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Strategic Registration of Voters: The Chilean Case

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Abstract

In this paper we investigate how the employment relationship, if it implies transfer of rents, may allow employers to control the voting behavior of their workers and lead to strategic registration of voters. This is feasible when individual voting behavior is observable, as in open ballot elections. More easily controlled voters are 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. Moreover, we show that as long as electoral districts are heterogeneous enough, i.e. contain also free voters, any attempt to control votes on the basis of district aggregate results is bound to fail. 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 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)

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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.

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. On the one hand landlords were able to control *inquilinos*' votes. On the other hand they effectively deterred many potential voters, among other farmers, from registering using the threat of individual punishment. In particular, 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 (*inquilinos*). 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. Other farmers need no longer fear any punishment from the landlord when voting for their preferred party. We show in section 5 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, 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 microfoundation 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 here is to show 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 their control of voters' registration. Focusing on the Chilean case, not only *inquilinos*' votes were controlled by landlords. *Inquilinos*

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.

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. 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). Our contribution here is to set up a simple model which links standard moral hazard in agricultural production with moral hazard in teams in voting behavior. Indeed, once individual voting behavior is no longer observable, 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 this strategy is not optimal for the landlord. 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 proven 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 simple 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 derive an utility $\sigma_m \sim U[0; 1]$ from voting for their preferred party, C³. Farmers derive a positive utility $|\sigma_f|$ from voting for their own preferred party, which can be R or L. Farmers utility of voting is described by $\sigma_f \sim U[-1; 1]$, where positive and negative values of σ_f characterize the utility of R and L voters, respectively. In other words, there is a continuum of individuals in terms of political motivation. Accordingly, the most ideologically voters derive an utility 1 from voting for their preferred party. Formally the utility for the generic voter j (with $j = m, f$) of voting for her own preferred party is:

$$U_j = |\sigma_j| - c \quad (1)$$

The political orientation and the level of motivation (σ) of farmers can not be deduced before the vote is expressed and it is randomly determined by nature at each period⁴. 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 R⁵. 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, respectively⁶. The *political* utility of the landlord is then described by the following equation:

$$U_l = \frac{\Pi v_R}{v_R + v_L + v_C} \quad (2)$$

³The existence of the middle-class voting for C only serve the purpose of keeping the proportional electoral system, as it was in Chile at the time under consideration, meaningful. The entire paper focuses on the behaviour of farmers.

⁴This captures the natural turnover in the composition of electoral eligible population.

⁵The 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.

⁶This mirrors the practice in a multiparty proportional system like Chile in the 1950s.

Taking the derivative with respect to v_L (v_C) we can obtain the utility for the landlord of deterring one L (C) oriented voter from voting:

$$-\frac{\partial U_l}{\partial v_L} = \frac{\Pi v_R}{(v_R + v_L + v_C)^2} \quad (3)$$

Notice that the marginal utility of deterring L (C) voters from registering is decreasing in the number of L (C) voters registered. In other words, the lower the number of L (C) voters the higher the utility of deterring one more L (C) voter from registration. Forcing a non R voter to vote for R provides instead a utility of $\frac{\Pi}{v_R + v_L + v_C}$.

All farmers can gain an income \underline{w} from their 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 production⁷. We assume this rent to 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. **In Section 2.2 we will discuss the consequences of reducing the rent received by tenants.**

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 chosen and 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. Moreover, we assume that the landlord has the power to inflict a punishment to *any L voter* in the district after observing their voting behavior. For simplicity, the cost for the landlord to punish each L or C voter equals the level of punishment chosen denoted by T . We can now explicitly give the timing of the model:

1. The landlord announces punishment T for non-R voters and invest accordingly in monitoring and capacity to implement the punishment⁸.
2. Production occurs both on the landlord's and on farmers' lands.

⁷We 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.

⁸This investment before the election solves the commitment problem on the side of the landlord. Think of it as a monitoring cost that the landlord has to incur. In fact, in a static framework the landlord would have no incentive to implement a costly punishment once vote has taken place. In a dynamic framework this assumption would not be needed.

3. Registration and elections take place. Individual votes are observed.
4. Payoffs \underline{w} and w_o are distributed, punishments inflicted and shirking tenants fired.

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 it follows:

$$w_o - c \geq \max [|\sigma| - c - T; 0] \quad (4)$$

$$w_o - c \geq \underline{w} + \max [|\sigma| - c - T; 0] \quad (5)$$

The LHS of (4) 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 deviate this utility has to be at least as large as the utility of deviating reported in the RHS of (4). The deviating tenants can either refuse registration or vote for L. As both registration and voting behavior are individually observable, deviation is certainly detected. Hence, the tenant voting L loses the contracted wage and remains with the net utility of voting at best. The participation constraint in (5) states that the utility of behaving according to the contract conditions has to guaranty an higher utility than 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 and the punishment received by the landlord. 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 (5) is fulfilled even for the highly motivated L farmers. Contract conditions for the farmers supporting the R party are instead:

$$w_o + \sigma - c \geq \underline{w} + \max [\sigma - c; 0] \quad (6)$$

$$w_o + \sigma - c \geq \underline{w} + \max [\sigma - c; 0] \quad (7)$$

A R oriented tenant willing to deviate would choose not to register in the first place, as voting L implies incurring the cost of registration c and the punishment T from the landlord, without any gain in terms of utility from the vote. She would rather refuse registration and lose the job. Starting from the following period she would become a farmer for ever. We report this utility on the RHS of (6). In fact, this incentive compatibility constraint along with the participation constraint in (7) are never binding given Assumption 1. Indeed, all R oriented farmers in the district are willing to accept the contract and to vote for R. Since R farmers do not need any control or incentive to vote according to the landlord's will, we will focus in the remaining of the paper on L oriented long-term tenants only.

To sum up, if the rent is high enough as implied by Assumption 1 all farmers are willing to enter the contract with 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 $\frac{1}{2}$ long-term tenants will be L oriented and $\frac{1}{2}$ will be R oriented.

Lemma 1. *Under Assumption 1, the landlord controls freely the vote of their long-term tenants in open ballot elections.*

Proof. Notice that Assumption 1 implies that the participation constraints and the incentive compatibility constraints are fulfilled for both L and R oriented tenants even with $T = 0$. The landlord will not need to inflict any extra punishment *to the tenants* as the threat to lose their privileged wage is enough to deter them from deviating when voting. 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. \square

Dealing with the L oriented farmers left outside the contract, the landlord has no rent available to control their voting behavior. However, deterring them from voting increases the probability of the R party to form the government. Accordingly, the landlord finds it optimal to announce and inflict a positive punishment T^* to the voters who cast their ballot for the L party. Given the linear cost of punishment and the convex nature of the return from registration deterrence among L voters as described in equation (3), a corner solution will arise. Either all non-oriented farmers will be deterred from registration or none will be.

Lemma 2. *Only R oriented farmers register if $\Pi \geq (1 - c)(m + n - c(m + n - i))$. No registration deterrence occurs otherwise.*

Proof. Notice first that the maximum utility that landlords can derive from registration deterrence is $\frac{\Pi(v_L + v_C)}{v_R + v_L + v_C}$. In other words, since all tenants are voting R as shown in Lemma 1 full deterring both L farmers and middle-class C voters from registration would determine the victory of the R party with certainty. The punishment announced has to be feasible to be implemented *ex post*. If all non R oriented agents ($\sigma > c$) registered and voted for their preferred party, the landlord would have to inflict the punishment upon all of them. Consequently, the maximum punishment which the landlord can announce is $\frac{\Pi(v_L + v_C)}{(v_R + v_L + v_C)(v_L + v_C)}$. Simplifying and substituting the expected values of $v_L + v_R + v_C = i + (n + m - i)(1 - c)$, as only farmers with a $\sigma > c$ would register, we obtain $T_{max} = \frac{\Pi}{i + (n + m - i)(1 - c)}$. Full deterrence of L and C potential voters occurs only if this punishment deters the most motivated from registering:

$$\frac{\Pi}{i + (n + m - i)(1 - c)} \geq 1 - c \quad (8)$$

If condition (8) is fulfilled, the landlord sets $T^* = 1 - c$ and no L oriented farmer registers. To prove the second part of Lemma 2 recall that the utility from registration's deterrence is convex in the number of voters deterred, whereas the cost of punishment is linear. Consequently, if it is not profitable to full deter all L farmers and middle-class voters from registration, no partial deterrence can be profitable either. \square

The consequences of the Lemmas 1 and 2 on the 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 force *all tenants* to register as it does not cost anything to them (as shown in Lemma 1) and it provides a positive utility as they will all vote for R. Among other potential voters, however, only individuals with $\sigma > c$ register and vote. Moreover, if condition (8) is fulfilled, by Lemma 2, no L farmer and middle-class voter registers. 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 registration and voting decisions and hence elections. On one side he can exploit the rent involved in the agricultural contract to force his tenants to register and vote for R. On the other hand by credibly announcing a punishment for L and C voters it further reduces total registration, increasing 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 vote controlling 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 aggregate electoral result on the behavior of his tenants. In the same spirit the landlord could also find it profitable to announce a similar collective punishment to all the farmers outside his farm. Notice, however, that the maximum credible punishment that the landlord can announce outside the farm is now lower, as punishment if implemented has to be inflicted upon *all* farmers and middle-class individuals in the district, whereas the direct gains from total deterrence strategy do not change as compared with the open ballot scenario. We consider only the case in which full deterrence is not feasible after the introduction of the secret ballot. This is implied by the following assumption:

Assumption 2.

$$\Pi < \frac{2(1-c)^2(n+m)(n+m-i)}{2m+n}$$

Relaxing this assumption implies, as we will show later, empowering the landlord to perfectly control the vote of the entire group of n farmers in the district at no cost, whatever the relative size of tenants i and other farmers ($n - i$). Ruling out collective punishment on other farmers and middle-class implies that outside the landlord's farm all farmers and middle-class individuals with $\sigma > c$ now register and vote freely for her preferred party. Given all other farmers registered and voting freely in the district, can the landlord still implement a collective punishment scheme to control the vote of his tenants? Assume that the landlord can announce a punishment according to which if more than \bar{x} votes of type L are cast in the district, then the whole pool of tenants i is dismissed and replaced at no cost. Obviously, since aggregate electoral results depend also on the behavior of other farmers, the landlord will set the optimal \bar{x} taking into account the expected vote among other farmers.

Since tenants recruitment is a random draw, the population of farmers $n - i$ also constitutes a random draw from the initial population n . Given the characteristics of the initial distribution of n the probability for each farmer to be L oriented is $\frac{1}{2}$. The number of total L farmers f_L in a random sample from the initial population is distributed as a binomial $K \sim B[n - i; \frac{1}{2}]$, which for $n - i$ large enough can be approximated by a normal distribution $\Phi[\frac{n-i}{2}; \frac{n-i}{4}]$.

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 conditions:

$$w_s \int_{-\infty}^{\bar{x}-x} \phi(f_L) df_L - c \geq |\sigma| + w_s \int_{-\infty}^{\bar{x}-x-1} \phi(f_L) df_L - c \quad (9)$$

$$w_s \int_{-\infty}^{\bar{x}-x} \phi(f_L) df_L - c \geq w_o - c \quad (10)$$

$$w_s \int_{-\infty}^{\bar{x}-x} \phi(f_L) df_L - c \geq (\underline{w} + \max[|\sigma| - c; 0]) \quad (11)$$

where x represents the number of tenants voting for the L party. Condition (9) 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 (10) 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. Assumption 1 implies that whenever (10) is true, then (11) 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. 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 vote controlling to break down. Notice first that the expected utility which the landlord can achieve through the control of his L oriented tenants equals $\frac{\Pi i}{2(ic+(n+m)(1-c))}$. Accordingly, the maximum wage increase profitable for the landlord if all tenants vote L has to respect the following condition:

$$w_s \int_{-\infty}^{\bar{x}} \phi(f_L) df_L - w_o \leq \frac{\Pi i}{2(ic+(n+m)(1-c))} \quad (12)$$

Isolating w_s in conditions (9), (10) and (12) yields:

$$w_s \geq \frac{|\sigma|}{\int_{\bar{x}-x-1}^{\bar{x}-x} \phi(f_L) df_L} \quad (13)$$

$$w_s \geq \frac{w_o}{\int_{-\infty}^{\bar{x}-x} \phi(f_L) df_L} \quad (14)$$

$$w_s \leq \frac{\frac{\Pi i}{2(ic+(n+m)(1-c))} + w_o}{\int_{-\infty}^{\bar{x}} \phi(f_L) df_L} \quad (15)$$

Proposition 2. *Under Assumption 1 and 2 full vote control is not optimal if $n - i > z$.*

Proof. Consider the maximum possible wage increase in (12). Full vote control can occur only if the wage in (15) is large enough to push the most motivated L tenant ($\sigma = 1$) to vote for R. As depicted in Figure 1, the punishment threshold \bar{x} which deters the most from deviating given the distribution of the L voters among farmers, is:

$$\bar{x}^* = \frac{(n-i)(1-c)}{2} \quad (16)$$

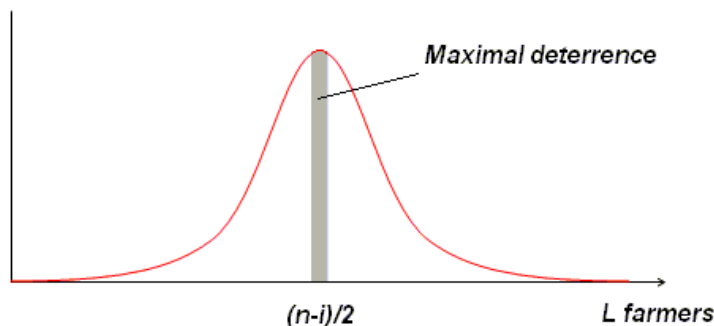


Figure 1: Maximum deterrence punishment

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

Combining (13), (15) and (16) the condition for the most motivated L tenant to vote for R becomes:

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

which simplifies to:

$$\frac{1}{\int_{\frac{(n-i)(1-c)}{2}-1}^{\frac{(n-i)(1-c)}{2}} \phi(f_L) df_L} < \frac{\Pi i}{(ic + (m+n)(1-c))} + 2w_o \quad (18)$$

The LHS of condition (18) is increasing with $n-i$, as the integral in the denominator decreases in the number of other farmers in the district. In Figure 2 we plot the distribution of f_L for different values of $n-i$. The larger the pool of farmers $n-i$ the larger the variance of this distribution (recall $f_L \sim \Phi[\frac{n-i}{2}; \frac{n-i}{4}]$), 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 (18), 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 (18) with equality, then any $n-i > \underline{z}$ leads the most motivated L tenant to vote for L . \square

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. On the other hand, when $n-i$ increases tenants face a decreasing probability to be decisive for the

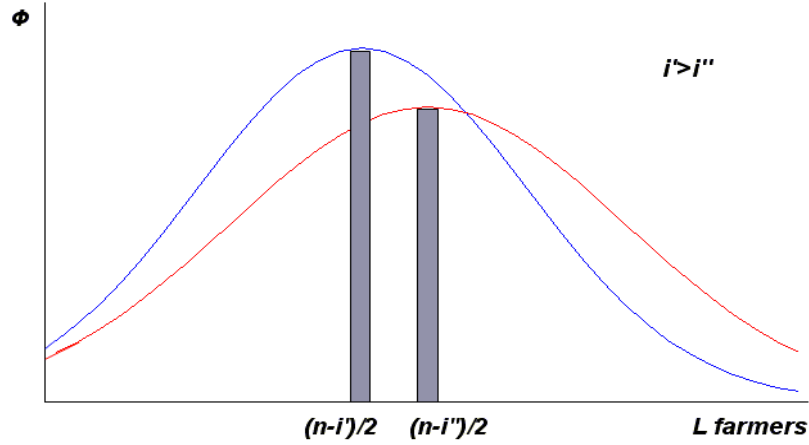


Figure 2: Maximum deterrence for different levels of farmers

implementation of the punishment. When is no longer profitable to offset this incentive to deviate by increasing further the expected wage, the motivated tenants deviates.

Corollary 1. *Under Assumption 1 and 2 full vote control is implemented at no cost $i = n$.*

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

$$\bar{x}^* = 1 \tag{19}$$

meaning that, if even one L vote emerges in the district, all tenants are punished. This implies that in condition (13) 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 behaviour 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. The result described in Corollary 1 represents also the only possible equilibrium if Assumption 2 is relaxed. In fact, if the landlord can deter all L oriented farmers and C potential voters from electoral registration, the electoral district will have R farmers and tenants only. Since L votes can only come from tenants, the optimal punishment scheme is the same at the one presented for $i = n$. Indeed this would imply perfect and costless control of electoral outcome.

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

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

Proof. Recall that the landlord forces his tenants to register at no cost. Registering tenants increases in expected terms the electorate by ic voters, who would not have registered spontaneously because the cost of registration is larger than the utility of voting ($\sigma < c$). If the landlord fails to control the voting behavior of the registered tenants, the vote of the low motivated tenants would increase the probability of winning the election for R and L by the same amount in expected terms (at the expenses of the C party). In other words, even without any control of votes, the electoral registration of tenants increases landlord's utility. Moreover, if the landlord controls even one tenant only, then the increase in the probability of victory for the R party, as determined by the vote of the low motivated tenants, is larger than the increase for the L party. 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 (13) 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 (14) is fulfilled for the wage w_o , as the denominator equals 1. Summing up, whatever the size of $n - i > 0$, 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 approaches zero, as the cost of registration is imposed on tenants anyway.

Some qualifications of the previous claims are needed. Our 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 anymore. Anticipating this, no L tenant would vote R. Hence, no punishment would be announced in the first place⁹. However, the landlord would still find it profitable to register all tenants as long as the probability of them being L oriented is equal or less than 1/2, since this increases the chances of winning the elections against the C party.

The provisions of the model are reasonably clear: when voting behavior is individually observable a landlord who concedes a large rent to his tenants for efficient purposes can control their vote. Since

⁹In 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 landlord has positive gains from letting them vote for R, he will register all his tenants to capture this political rent. If the landlord can inflict a punishment to L voters, a bias in registration occurs, 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. However, the bias in registration should not reduce significantly as landlords can still profit marginally from controlling the votes of the least motivated L tenants. The remainder of this paper tests these provisions 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. These became institutionalized in the 19th century and elections determined presidential succession without significant military or other intervention. During the first period the electoral process was controlled by the municipal authorities who usually strongly favored the central government. 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 (Boron, 1971).

After a period where municipal authorities controlled elections again (1891-1912) spread corruption and fraudulent behavior, proven by the number of registered voters being higher than the population eligible for voting (Nazer and Rosembliit, 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 unique electoral list was formed to be renewed every 9 years. This drastically reduced the number of registered voters by more than two third as shown in Table 1 (Nazer and Rosembliit, 2000).

A new political constitution was introduced in 1925. Concerning electoral legislation, a permanent electoral registration office was created, which would be suspended only six months before each election. Before 1925 offices were open only 10 days from 10:00 to 14:00 during the year before the elections. Most eligible voters were not even aware of the opening times unless they had strong personal political engagement. Elections supervision was given to a new body formed by ex high institutional personalities (Tribunal Calificador de Elecciones) and Armed Force members were excluded from registration lists. Thus, theoretically the largest taxpayers were substituted by public officers and notables in elections supervision. However, the same law insisted that they should preferably be proprietors, professionals and rich in general, ensuring to landlords a firm hold on elections (Gumucio and Vanquez, 1988; Valenzuela, 1998).

Perhaps not surprisingly, 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). Landlords systematically controlled rural voting until the late 1950s (Millar, 1981). In 1958 control of voting was endemic in the traditional oligarchic provinces of the North and Urban Central Valley 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. Valenzuela (1985; 1998), even if not entirely supporting the hypothesis of total control, confirms that the landlords would typically organize a party where the preferred candidates were presented to their peasants. On the election day landlords would then organize the transport to the cities or villages, where polls were located.

This pervasive control was a result of different 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.

Table 1: the Chilean national registration rate in XX century

Election	Population	Registered Voters	Registration Rate (%)
1900	2,959,000	281,351	9.54
1903	3,065,000	340,106	11.1
1906	3,175,000	409,635	12.9
1909	3,295,000	493,474	14.9
1912	3,421,000	593,234	17.3
1915	3,553,000	184,307	5.2
1918	3,690,000	341,872	9.3
1921	3,839,000	380,000	9.9
1925	3,929,000	302,142	7.7
1932	4,495,000	429,772	9.6
1937	4,842,000	475,354	9.8
1941	5,149,000	575,625	11.2
1945	5,541,000	641,495	11.6
1949	5,962,000	591,994	9.9
1953	6,462,969	1,106,709	17.1
1957	7,062,403	1,284,154	18.2
1961	7,765,900	1,858,980	23.9
1965	8,509,717	2,920,615	34.3
1969	9,198,978	3,244,892	35.3

Source: Correa et al. 2001 and Nazer and Rosembit, 2000.

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 long term tenants (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 probably provided a strong enough incentive for inquilinos to vote for their landlord's preferred candidate. In fact, "the relation between patron and worker [inquilino] was defined by a total authority on the one side and total dependence and obedience on the other" (Kaufman, 1972, p.22). This incentive

was even reinforced from the political isolation of the countryside and from the almost unchallenged power that landlords enjoyed on their lands where they dominated the local government and the police force (Swift, 1971; Bauer, 1975; Petras and Zemelman, 1973). They would throw out of their land tenants and peasants voting for the left, or simply for the non-designated candidate as well as anybody trying to influence their peasants' political opinion (Loveman, 1976). Moreover, the 30s and 40s economic crisis led to a "tacit pact" in which landlords guaranteed low price agricultural products for the expanding cities and in exchange obtained from center and left parties low or no political spread of the new ideologies on their lands. Accordingly, left parties were then mainly urban organizations and Christian Democrats became interested in the countryside only after 1958 (Loveman, 1976). Until 50s the urban-rural border was generally accepted as a border for political competition. Using the words of Kaufman:

With the rural workers considered beyond the pale of legitimate competition, none of the parties, including those of the left, were in a position to acquire a large, organized mass base of support. The landowners' [...] willingness to acquiesce in the limited welfare demands of salaried and blue-collar strata [...] virtually assured the preservation of their rural prerogatives during the years between 1920 and 1950. Thus, by an agreement which was sometimes tacit and sometimes explicit, centrist and leftist groups abandoned efforts to shake the rural authority structure (Kaufman 1972, pp. 18, 25-26).

Well into the 1950s the countryside was outside the bounds of legitimate party competition (Loveman, 1976). Quoting directly Loveman:

In these conditions (economic crisis) the bourgeoisie decided again and again to oppose increases in agricultural prices. The bourgeoisie was disposed to find ways to compensate the landowners. The nature of these measures depended upon political exigencies but there was one means which was almost always constant: repression of the rural union movement (Loveman, 1976, p. 203).

However, this pervasive control was bound to change eventually. There were several important electoral reforms undertaken in Chile Between 1949 and early 1960s.

In 1949, Law N 9.292 extended the franchise to women, who voted first for municipality elections, then for congressional contests in 1951, and finally for presidential race in 1952. This determined a first sharp increase in size of the electorate (see Table 1). However, this increase in registration does not seem to have significantly changed the control of votes on the countryside (Baland and Robinson, 2007).

The most important reform was Law 12.889 promulgated on May 31st 1958 (see Cruz Coke, 1984, pp. 27-29 for a discussion of this law) and its most important aspect 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.

If the lack of secret balloting had played an important role in guaranteeing democratic stability in Chile since the 1930s, why was the secret ballot introduced? A plausible reason for this is a

deliberate attempt to disrupt the existing political equilibrium by Ibez, elected President few years before supported by a heterogeneous coalition and with an anti-politics platform. Ibez intended to form a new political movement and the introduction of the secret ballot, with its expected shock on voting in the countryside, might have been a calculated gamble. Another reason might derive from the victory of the right parties in 1957 and the consequent increase in personal power and popularity of Jorge Alessandri. That might have pushed Ibez to reject the coalition with the right wing of his constituency and to rely more on the leftist parties' support (Correa et al., 2001b). The 1958 reform was heavily supported by leftist parties (FRAP along with the Radical and Falange Nacional) which saw in the elimination of bribery and vote control the opportunity to increase popular participation and consequently their power (Parrish et al., 1970).

Finally, a potential explanation is provided by the words of a Colombian Senator facing an analogous law project more recently: "To go against public opinion is to commit [political] suicide" (Shugart et al., 2006, p.20). In other words, actors do not support reform for its own sake but fear the political consequences of blocking it (Shugart et al. 2006).

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. Moreover, that immediately increased electoral participation. The proportion of population registered increased from 18% in 1957 to almost 24% in 1961 (Fandez, 1988; see also Table 1).

However, the largest increase in registration occurred after the adoption of the 1962 electoral reform, which 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 (e.g. access to services in banks, credit institutions and government entities, and documents to leave the country) and fixed tougher sanction for non registration (up to sixty days in prison, or a fine of half *scudo* a day, and loss of civil rights for ten times the length of imprisonment), and on the other hand " [...] simplified significantly the registration process making it easier for all citizens, whatever their work schedule and working conditions, to comply with the legal requirements" (Born, 1971, p. 406; Gil, 1969).

Thus, registration list were made are permanent and would be declared null only if more than fifteen names had been dropped for death, change of residence, or similar reasons. Opening hours of registration offices (which represented 4% of work time in the 50s) were significantly extended making it finally possible for the working class to comply with their electoral duty (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. The first elections following the reform led the Christian Democrats to the Presidency although Fandez (1988) claims that this result was heavily influenced by U.S. financing which covered apparently more than half of the total budget of the Christian Democratic candidate Eduardo Frei. However, in the 1965 Parliamentary election and even more in the 1970 Presidential election the change in the electorate became evident with the victory of the socialist candidate Salvador Allende.

As already mentioned Baland and Robinson (2008) focus exactly on this change in electoral results. Our focus is instead on the radical change in registration. Indeed, it was not only the freed *inquilinos'* votes which determined the change, but the increasing electorate that found it profitable to register and vote, once landlords' punishment was not feasible anymore.

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 mainly concentrate 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 L oriented voters. This can be a reasonable assumption in the rural setting in which the landlord often represented the only authority in situ and could frequently dispose of the public force for her purposes. 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 other farmers are weakly politically motivated. This is a standard characteristic of relatively isolated rural regions, in which political activism is costly and easily contrasted by local interests. Usually the closer one gets to large urban settlements the larger the interest and the participation of the population to politics. We focus therefore in the remainder of the paper on results derived from the rural sub-sample.

3.2 The Empirical Models

The model set up in the theoretical part of this paper shows under some conditions, i.e. privileged economic status for tenants (inquilinos), observable individual voting behavior and feasible punishment of *wrong* voters by the landlord, a bias in registration would emerge, in which tenants 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 that directly, as we do not have the data on the registration 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 will only marginally decrease, as landlords still register all inquilinos even when only some can be controlled. We test this by comparing registration rates before and after the 1958 reform. We

expect the gap in registration rates after 1958 to slightly reduce. 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. In the previous section we reported that landlords would typically teach to their inquilinos how to write their name to pass the test of literacy needed to register. If that continued after 1962, we might still observe some bias in registration.

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

$$V_{jt} = r^I l_{jt}^I I_{jt} + r^A l_{jt}^A A_{jt} + r^O l_{jt}^O O_{jt} \quad (20)$$

where V_{jt} is the number of registered voters at time t in municipality j ; r^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}^K 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 is at the municipality level. We proceed testing our predictions using two specifications of the model. In the first specification we divide both sides of (20) by the total population of the municipality:

$$\frac{V_{jt}}{P_{jt}} = c + r^I l_{jt}^I \frac{I_{jt}}{P_{jt}} + r^A l_{jt}^A \frac{A_{jt}}{P_{jt}} + \epsilon_{jt} \quad (21)$$

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

$$\frac{V_{jt}}{P_{jt}} = c + r^I l_{jt}^I \frac{I_{jt}}{P_{jt}} + r^I l_{jt}^I \frac{I_{jt}}{P_{jt}} * year_t + r^A l_{jt}^A \frac{A_{jt}}{P_{jt}} + r^A l_{jt}^A \frac{A_{jt}}{P_{jt}} * year_t + \epsilon_{jt} \quad (22)$$

where y_{61} and y_{65} are year dummies for year 1961 and 1965, respectively.

To obtain the second specification, Model II we divide both sides of (20) by the total *literate* population of the municipality, L_{jt} :

$$\frac{V_{jt}}{L_{jt}} = c + r^I l_{jt}^I \frac{I_{jt}}{L_{jt}} + r^I l_{jt}^I \frac{I_{jt}}{L_{jt}} * year_t + r^A l_{jt}^A \frac{A_{jt}}{L_{jt}} + r^A l_{jt}^A \frac{A_{jt}}{L_{jt}} * year_t + \epsilon_{jt} \quad (23)$$

According to the theoretical predictions, we expect $r^I > r^A$ before the introduction of the secret ballot. Moreover, the coefficients of the interaction terms should reduce the gap between the two registration rates. However, in both specifications above the coefficients estimated are determined both by the registration rate *and* the literacy rate. If inquilinos had systematically higher literacy rates than other farmers, 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 differential. 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 still can 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:

$$\frac{L_{jt}}{P_{jt}} = c + \beta_1 \frac{I_{jt}}{P_{jt}} + \beta_{2t} \frac{I_{jt}}{P_{jt}} * year_t + \beta_3 \frac{A_{jt}}{P_{jt}} + \beta_{4t} \frac{A_{jt}}{P_{jt}} * year_t + \epsilon_{jt} \quad (24)$$

Our identification assumption is safe if $\beta_1 \leq \beta_3$. We test equation (24) 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 2 for the entire sample and for the rural sample only.

Table 2: Test on literacy rate across groups and time.

Dep. Var.= $\frac{L_{jt}}{P_{jt}}$	Municipality FE		Municipality FE	
	Entire sample (n=717)	Rural Sample (n=570)		
	β	t-statistics	β	t-statistics
I/P	-0.42	-2.38	-0.4	-2.13
A/P	0.048	1.58	0.01	0.33
$I/P*y61$	0.07	1.07	0.16	1.52
$A/P*y61$	0.001	0.10	0.01	0.75
$I/P*y65$	0.16	2.36	0.37	3.50
$A/P*y65$	0.006	0.40	0.025	1.43
$y61$	0.06	21.82	0.056	15.68
$y65$	0.12	46.22	0.12	33.13
$constant$	0.64	117.33	0.63	96.33

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

As expected $\beta_1 \leq \beta_2$, 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 incentive was present. Overtime literacy rate increased among all rural agents in Chile, but more rapidly in municipalities with relatively more inquilinos. Accordingly, we should expect the registration rate to increase more sharply in those inquilinos richer municipalities, if registration depended genuinely on literacy only.

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, literacy rate is not constant over time and it increases more among inquilinos rich municipalities. This will tend to decrease the reduction of the bias detected in the estimation for 1961 and 1965 elections.

3.3 The Basic Results

We tend to favor 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 3 the results of the estimation of Model I and in Table 4 the results of Model II with and without provincial dummies.

As expected for both specification the coefficient for inquilinos is 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 control their tenants' votes and able to deter effectively low motivated agents in the countryside from registering. Clearly, municipalities with a relevant presence of inquilinos had relatively more voters, which is exactly what our model predicts.

Let us now focus on the effects of the introduction of the secret ballot that occurred in 1958. This is captured by the group-specific terms interacted with the time dummies. Looking at Table 3 we observe that indeed after the introduction of the secret ballot the bias in registration partially falls. In both specifications with and without provincial dummies the reduction in registration rate in 1961 among inquilinos as compared with the reference category (non agricultural agents) is larger than the reduction experienced by other agricultural workers. Interestingly, when provincial dummies are entered in the regression the two coefficients capturing the reduction in the registration rate in inquilinos rich municipalities lose significance.

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

Dep. var. = $\frac{V_{it}}{P_{it}}$	Municipality FE		Municipality FE Provincial dummies	
	β	t-statistics	β	t-statistics
<i>I/P</i>	1.39	3.73	0.74	1.92
<i>A/P</i>	0.286	4.00	0.31	3.61
<i>I/P*y61</i>	-0.42	-2.03	-0.26	-0.97
<i>A/P*y61</i>	-0.16	-4.85	-0.15	-3.45
<i>I/P*y65</i>	-0.57	-2.67	-0.43	-1.60
<i>A/P*y65</i>	-0.296	-8.26	-0.28	-6.18
<i>y61</i>	0.08	11.04	0.07	2.68
<i>y65</i>	0.16	22.90	0.15	5.84
<i>constant</i>	0.06	4.67	0.07	2.43

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

Table 4: Model II using the rural sub-sample (n=570)

Dep. var. = $\frac{V_{it}}{L_{it}}$	Municipality FE		Municipality FE Provincial dummies	
	β	t-statistics	β	t-statistics
	<i>I/L</i>	1.07	3.71	0.697
<i>A/L</i>	0.27	4.82	0.29	4.57
<i>I/L*y61</i>	-0.24	-1.36	-0.11	-0.52
<i>A/L*y61</i>	-0.11	-3.92	-0.08	-2.53
<i>I/L*y65</i>	-0.30	-1.42	-0.25	-1.01
<i>A/L*y65</i>	-0.21	-7.80	-0.18	-5.69
<i>y61</i>	0.086	9.38	0.07	2.11
<i>y65</i>	0.17	18.45	0.15	4.44
<i>constant</i>	0.11	6.51	0.12	2.94

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

The reason may be related to the high correlation between the share of inquilinos on the population and the provincial dummies. A way of testing for this is to regress the share on inquilinos on the set of provincial dummies interacted with year dummies. Such an exercise results in highly significant coefficients and a $R^2 = 0.51$, which confirms our worries. This leads to a problem of multicollinearity which typically increases the variance of the estimated coefficients which we observed. Since we are estimating our model in a municipality fixed-effect framework, we are already controlling for unobservable local specific heterogeneity. Moreover, depending on the model only 3 out of 75 provincial dummies are significantly different from zero. Consequently, we argue that the specification without provincial dummies can be trusted. Notice that as expected the bias reduces only marginally in 1961. We argue that this was mainly due to the relative larger increase in the registration among other farmers. In 1965 the bias falls further. However, this is very likely to result from the 1962 reform. Making registration compulsory reduces by definition the bias as it forces the entire literate population to register. It still remains the possibility for the landlords to register their illiterate inquilinos by teaching them how to write their name. Even allowing for this, the bias is expected to fall.

The reductions of the bias in 1961 and 1965 are instead less stable and non-significant in Model II. Even in the specification without provincial dummies Model II does not show any statistically significant reduction of the registration rate for inquilinos. Recall however, that what we are in fact capturing with these coefficients is a joint effect of the change in registration rate and literacy rate. As we showed in Table 2 literacy rate in inquilinos rich municipalities increased over time. Given the coefficient found it is likely that on average the reduction in registration rate might have been larger than the increase in literacy rate, but that that has not systematically been the case, resulting in poorly significant coefficients.

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 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. 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 the two strategies are reported in Table 5 for Model I. We can not run this test on Model II as we do not have literacy in 1935 by municipality.

Table 5: Model I with inquilinos in 1935 using the rural sub-sample (n=486)

Dep. var. = $\frac{V_{it}}{P_{it}}$	Municipality FE		Municipality FE		POLS ($R^2 = 0.54$)	
			Prov. dummies		Prov. dummies	
	β	t-stat	β	t-stat	β	t-stat
<i>I/P</i>	–	–	–	–	0.25	1.32
<i>A/P</i>	0.47	5.91	0.45	4.86	-0.12	-2.34
<i>I/P*y61</i>	-0.31	-2.23	-0.21	-1.23	-0.09	-0.55
<i>A/P*y61</i>	-0.20	-5.22	-0.19	3.81	-0.13	-3.79
<i>I/P*y65</i>	-0.57	-3.99	-0.61	-3.61	-0.55	-1.46
<i>A/P*y65</i>	-0.35	-8.66	-0.29	-5.40	-0.09	-1.16
<i>y61</i>	0.08	9.99	0.10	2.65	0.09	11.11
<i>t65</i>	0.17	20.97	0.19	3.41	0.12	20.30
<i>constant</i>	0.06	5.09	0.05	1.51	0.10	163.71

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

The fixed-effect estimations is consistent with a marginal fall of the bias in 1961. After the introduction of the secret ballot, a larger reduction in registration rate among inquilinos occurs as compared to other farmers. 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, our robustness check mainly focuses on the existence of a bias in registration in 1957, and the estimation 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 consistent with the predictions of the model. The different empirical models we tested converged regarding the existence of a bias in registration before 1958, in which inquilinos were more likely to register than other farmers. The introduction of a secret ballot reduced partly this bias, probably due to an increase in registration among other farmers.

Baland and Robinson (2008) showed that it was in inquilinos-rich municipalities that the largest change in political orientation occurred (from right parties to center-left parties) after 1958. They interpreted this as evidence that inquilinos were finally free to vote for their own preferred party after the introduction of the secret ballot. According to our result we suggest that it was not only the control of inquilinos which drove the electoral results before 1958, but also the unchallenged power of landlord on their territories which effectively deterred a large section of population from

registering. In the same line, the change in election results after 1958 was only partly determined by the free vote of inquilinos, declining in number starting from 1935 (Bauer, 1975). Indeed, the large mass of new voters registering in 1961 and even more in 1965, had probably an equally important impact.

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 elections. 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. Moreover, we show that as long as electoral districts are heterogeneous enough, i.e. contain also free voters, any attempt to control votes on the basis of district aggregate results is bound to fail. 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, consistent with our theory, the political reforms led to large changes in registration. Before the reforms, localities with more pervasive patron-client relationships tend to exhibit a higher registration rate. After the reform, the difference in registration rate across localities decreased, but not entirely. A direct support to the introduction of secret balloting in democratic political systems is directly implied by our results. However, our model 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 be some uncertainty on the aggregate elections' results at the smallest electoral level. Accordingly, we argue that sometimes secret ballot alone will not be enough to achieve truly democratic elections. In the case of Chile, compulsory registration introduced by the 1962 reform most likely strengthened the effects of the secret ballot. Elsewhere redesigning electoral district boundaries might even be required.

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