been reported in the literature in which employers control the votes of their employees and supply them to parties in exchange for money, favors or policies. In agrarian economies landlords influenced or even directly controlled the voting behavior

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of their workers sometimes crucially determining election outcomes where vote secrecy was not guaranteed¹.

In the absence of an effective secret ballot, the ballots have frequently subtle but distinct marks across parties, such as paper thickness, color and size, from which the voter's decision is easily detected. Once this information reaches the local lords (in agrarian societies notably the landlords) punishment can be inflicted upon the deviating voters. Similar tactics have been in use up to the present day in democratic third world countries².

Baland and Robinson (2008) describe the mechanism which allowed Chilean landlords to control the political behavior of their long-term tenants (*inquilinos*). In particular, they show that before the introduction of the secret ballot in 1958, landlords were able to control their workers and thereby to influence election results to the advantage of the Conservative and Liberal parties. After 1958, the secrecy of the vote reduced this control and increased the votes gained by the Christian Democrats first and the left parties.

This paper originates as an extension or a qualification of these results. We argue that the effects documented in Baland and Robinson (2008) result at least partially from the existence of a bias in electoral registration. The power that landlords had on their lands led in fact to a distortion in registration incentives. Indeed, landlords were able to control *inquilinos'* votes. Additionally, they forced all their *inquilinos* to register in the electoral lists. We show that if registration is costly, all *inquilinos* controlled by the landlord are likely to register because they fear losing their job otherwise, whereas among independent farmers only individuals who derive a sufficiently high utility from voting register.

We develop a simple model of labor contracting assuming moral hazard and limited liability of the contracted tenants. Landlords find it optimal to concede rents to *inquilinos* to induce optimal effort in agricultural production. These rents place *inquilinos* in a privileged status (as compared to the outside option) and allow landlords to force them to register in the electoral lists at their own cost and to vote for the landlord's preferred party. The price for the *inquilinos* to pay in case of non-compliance is the loss of their privileged status.

The theoretical model generates predictions about electoral registration, which can be tested by investigating the impact of the introduction of the secret ballot in 1958. This makes individual voting behavior and consequently any individual targeted punishment impossible, reducing landlords' control. We show in section 3 that the empirical predictions of our model are consistent with the data.

The incidence of secret balloting has been studied by the literature on political economy and institutions (e.g. Cox 1997; Persson and Tabellini, 2000,

¹See for instance Kitson-Clark (1951) for Britain, O'Gorman (1989) for Andalucia, and Blackburn (1988), Gibson and Blinkhorn (1991), Bendix (1964), and Hamerow (1974) for Germany.

²Baland and Robinson (2008) report examples particularly focusing on Latin America. For instance, in Colombia, an effective secret ballot (*tarjetón*) was legislated only in 1988 and introduced two years later in the 1990 election.

2003; Acemoglu and Robinson 2006). However, the existing theoretical papers focus on different issues (mainly the efficiency of government policies) than those we study. Several studies have also investigated the impact of the cost of voting (including cost of registration) on turnout (e.g. Wolfinger and Rosenstone, 1980; Powell, 1986; Riker and Ordeshook, 1968), but to our knowledge no study relates this with the effects of an open ballot.

The case study literature on the secret ballot focuses mainly on coercion and corruption and has pointed out that this can lead to systematic biases in election results. In the Chilean case, scholars such as Loveman (1976), Scully (1992) or Bauer (1995), have reported the significance of *inquilinos* for the political power of the right parties (Conservative and Liberals) before 1958. They also suggest a link between the introduction of the secret ballot and the 1970 election result, which brought the socialist candidate Allende to the presidency. Recently, Baland and Robinson (2008) provided both the microfoundations for the reason why landlords control voting behavior and the first systematic tests for the effects of 1958 reform on electoral results in Chile.

Our contribution is showing both theoretically and empirically that the effect of an open ballot on electoral results may derive not only from the direct control of employers on the vote of their workers but also largely from the effects on voters' registration. Focusing on the Chilean case, not only *inquilinos*' votes were controlled by landlords. *Inquilinos* were also more likely to be registered as voters as compared to the rest of the population, increasing the share of total votes influenced by the landlords.

Finally, this paper relates also with the literature on moral hazard in teams, which investigates optimal contracting in settings characterized by moral hazard issues, in which the principal can only observe agents' aggregate output (Holmstrom, 1982; Eswaran and Kotwal, 1985; Mathewson and Winter, 1985 and Lal, 1990; Demski and Sappington, 1991). After the introduction of secret ballot, individual voting behavior is no longer observable, but the landlord can still use the aggregate electoral output to build a collective punishment scheme after which everybody in the farm is punished if "too many wrong" votes emerge in the electoral district. We provide the sufficient conditions under which the full control of the *inquilinos*' votes is no longer the optimal strategy for the landlord. And yet, we argue that the landlord will keep registering all his tenants even under the secret ballot. By doing so, the least politically motivated tenants, who are the easiest to manipulate, remain in the electorate.

The remainder of the paper is organized as follows. We present our theoretical model in Section 2. The existence of a bias in registration under open ballot elections is proved in Section 2.1. Section 2.2 discusses the effect of the introduction of a secret ballot and considers the issue of collective punishment. The predictions of the model are tested in Section 3 on Chilean data. Section 4 concludes.

2 The Model

We set up a model to describe the incentives at work. A unique electoral district is constituted by n farmers and m middle-class individuals who have to register at a cost $c < 1$ in order to vote. The political system is constituted by three parties: left (L), center (C) right (R). Middle-class individuals vote for C , whereas farmers prefer L with probability p and R with probability $(1 - p)$.

Individuals derive utility $\sigma \sim U[0; 1]$ from voting for their preferred party.

In other words, there is a continuum of individuals in terms of political motivation. Accordingly, the most ideologically motivated voters derive an utility of 1 from voting for their preferred party. Formally the utility for the generic voter j with of voting for her own preferred party is:

$$U_j = \sigma_j - c \tag{1}$$

The political orientation and the level of motivation (σ) can not be deduced before the vote is expressed. Furthermore, we consider a single landlord, who derives a profit Π if R reaches the government. Think of Π as the profit derived from favorable policies implemented by R ³. Assume a proportional electoral system in which the probability for party R to form the government is determined by the share of votes gained, $\frac{v_R}{v_R+v_L+v_C}$, where v_R , v_L , and v_C are the number of votes cast for the R , L , and C parties, respectively (Baron and Diermeier, 2001)⁴. The *political* utility of the landlord is then described by the following equation:

$$U_l = \frac{\Pi v_R}{v_R + v_L + v_C} \tag{2}$$

From (2) we can derive the utility for the landlord to force a non R voter to vote for R which equals $\frac{\Pi}{v_R+v_L+v_C}$.

All farmers can gain an income w from their independent activity on the land. A given amount of farmers denoted by i (with $i < n$) are hired by the landlord as long-term tenants.

We make some assumptions on the nature of this contract. Effort in production is not observable by the landlord and agricultural output is characterized by uncertainty. Furthermore, we assume limited liability of the long-term tenants entering the contract. These features lead to a classical moral hazard issue. The landlord has to offer a higher wage w_o to their tenants to give them the incentive to provide the optimal effort in production⁵. We assume this rent to

³The correspondent profit derived from farmers in case the government is formed by their preferred party is normalized to 0. It seems natural to create this asymmetry between the profit derived from the landlord and from the farmers given the larger dispersion of interests among the latter.

⁴This mirrors the practice in a multiparty proportional system like Chile in the 1950s.

⁵We do not explicitly model the part of the contract dealing with moral hazard in production as it is well established in the literature and it does not add insights to our results. For the interested reader a general reference on optimal contract in presence of uncertainty is chapter 4 in Bolton and Dewatripont (2005). Baland and Robinson (2008) explicitly model the optimal contract in the setting studied here.

be larger than the highest utility of voting. Formally:

Assumption 1. $w_o - \underline{w} \geq 1$

In a politically relatively inactive rural context this represents a reasonable assumption: poor farmers, living in a context in which no real political campaigning occurs, probably care less about politics than about the economic situation of their household. Relaxing this assumption would qualitatively not change the main results as long as the rent is positive.

2.1 Registration under Open Ballot Regime

If the electoral system is characterized by an open ballot regime, voting behavior is observable at the individual level. That happens for instance when each party is allowed to print and distribute its own ballot showing different features (e.g. color, thickness, size). At the polls anybody can observe the ballot paper cast by any single voter, making vote secrecy virtually impossible.

We capture this feature in our model making individual voting behavior observable and consequently contractable.

We can now explicitly give the timing of the model:

1. Production occurs both on the landlord's and on farmers' lands.
2. Registration and elections take place. Individual votes are observed.
3. Payoffs \underline{w} and w_o are distributed.

What would the optimal contract offered by the landlords under this scenario look like? As voting behavior is individually observable the contract specifies that the long-term tenants will have to register in the electoral lists at their own expenses and vote for the landlord's preferred party, i.e. the R party. Such a contract has to fulfill some conditions. The incentive compatibility and participation constraints for farmers supporting the L party are as follows:

$$IC : \quad w_o - c \geq \max[\sigma - c; 0] \tag{3}$$

$$PC : \quad w_o - c \geq \underline{w} + \max[\sigma - c; 0] \tag{4}$$

The LHS of (3) describes the utility of the tenant when behaving according to the contract, i.e. when registering at her own expenses and voting for the R party. The tenants receive the wage proposed and incur the cost of registration. Since she votes for R , no extra utility is derived from voting. In order for tenants not to misbehave this utility has to be at least as large as the utility of deviating reported in the RHS of (3). The deviating tenants can either refuse registration or vote for L . As voting behavior is individually observable, deviation is certainly detected. Hence, the tenant voting L loses the contracted wage and remains with the utility of voting net of the cost of registration. Alternatively, if the tenant refuse to register, she loses the wage and does not vote.

The participation constraint in (4) states that the utility of behaving according to the contract conditions has to guaranty a utility at least as large as the outside option. If a farmer does not enter the contract, she obtains the outside wage \underline{w} and the utility of voting for her preferred party net of the cost of registration. For low motivated L farmers the RHS is simply \underline{w} as they will not to register. Given Assumption 1 all L oriented farmers offer their labor to the landlord as the participation constraint in (4) is fulfilled even for the highly motivated L farmers.

For obvious reasons the same contract conditions are also always verified for the farmers supporting the R party.

Consequently, if the rent is high enough as implied by Assumption 1 all farmers are willing to enter the contract offered by the landlord. As the landlord can not screen on the basis of political preferences, tenants' recruitment becomes a random draw of i individuals out of the population of n . Given the characteristics of the initial population of farmers, this implies in expected terms that pi tenants will be L oriented and $(1 - p)i$ will be R oriented.

A first result of the model is that under Assumption 1, the landlord controls freely the vote of his long-term tenants in open ballot elections. Indeed, the threat to lose the privileged wage is enough to deter tenants from deviating. Consequently, it is costless for the landlord to force his tenants to incur the cost of registration and to vote for R . Observable individual voting behavior provides the landlord with the credible threat not to pay whoever deviates.

The consequences of the previous analysis for the electoral registration process are stated in the following proposition.

Proposition 1. *Under Assumption 1 a bias in registration occurs in open ballot elections.*

Proof. The landlord pushes *all* tenants to register as it does not cost anything to him and it provides a positive utility in terms of political rent. Among other potential voters, however, only individuals with $\sigma > c$ register. The bias follows. \square

Open ballot elections provide the landlord with perfect information about voting behavior. This allows him to use his powerful position to influence electoral results. On one side he can exploit the rent involved in the agricultural contract to control his tenants' votes. On the other hand, he registers *all* his tenants, inflating the electorate with all politically low motivated tenants, who would not register otherwise, were they free to choose. This, in turn, increases the total share of votes controlled in the district. Next section explores whether the introduction of a secret ballot can break this control.

2.2 Registration under Secret Ballot

The introduction of an effective secret ballot in the electoral district makes it impossible to observe individual voting behavior. Aggregate results are still observable at the district level. It is straightforward that the control of vote can

not be implemented like in the previous setting as individual voting decisions can not be explicitly addressed in the contract. However, the landlord can still set up a collective punishment scheme in which all his tenants are punished if *too many* L votes emerge in the district. In other words the landlord could still try to use the information carried by the district aggregate electoral result on the behavior of his tenants.

Assume that the landlord can announce a punishment according to which if more than \bar{x} votes are cast for the L party in the district ($v_L \geq \bar{x}$), then the whole pool of tenants i is dismissed and replaced at no cost (or does not receive any wage). Since aggregate electoral results also depend on the voting behavior of the other farmers, the landlord will set the optimal \bar{x} taking into account their expected vote.

Since tenants recruitment is a random draw, the population of $n - i$ farmers also constitutes a random draw from the initial population n .

The total number of L farmers f_L in a random sample from the initial population is distributed as a binomial $K \sim B[n - i; p]$, which for $n - i$ large enough can be approximated by a normal distribution $\Phi[p(n - i); p(1 - p)(n - i)]$.

If the landlord wants his L oriented tenants to vote for R and provide the optimal effort in agricultural production, the new contract wage w_s has to satisfy the following incentive compatibility and participation constraints:

$$IC1: \quad w_s \int_{-\infty}^{\bar{x}-x} \phi(f_L) df_L - c \geq \sigma + w_s \int_{-\infty}^{\bar{x}-x-1} \phi(f_L) df_L - c \quad (5)$$

$$IC2: \quad w_s \int_{-\infty}^{\bar{x}-x} \phi(f_L) df_L - c \geq w_o - c \quad (6)$$

$$PC: \quad w_s \int_{-\infty}^{\bar{x}-x} \phi(f_L) df_L - c \geq (\underline{w} + \max[\sigma - c; 0]) \quad (7)$$

where x represents the number of tenants voting for the L party.

Condition (5) states that the expected utility for a L oriented tenant to register and vote for R has to be at least as large as the expected utility of voting for L . The integral in the LHS describes the expected probability of the punishment not to be implemented ($v_L < \bar{x} - x$), given x tenants actually voting for L . The integral on the RHS describes the expected probability for the punishment not to occur if also the tenant under consideration votes for L .

Condition (6) states that the landlord still has to give in expected terms at least the wage w_o in order for the tenants to provide the optimal effort in agricultural production.

Notice that Assumption 1 implies that whenever (6) is true, then (7) is fulfilled too. This means that, as in the open ballot scenario, the landlord is not able to apply any political screening during the recruitment of tenants. In

other words, any w_s which sets the optimal effort provision will also attract all n farmers in the contract.

The landlord chooses \bar{x} to maximize his utility.

Instead of solving for the optimal punishment scheme, which goes beyond the scope of this paper, we are interested in isolating sufficient conditions for the complete vote controlling to break down. Next proposition deals with this issue.

Proposition 2. *Under Assumption 1 full vote control is not optimal if $n - i$ is large enough.*

The proof is provided in Appendix.

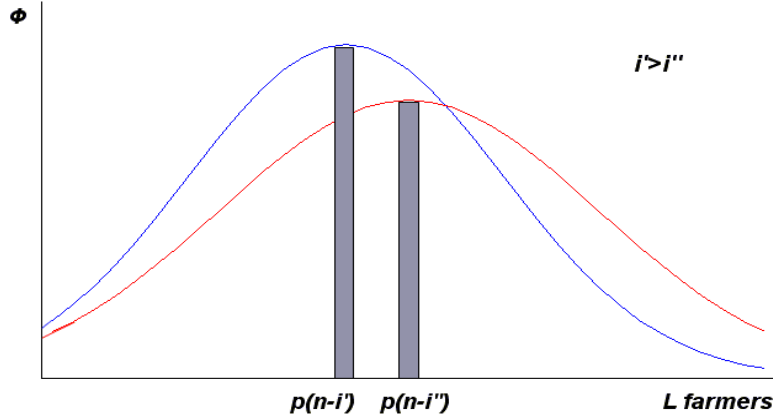


Figure 1: Maximum deterrence for different levels of farmers

The intuition behind the result in Proposition 2 is related to the informativeness of the district aggregate electoral result on the voting behavior of the tenants. The larger the pool of farmers $n - i$ who vote freely in the district, the larger the variance in the aggregate electoral results, and hence the fuzzier the signal which can be derived from the landlord about his tenants' behavior. Indeed, when $n - i$ increases, tenants face a decreasing probability to be decisive for the implementation of the punishment. Figure 1 depicts the decrease of the highest probability of being decisive for the first shirking tenant when the number of free voters ($n - i$) increases. When is no longer profitable for the landlord to offset the incentive to deviate by increasing further the expected wage, the most motivated tenants deviates and vote for L .

Corollary 1. *Under Assumption 1 full vote control is implemented at no cost if $i = n$.*

Proof. If the district is constituted by tenants and middle-class individuals only, then the optimal \bar{x} for the landlord is:

$$\bar{x}^* = 1 \tag{8}$$

meaning that, if even one L vote emerges in the district, all tenants are punished. This implies that in condition (5) the probability to be decisive for the implementation of the punishment when voting L equals 1. Nobody planning to vote L would enter such a contract in the first place as it could achieve a larger utility by working outside the farm. However, under Assumption 1 all n farmers are willing to accept the contract for a wage w_o . Consequently, the landlord will set the wage at the previous level, w_o and all tenants will vote for L . \square

If the landlord face a district composed by tenants and middle-class individuals only, then the district aggregate electoral result provides a certain signal about the behavior of his tenants. This allows the landlord to set a costless device to keep controlling votes making the effect of the introduction of the secret ballot void.

It remains to be addressed the impact of the secret ballot on electoral registration. Proposition 3 summarizes the main result.

Proposition 3. *The introduction of a secret ballot does not eliminate the bias in registration observed under open ballot election.*

Proof. Recall that the landlord forces his tenants to register at no cost. This implies that if even one tenant only is controlled, then the consequent increase in the probability of victory for the R party makes it worthwhile for the landlord to register all tenants. Consider a tenant with $\sigma = 0$. She is in the population of tenants with a positive probability. She would not have registered if not forced to do it. After registration, she would be indifferent about voting L or R . Announcing the loosest possible collective punishment of replacing everybody if $v_L > n - 1$ would be enough to push her to vote R , whatever the size of $n - i$. In other words, given this collective punishment scheme, the previous efficiency wage w_o is enough to fulfill condition (5) for such a tenant. This increases the likelihood for R to form the government (and the utility of the landlord in expected terms) as compared with the situation in which no forced registration takes place. Since she votes for R , at equilibrium the collective punishment will never be implemented. Consequently, also (6) is fulfilled for the wage w_o . Summing up, whatever the size of $n - i$, implementing this strategy gives a small but positive extra utility from vote controlling to the landlord at no cost. The claim in Proposition 3 follows. \square

An effective secret ballot does reduce the political power of landlord making it more difficult to control the voting behavior of the individuals within his reach. The larger the pool of free farmers the smaller the actual control that can be enforced through a collective punishment scheme. However, the control on votes can never be completely destroyed, as scarcely ideological individuals

will be easy to convince, once registered. This, in turns, implies that the landlord will always continue registering all tenants, even if the expected extra utility of doing so approaches zero.

Some qualifications of the previous claims are needed. First, the result rests partially on the assumption that firing and replacing all tenants has no costs. This might be questionable. In the society we model the higher status of the tenants implies that there will be always enough farmers willing to replace the fired tenants. However, if replacing some tenants might entail no costs, when the whole group has to be replaced recruitment and training costs might become considerable. Relaxing this assumption involves a commitment issue in the static framework adopted. Any costly punishment is not credible, as once the tenants fail to comply with the rule announced, the landlord would find it more profitable not to incur the cost of punishment anymore⁶. We consider, however, that our assumption roughly approximate the real situation given the large cheap labour supply available at the time in the rural context.

It is also worth discussing that the result in Proposition 3 holds even stronger if the landlord is able to politically screen individuals hired as tenants. Indeed, had landlords the opportunity to select R individuals into the tenants' contract, the rational for registering *all* tenants would be strengthened. By registering all of them landlords expands the electorate with a substantial group of scarcely motivated R voters who would otherwise not register, because their low utility of voting would not offset the cost of registration.

The previsions of the model are reasonably clear: when voting behavior is individually observable a landlord, who concedes a large rent to his tenants to improve efficiency in production, can control their vote. Since the landlord has positive gains from letting them vote for R , he will register all his tenants to capture this political rent. A bias in electoral registration follows, according to which tenants are more likely to be registered than other farmers.

After an effective secret ballot is introduced, the control of votes falls in heterogeneous electoral district in which both tenants and farmers coexist. The bias in registration, however, does not disappear as landlords can still profit marginally from controlling the votes of the least motivated L tenants. The remainder of this paper tests these previsions using the 1958 Chilean electoral reform as a natural experiment.

3 A Study of Strategic Registration: Chile

Like most Latin American countries, upon gaining independence from Spain, Chile adopted republican institutions. During its first period the electoral process was controlled by the municipal authorities who usually strongly favored the central government.

⁶In a dynamic framework, if the discount factor is large enough, the collective punishment becomes credible. Full registration of tenants would then occur only for levels of $n - i$ such that the expected utility from controlling the least motivated L tenants exceeds the expected cost of the punishment.

The 1834 electoral legislation required literacy and a minimum rent to register in the electoral lists. The rent requirement was lifted in 1874, extending the suffrage to the entire literate male population. The same year the electoral process including registration supervision was transferred from the municipal authorities to a committee of taxpayers chosen among the 40 major taxpayers at the district level, the Junta de Mayores Contribuyentes (Borón, 1971).

After a period where municipal authorities controlled elections again (1891-1912) spread corruption and fraudulent behavior, proved by the number of registered voters being higher than the population eligible for voting (Nazer and Rosembli, 2000), brought to a new reform in 1912-1914 which re-imposed the committee formed by the largest taxpayers (Asamblea de Mayores Contribuyentes) as the elections supervision body, ensuring elections control to local oligarchies (Salazar and Pinto, 1999).

A new political constitution, introduced in 1925, facilitated electoral registration but left almost intact the hold of landlords on elections (Gumucio and Vanquez, 1988; Valenzuela, 1998).

Perhaps not surprisingly, congressional representation was heavily weighted in favor of rural districts where the peasants historically formed a controllable mass base for conservative political groups (Hellinger, 1978). Landlords systematically controlled rural voting until the late 1950s (Millar, 1981). In 1958 control of voting was endemic in the traditional oligarchic provinces characterized by long term patron-client relationships (*inquilinaje* system).

There is a consensus amongst historians, political scientists and sociologists about how this system functioned (see Kaufman, 1972; Bauer, 1975; Loveman, 1976; Valenzuela, 1976 Petras and Zeitlin, 1968; and Scully, 1992). 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 employers would vote together with all their employees.

This pervasive control was a result of some peculiar features of the Chilean countryside. The first determinant was the lack of secrecy of voting. Prior to the reforms of 1958, parties issued their own ballot papers. 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.

Secondly, in line with our model, the control of rural votes by landlords was also made possible by the relatively good working conditions of the *inquilinos* compared to the possible alternatives. In fact, most *inquilinos* judged their welfare on the estate superior to life outside or in the nitrate mines (Bauer, 1995; Kay, 1982; Friedman, 1979). The threat of being evicted provided a strong enough incentive for *inquilinos* to vote for their landlord's preferred candidate (Baland and Robinson, 2009).

However, this pervasive control was bound to change eventually. Several important electoral reforms was adopted in Chile in the late 1950s and early 1960s.

On May 31st 1958, Law 12.889 was promulgated (see Cruz Coke, 1984, pp. 27-29 for a discussion of this law). Its most relevant aspect for this study was the introduction of the *cedula unica* (the unified ballot). After 1958, the voter

received a single, numbered, official ballot, which contained all party slates for any single type of election in his district (Nazer and Rosembliit, 2000).

This had an immediate impact on the balance of political power in Chile, reducing the control of votes on the countryside and electoral fraud in general (Loveman, 1976; Faundez, 1988; Petras and Zemelman, 1973; Born, 1971; Kaufman, 1972). Baland and Robinson (2008) show that this reform coincides with a shift in political support from the landlords' traditional party to other center and left parties, particularly in rural regions. Moreover, these authors also provide valid reasons as for why this reform can be considered an exogenous shock for the dynamics under consideration.

Whatever the rationale beyond the reform, its effects were dramatic: landlords could no longer observe the voting behavior of their peasants and saw their political power reduced in the countryside.

A second electoral reform was adopted in 1962, and made registration and vote compulsory for male and female literate population older than twenty-five (Gil, 1969). The new law on one hand increased the social benefits attached to registration and fixed tougher sanction for non registration, and on the other hand "[...] simplified significantly the registration process" (Born, 1971, p. 406; Gil, 1969). For instance, opening hours of registration offices were significantly extended (Burnett, 1970; Gil, 1969).

The joint effects of these two reforms would be dramatic both on the size of the electorate and on electoral results, as documented in Baland and Robinson (2008). With this brief historical background, we can now present our empirical study on the strategic electoral registration in Chile.

3.1 The Data

We searched for data on the voting behavior in Chile before and after the 1958 electoral reform. We focused on parliamentary elections occurred in 1957, in 1961 and in 1965. We collected data on the number of voters at the municipality level which represents the smallest electoral unit for these three elections. To collect information on *inquilinos* and other farmers by municipality we used the agricultural census which was run in 1935, in 1955 and in 1965. We used the last two data period to derive the number of *inquilinos* and other farmers in 1957 and 1961 by interpolation. Secondary historical sources were checked to confirm the general diminishing trend in the *inquilinos* population throughout the country starting from 1935 (Kay, 1982; Bauer, 1975). The 1935 information was used to run some robustness checks on our results.

Since electoral registration was theoretically open to literate citizens only, we collected data on literate population and total population by municipality. We referred to the national census which occurred in 1952, in 1960 and in 1970. We used exponential interpolation to derive literate and total population for the years in which the elections under study occurred (aggregate figures from national statistics seem not to contradict this choice - see, for instance, Mamalakis, 1980 and Correa et al., 2001). Given inconsistency in the denomination of municipalities across the three data sources (National Census, Agricultural Census

and Electoral Administration), we dropped 56 ambiguous observations. We end up with 239 observations with complete information for the three periods.

Finally, as the phenomenon described by our theoretical model applies almost exclusively to the rural setting, we will run our analysis on the rural sub-sample in which the two mostly urban provinces of Chile (Santiago and Valparaiso) are dropped. Several reasons motivate this choice. First, recall that we assumed in our model a relative freedom for the landlord to selectively punish voters. This can be a reasonable assumption in the rural setting in which the landlord often represented the only authority in situ. However, this is certainly less the case close to the urban centers. Secondly, according to our model the bias gets stronger in electoral districts where a large share of potential voters are politically weakly motivated. This is a standard characteristic of relatively isolated rural regions, in which political activism is costly and easily contrasted by local interests. The closer one gets to large urban settlements the larger the involvement of the population into politics.

3.2 The Empirical Models

Our theoretical model shows that under some conditions, i.e. privileged economic status for *inquilinos* and observable individual voting behavior, a bias in registration would emerge, in which *inquilinos* are more likely to be registered than other farmers. To test this prediction we want to compare the registration rate across groups. With the available data we can not test this directly, as we do not have electoral registration data by worker category. Instead, we can compare the specific registration rate found among *inquilinos* richer municipalities as compared with municipality with relatively less *inquilinos*. In other words, we can test if a municipality with relatively more *inquilinos* was systematically showing a higher registration rate.

The second prediction of the model is that after an effective secret ballot is introduced the bias does not disappear, as landlords still register all *inquilinos* even when only some of them can be controlled. We test this by comparing registration rates before and after the 1958 reform, i.e. in the 1957 and 1961 elections.

The 1965 results are less useful for this goal, since the 1962 reform makes it impossible to isolate the effects of the secret ballot only. Theoretically, once registration becomes compulsory, no bias should exist anymore, as all eligible population should be registered. However, the literacy requirement can still lead to some strategic behavior. When presenting the historical background we mentioned that landlords would typically teach to their *inquilinos* how to write their name to pass the test of literacy needed to register. If this practice continued after 1962, it would still affect registration rates.

Let us now specify our structural model in formal terms. We start from the following equation:

$$V_{jt} = r_t^I l_{jt}^I I_{jt} + r_t^A l_{jt}^A A_{jt} + r_t^O l_{jt}^O O_{jt} \quad (9)$$

where V_{jt} is the number of registered voters at time t in municipality j ; r_t^K are time and group-specific registration rates with $K = I, A, O$ (*inquilinos*, other farmers, others in the district, respectively); K_{jt} is the number of agents of type K at time t in municipality j , and l_{jt}^I represents the group-specific literacy rate at time t in municipality j . What this model says is that the total number of registered voters in municipality i at time t equals the sum over K of the number of agents in municipality i at time t times their specific literacy rate (which gives the pool of local K agents eligible for registration) times their specific registration rate (which equals the actual registered K agents in the municipality).

Ideally, one would like to control for the different literacy rates by class. However, the only information available on literacy is at the municipality level. The best we can achieve is to test our predictions using reduced forms of the model imposing some structure on (9). We proceed with two specifications of the model. In the first specification we divide both sides of (9) by the total population of the municipality:

$$\frac{V_{jt}}{P_{jt}} = c + r_t^I l_{jt}^I \frac{I_{jt}}{P_{jt}} + r_t^A l_{jt}^A \frac{A_{jt}}{P_{jt}} + \epsilon_{jt} \quad (10)$$

where c is the constant term. Adding the interaction terms capturing the effects of the 1958 and 1962 reforms, we obtain our Model I:

$$\frac{V_{jt}}{P_{jt}} = c + r_t^I l_{jt}^I \frac{I_{jt}}{P_{jt}} + r_t^I l_{jt}^I \frac{I_{jt}}{P_{jt}} * year_t + r_t^A l_{jt}^A \frac{A_{jt}}{P_{jt}} + r_t^A l_{jt}^A \frac{A_{jt}}{P_{jt}} * year_t + \epsilon_{jt} \quad (11)$$

where $y61$ and $y65$ are year dummies for year 1961 and 1965, respectively.

To obtain the second specification, Model II, we divide both sides of (9) by the total *literate* population of the municipality, L_{jt} :

$$\frac{V_{jt}}{L_{jt}} = c + r_t^I l_{jt}^I \frac{I_{jt}}{L_{jt}} + r_t^I l_{jt}^I \frac{I_{jt}}{L_{jt}} * year_t + r_t^A l_{jt}^A \frac{A_{jt}}{L_{jt}} + r_t^A l_{jt}^A \frac{A_{jt}}{L_{jt}} * year_t + \epsilon_{jt} \quad (12)$$

This second specification, however, is prone to endogeneity issues. Literacy is largely endogenous as pointed out earlier, since landlords were teaching their *inquilinos* how to write their names to register them in the electoral list. We nevertheless present the results of Model II as a robustness check.

According to the theoretical predictions, we expect $r^I > r^A$ before the introduction of the secret ballot. The gap between the two registration rates should not change significantly right after the reform, whereas in 1965, after the 1962 reform that makes electoral registration compulsory, the gap should reduce. Indeed, all eligible population should be registered by then.

However, in both specifications of the model presented above the coefficients estimated are determined by both the registration rate *and* the literacy rate. If *inquilinos* richer municipalities had systematically higher literacy rates than

other municipalities, higher coefficients for the regressors $\frac{I_{jt}}{P_{jt}}$ and $\frac{I_{jt}}{L_{jt}}$ as compared to $\frac{A_{jt}}{P_{jt}}$ and $\frac{A_{jt}}{L_{jt}}$, respectively, might be simply due to the literacy rate differentials. In other words, this findings in itself would not necessarily imply a strategic registration of *inquilinos*.

Although we do not have the literacy rate per class, we can still test our identification assumption by looking whether literacy rate was systematically higher in municipality with a larger share of *inquilinos* over total population. Formally, we regress literacy rate on the share of *inquilinos* and other farmers:

$$\frac{L_{jt}}{P_{jt}} = c + \beta_1 \frac{I_{jt}}{P_{jt}} + \beta_{2t} \frac{I_{jt}}{P_{jt}} * year_t + \beta_3 \frac{A_{jt}}{P_{jt}} + \beta_{4t} \frac{A_{jt}}{P_{jt}} * year_t + \epsilon_{jt} \quad (13)$$

Our identification assumption is safe if $\beta_1 \leq \beta_3$. We test equation (13) using a municipality fixed effect specification to control for local municipality specific unobserved effects and adding interaction terms to check how literacy rates evolved over time. The results are reported in Table 1 for the entire sample and for the rural sample only.

As expected $\beta_1 \leq \beta_3$, indicating that *inquilinos* richer municipalities could not have higher registration rate deriving from higher local literacy rate. Indeed, if anything, we should observe a lower registration rate among *inquilinos* rich electoral districts, in case no different mechanism was in place. Between 1957 and 1961 changes in literacy have the same patterns in all municipalities. Finally, starting from 1965 literacy rate increased more rapidly in municipalities with relatively more *inquilinos*.

Table 1: Test on literacy rate across groups and time.

Dep. Var.= $\frac{L_{it}}{P_{it}}$	Municipality FE		Municipality FE	
	Entire sample (n=717)	Rural Sample (n=570)		
	β	S.E.	β	S.E.
I/P	-0.42**	0.17	-0.4**	0.19
A/P	0.048	0.03	0.01	0.04
$I/P*y61$	0.07	0.06	0.16	0.10
$A/P*y61$	0.001	0.01	0.01	0.01
$I/P*y65$	0.16**	0.07	0.37***	0.11
$A/P*y65$	0.006	0.01	0.025	0.018
$y61$	0.06***	0.003	0.056***	0.004
$y65$	0.12***	0.003	0.12***	0.004
$constant$	0.64***	0.005	0.63***	0.007

Notes: I=inquilinos, A=other farmers, P=total population, S.E.= Standard Error
*, **, *** denote 10%, 5%, and 1% significance level respectively

The results of the test on the literacy rate run above imply that Model I and Model II will probably lead to an underestimation of the bias in registration predicted for the 1957 elections. Moreover, since *inquilinos* rich municipalities show no peculiar literacy patterns in 1961, the interpretation of the change in

the registration rates between 1957 and 1961 is not affected by literacy rate differentials. As for 1965, the increase in literacy for *inquilinos* richer municipalities will decrease the reduction of the bias in registration rate predicted.

3.3 The Empirical Results

We choose a municipality fixed-effect framework for our estimations as it controls for municipality specific unobservable effects. To test our choice we run first a Breusch-Pagan test (Green, 2000), which test for the existence of residual structure in the municipality specific component of the error, after we control for provincial specific effects (provincial dummies) in a POLS estimation of model I. The test strongly rejects the null that the variance of the municipality specific component of the error is zero. That indicates that an error component model performs better than POLS. Running a generalized Hausman test indicates a municipality fixed-effect model as the most appropriate.

We can now proceed to estimate our models. We report in Table 2 the results of the estimation of Model I and in Table 3 the results of Model II with and without provincial dummies (interacted with year dummies in all FE estimations)⁷.

As expected in all specifications of the model the coefficients capturing the effect of the presence of *inquilinos* on the registration rate are significantly larger than for other farmers. This result varies in magnitude across the different specifications but it is robust. Indeed, before the 1958 reform *inquilinos* relatively rich municipalities show systematically larger registration rates. This is consistent with the theory presented of landlords controlling their tenants' votes and registering all of them in the electoral lists.

Table 2: Model I using the rural sub-sample (n=570)

Dep. var. = $\frac{V_{it}}{P_{it}}$	Municipality FE		Municipality FE Provincial dummies	
	β	S.E.	β	S.E.
<i>I/P</i>	1.39***	0.37	0.68*	0.39
<i>A/P</i>	0.286***	0.07	0.31***	0.09
<i>I/P*y61</i>	-0.42**	0.21	-0.31	0.29
<i>A/P*y61</i>	-0.16***	0.03	-0.15***	0.04
<i>I/P*y65</i>	-0.57***	0.21	-0.40	0.29
<i>A/P*y65</i>	-0.296***	0.036	-0.27***	0.05
<i>y61</i>	0.08***	0.007	0.07**	0.03
<i>y65</i>	0.16***	0.007	0.15***	0.03
<i>constant</i>	0.06***	0.01	0.07***	0.02

Notes: I=inquilinos, A=other farmers, P=total population

*, **, *** denote 10%, 5%, and 1% significance level respectively

Clearly, municipalities with a relevant presence of *inquilinos* display relatively larger registration rates.

⁷Chile has 25 provinces, which represent the largest administrative units.

Let us now focus on the effects of the introduction of the secret ballot that occurred in 1958 on electoral registration. These are captured by the interaction terms. The results reported in the first column of Table 2 seem to suggest that after the introduction of the secret ballot the bias in registration partially falls. In the specification with provincial dummies, however, the reduction in registration rate in 1961 among *inquilinos* is not significant.

Table 3: Model II using the rural sub-sample (n=570)

Dep. var. = $\frac{V_{it}}{L_{it}}$	Municipality FE		Municipality FE Provincial dummies	
	β	S.E.	β	S.E.
<i>I/L</i>	1.07***	0.29	0.65**	0.3
<i>A/L</i>	0.27***	0.06	0.29***	0.07
<i>I/L*y61</i>	-0.24	0.18	-0.20	0.24
<i>A/L*y61</i>	-0.11***	0.03	-0.09**	0.03
<i>I/L*y65</i>	-0.30	0.21	-0.21	0.27
<i>A/L*y65</i>	-0.21***	0.03	-0.18***	0.03
<i>y61</i>	0.086***	0.009	0.07*	0.4
<i>y65</i>	0.17***	0.009	0.16***	0.4
<i>constant</i>	0.11***	0.02	0.12***	0.02

Notes: I=inquilinos, A=other farmers, L=literate population

*, **, *** denote 10%, 5%, and 1% significance level respectively

The results in Table 3 also point in the same direction. After the introduction of the secret ballot registration remains biased: *inquilinos* richer municipalities still display larger registration rates. Interestingly, registration rates increase everywhere in the country, as suggested by the positive and significant coefficient of the year dummies. The presence of *inquilinos* does not seem to hamper this increase, whereas municipalities with an important share of other farmers experience a lower growth of their registration rates. This is consistent with the prediction according to which landlords still find it worthwhile to register all their *inquilinos* under the secret ballot regime.

We find similar results in 1965. Although Model I in the specification without provincial dummies suggests a reduction of the bias in the 1965 elections, all other specification do not show any significant change. In interpreting these results we should consider the effects of the 1962 reform. Making registration compulsory should reduce by definition the bias as it pushes the entire literate population to register. It is still possible, however, for landlords to register their illiterate *inquilinos* by teaching them how to write their name. This would sustain the bias at least partially. Moreover, recall from the results in Table 1 that literacy increased in 1965 more rapidly in *inquilinos* richer municipalities than elsewhere. Since the coefficients under consideration capture in fact both the change in registration rate and literacy, it is likely that the increase in literacy offsets the relative decrease in registration rate, yielding a non significant result. Finally, it is possible that 1962 reform boosting registration was implemented at a slower pace in the rural context as compared with the urban centres, given

the different investments in electoral campaigning and information circulation. If this is true, more rural municipalities should display lower registration rates, with the exception of the *inquilinos* rich municipalities, in which strategic registration would still occur. The results in Table 2 and 3 are compatible with this interpretation.

A last exercise addresses the potential endogeneity of the *inquilinos* variables. Theoretically, endogeneity does not seem to be a concern for the phenomenon under consideration. We decided however, to run the analysis as a robustness check. The only good instrument for the presence of *inquilinos* in the municipality, that we were able to find is the number of *inquilinos* per municipality as recorded by the rural census in 1935. We can safely assume that the number of registered voters in 1957-1965 can not influence the number of *inquilinos* in 1935. Unfortunately, having one data period in the past (1935) to instrument for three periods (1957, 1961 and 1965) reduces the scope and the power of such a test.

We can investigate the effect of having more *inquilinos* in 1935 on the registration rate in 1957, 1961 and 1965. Substituting the share of *inquilinos* over the population in 1935 for the same variable in 1957, 1961 and 1965 in our fixed-effect specifications presents a drawback. Given the structure of the fixed-effect framework, the registration rate among *inquilinos* drops from the equation and therefore does not allow us to test for the existence of a bias in registration in 1957. We can therefore only test whether registration rate among *inquilinos* decreased more than among other farmers in the following 1961 and 1965 elections by looking at the coefficients of the interaction terms.

We provide finally a POLS estimate in which the share of *inquilinos* over the population in 1935 substitutes the same variable in 1957, 1961 and 1965. That allows a test on the existence of a bias in registration. Results of these two exercises are reported in Table 4 for Model I. These tests can not be run on Model II as we do not have literacy in 1935 by municipality.

As in the previous estimations, the fixed-effect estimation using the presence of *inquilinos* in 1935 yields ambiguous results on the change in the bias occurred in 1961. The specification without provincial dummies suggest that a marginal reduction in the bias took place. In the specification with provincial dummies, however, this result loses significance. In 1965, on the other hand, a reduction of the bias does occur.

Finally, we can consider the contributions of the POLS estimation. We know from the tests run previously that POLS performs quite poorly as a large share of the variance is explained by municipality specific unobserved heterogeneity. The results emerged from the POLS are generally not satisfactory. However, this robustness check confirms that municipality with a larger share of *inquilinos* in 1935 displayed a relatively higher registration rate in 1957.

The results of this section are largely consistent with the predictions of the model. The different empirical models we tested converged regarding the existence of a bias in registration before the 1958 reform, in which *inquilinos* were more likely to register than other farmers. The introduction of a secret ballot did not seem to significantly reduce this bias as least in 1961, the only

elections which took place after the the 1958 and before the 1962 reform.

Table 4: Model I with inquilinos in 1935 using the rural sub-sample (n=486)

Dep. var. = $\frac{V_{it}}{P_{it}}$	Municipality FE		Municipality FE Prov. dummies		POLS ($R^2 = 0.52$) Prov. dummies	
	β	S.E.	β	S.E.	β	S.E.
I/P	—	—	—	—	0.34**	0.16
A/P	0.47***	0.08	0.45***	0.09	-0.08**	0.04
$I/P*y61$	-0.31**	0.14	-0.21	0.17	-0.18	0.22
$A/P*y61$	-0.20***	0.04	-0.19***	0.05	-0.18***	0.05
$I/P*y65$	-0.57***	0.14	-0.61***	0.17	-0.64	0.4
$A/P*y65$	-0.35***	0.04	-0.29***	0.05	-0.14*	0.08
$y61$	0.08***	0.008	0.09**	0.04	0.05***	0.008
$y65$	0.17***	0.008	0.16***	0.04	0.09***	0.007
<i>constant</i>	0.06***	0.01	0.07***	0.01	0.14***	0.007

Notes: I=inquilinos, A=other farmers, P=total population

*, **, *** denote 10%, 5%, and 1% significance level respectively

4 Conclusions

In this paper we have investigated how the employment relationship, if it implies transfer of rents, may allow employers to control the voting behavior of their workers and lead to a strategic registration of voters. This is feasible when individual voting behavior is observable, as in open ballot electoral system. More easily controlled voters would also be more likely registered providing an even larger impact of vote controlling on election results.

Making individual vote truly secret (for instance with the adoption of a secret ballot) significantly reduces this control. The registration remains biased, however, as the perspective of controlling even a few scarcely motivated voters motivates the controller to register *all* the potentially controllable agents.

We test the predictions of our theoretical model by examining in detail the effects of the introduction of the secret ballot in Chile in 1958. We show that, consistently with the theory, before the reforms municipalities with more pervasive patron-client relationships tended to exhibit a higher registration rate. After the reform, the difference in registration rate does not decrease significantly. Indeed, landlords still find it profitable to register their *inquilinos* as the least politically motivated among them might be easily influenced in their voting behavior.

A direct support to the introduction of secret balloting in democratic political systems is directly implied by our results. Our model, however, warns on the danger of collective punishment schemes, which might void completely the effects of a secret ballot. In order to guarantee vote secrecy there should always be enough uncertainty on the aggregate elections' results at the smallest electoral level.

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5 Appendix - Proof of Proposition 2

Proof. Notice first that the expected utility which the landlord can achieve through the control of his L oriented tenants equals $\frac{\Pi p i}{(ic+(n+m)(1-c))}$. Accordingly, the maximum increase in wage profitable for the landlord if his tenants vote R has to respect the following condition:

$$w_s \int_{-\infty}^{\bar{x}} \phi(f_L) df_L - w_o \leq \frac{\Pi p}{(ic+(n+m)(1-c))} \quad (14)$$

Full vote control can occur only if the wage in (5) is large enough to push the most motivated L tenant ($\sigma = 1$) to vote for R . The punishment threshold \bar{x} which deters the most from deviating, given the distribution of the L voters among farmers, is:

$$\bar{x}^* = p(n-i)(1-c) \quad (15)$$

Indeed, the first deviating tenant faces the highest possible probability of being decisive for the implementation of the collective punishment.

Combining (5), (14) and (15) the condition for the most motivated L tenant to vote for R becomes:

$$\frac{1}{\int_{p(n-i)(1-c)-1}^{p(n-i)(1-c)} \phi(f_L) df_L} < \frac{\frac{\Pi p}{(ic+(n+m)(1-c))} + w_o}{\int_{-\infty}^{p(n-i)(1-c)} \phi(f_L) df_L} \quad (16)$$

which simplifies to:

$$\frac{1}{\int_{p(n-i)(1-c)-1}^{p(n-i)(1-c)} \phi(f_L) df_L} < \frac{\Pi 2p}{(ic+(m+n)(1-c))} + 2w_o \quad (17)$$

The LHS of condition (17) is increasing with $n-i$, as the integral in the denominator decreases in the number of other farmers in the district. The larger the pool of farmers $n-i$ the larger the variance of the distribution of f_L ⁸, and hence the smaller the probability for deviating tenants to be decisive, whatever the chosen \bar{x} . Increasing $n-i$ for any fixed n decreases i . This, in turn, reduces the RHS of (17), making the condition even less likely to be fulfilled. The same result obtains from increasing $n-i$ for a fixed i . If we define \underline{z} the level of $n-i$ which satisfies (17) with equality, then any $n-i > \underline{z}$ leads the most motivated L tenant to vote for L . \square

⁸Recall $f_L \sim \Phi[p(n-i); p(1-p)(n-i)]$.