

# IBS

---

**INSTITUTE OF BEHAVIORAL SCIENCE ■**

---

**RESEARCH PROGRAM ON  
ENVIRONMENT and BEHAVIOR ■**

University of Colorado at Boulder  
Boulder CO 80309-0484

---

***WORKING PAPER* EB2005-0005 ■**

---

---

## **How Interest Groups with Limited Resources can Influence Political Outcomes: Information Control and the Landless Peasant Movement in Brazil**

Lee J. Alston  
Gary D. Libecap  
Bernardo Mueller

June 2005



**How Interest Groups with Limited Resources can Influence Political Outcomes:  
Information Control and the Landless Peasant Movement in Brazil**

by

Lee J. Alston  
University of Colorado  
NBER

Gary D. Libecap  
University of Arizona  
NBER

Bernardo Mueller  
University of Brasilia

June 13, 2005

JEL classification: **D23, D72, D78**

Keywords: Landless Peasant Movement, MST, Interest groups, multiprincipal, multitask, land reform.

For comments we thank A. Mushfiq Mobarak and Anna Rubinchik-Pessach as well participants at the following workshops and meetings: XXIII Encontro Brasileiro de Econometria Salvador 2001, Universidade Católica de Brasília 2001, Department of Economics of the University of Brasília 2001, Latin American Meetings of the Econometric Society (LAMES 2002), Institute for Behavioral Science - University of Colorado 2004, Colorado University Environmental and Resource Economics Workshop 2004, and the Latin American and Caribbean Economics Association Meeting (2005). Libecap thanks the the International Center for Economic Research (ICER), Turin, Italy for support to work on this project during the summer of 2005.

## **I. Introduction.**

In this paper we examine how interest groups with limited resources (votes and campaign contributions) nevertheless effectively influence political policy through the control of information to general voters. Voters in turn lobby politicians to take actions desired by the interest group. As an illustration of our model we focus on the Landless Peasants Movement (*Movimento Sem-Terra*) or MST and its success in invigorating land reform in Brazil. Although we direct attention to the MST, our analysis can be generalized to interest group behavior in other settings.

We analyze the politics of land reform in Brazil through a model that takes into consideration the constraints faced by the President in determining how many resources to devote to interest groups. Although there are well-organized, wealthy constituents, large property owners, who oppose land reform, we show how the MST effectively countered by affecting how voters perceive the government's land reform efforts. In general, urban voters support rural land reform, but since it does not directly affect them, they have little incentive to determine whether or not the government's claims of action are consistent with actual resource allocation. Indeed, prior to the mid 1990s and the effective rise of MST, despite broad voter backing, there was little progress on land reform. Entrenched opposition from property owners and the inability of voters to monitor government policies resulted in assertions of action with little practical results. After 1993, however, the pattern changed and we analyze how this occurred.

## **II. Background: Land Reform in Brazil.**

Brazil has long had one of the most concentrated land ownership structures in the world. Approximately 45% of the agricultural land is held by the largest 1% of farm owners, and large tracts of this land are not used. The Gini coefficient of 0.85 in 1985 was the 9<sup>th</sup> highest in the world, only behind countries like Panama, Barbados, and Guam (FAO/UN, 2004).<sup>1</sup> In terms of the size of the population affected it is certainly among the

---

<sup>1</sup> The ten highest Gini coefficients in the FAO dataset ([www.fao.org/es/ess](http://www.fao.org/es/ess)) are Barbados (0.94, 1989 data), Paraguay (0.93, 1991), Guam (0.88, 1987), Virgin Islands (0.87, 1987), Panama (0.87, 1990), Bahamas (0.87, 1994), Peru (0.86, 1994), Spain (0.86, 1989), Brazil (0.85, 1985), Argentina (0.83, 1988).

most problematic cases with more than 4 million landless peasants estimated<sup>2</sup>, a contingent bigger than the entire population of some of those countries (Panama – 3 million, Barbados – 0.265 million, Guam – 0.166 million).

Concentrated land holdings grew out of the Brazilian colonial experience, and since the 19<sup>th</sup> century there have been repeated efforts by the central government to “substitute small holdings for latifundia” [Dean, 1971:624]. This desire was to a large extent motivated by the comparison with the United States where an equalitarian system based on small family farms was proving to be highly successful in attracting migration and generating economic growth. In 1938 the federal government created the Land and Settlement Division which focused mostly on distributing public land. In 1946 the Constitution introduced the notion of expropriation of a private farm if it were not fulfilling its “social function,” allowing latifundia to be expropriated. After the military coup of 1964, the government viewed land reform as key to economic development, but even 21 years of a military dictatorship did not lead to serious changes in the distribution of land ownership. With return of civilian rule further attempts were made, and indeed, every new government had a special land reform program with ambitious goals that featured prominently in party platforms and election campaigns.

But little of consequence happened. The Gini coefficient barely budged. In 1960 it was 0.842; in 1978, and 1998, 0.843. Very large farms of over 1,000 hectares also continued to dominate land holdings. In 1940 1.5% of the farms held 48.3% of farmland; in 1960 1.0% held 44.1%; and in 1980 0.9% held 45.1%, and in 1996 1.1% held 45.1%.<sup>3</sup>

Despite this lack of action, the general electorate has long been sympathetic to the notion of land reform, a natural reaction given such salient inequality.<sup>4</sup> This broad constituency for land reform, however, is unorganized, heterogeneous and has only limited information regarding how much land reform is being carried out. Rural property owners

---

<sup>2</sup> This is the estimate typically given by the Landless Peasants Movement. The Lula government’s II National Plan for Agrarian Reform (Ministério do Desenvolvimento Agrário, 2004) puts the demand for land reform at 3.1 million, or 5 million if one counts those who have land but in an insufficient amount. The Food and Agriculture Organization estimated the demand for land reform in Brazil at 2.5 million families in the mid-nineties (Romeiro et. al. 1994).

<sup>3</sup> Gini coefficients presented here are from Incra (2001) which tries to deal with several of the methodological difficulties in the calculation of this index.

<sup>4</sup> Evidence to back this statement will be given in Section III.

have steadfastly opposed it.<sup>5</sup> Historically, they were well organized and provided support to politicians through contributions and votes. They were represented by several organizations, such as the Brazilian Rural Society (*Sociedade Brasileira Rural*) and especially by a large group of Congressmen from various parties, known as the ‘rural bench’ (*bancada rural*), that united to promote the interests of land owners and agricultural producers. As a result until after 1993, the pattern was for politicians to call for aggressive land reform during electoral campaigns, and for little to be implemented once the election was over. So long as large landowners could deliver more support than could landless peasants, and so long as voters had little information on the actual state of land reform, politicians devoted few resources to it.

The pattern began to change when the MST (organized in 1985) took advantage of the new Constitution of 1988 that mandated the federal government to expropriate and redistribute unproductive properties and enabling complementary legislation that was passed in 1993.<sup>6</sup> By the mid 1990s, the MST had honed its strategy of invading unproductive properties with elaborate press coverage to demonstrate the plight of the landless poor. This new public relations effort galvanized voters and spurred the government to act on land reform.<sup>7</sup> As the numbers of invasions multiplied, urban voters were continually reminded of the task at hand, and land reform moved to the forefront with real resources devoted to it.

The purpose of this paper is to analyze how the MST influenced policy making in land reform so effectively. It is one of the most successful grassroots movements in the world and is frequently held as a model of interest group effectiveness even though it lacks direct voting power and funds to contribute to politicians.<sup>8</sup> We show how the MST has used its strengths to influence the level of information received by voters.

There is a large literature on the role of interest groups as transmitters of information (see Austen-Smith 1999, Grossman and Helpman 2001 and Van Winden 1999

---

<sup>5</sup> See Mueller (1998) for an incidence analysis on which groups were affected by land reform and econometric measurement of their effect on land reform policy.

<sup>6</sup> Although the Land Statute of 1964 already provided the legal basis for expropriations, the new Constitution broadened the scope for the use of this instrument, made it easier to use and, most importantly, signaled the disposition of government and society that land reform should be pursued with high priority.

<sup>7</sup> For the history of the MST and an analysis of their organization, thinking and impact see Wright and Wolford (2003).

<sup>8</sup> Noam Chomsky was cited by the Economist (2004) as stating that the MST “...is the most exciting popular movement in the world today.”

and 2003 for surveys), however, the flow of information in that literature is almost always from the interest group to policy makers to influence their actions.<sup>9</sup> In this paper, however, MST is modeled as revealing information to voters, who in turn pressure politicians for policy change. In our earlier papers (Alston, Libecap and Mueller, 1999a, 1999b, 2000) we described how MST invasions generated negative publicity for politicians, stimulated broad sympathy toward the landless, and led to further invasions. We were interested in explaining the pattern of invasions and modeled government intervention as exogenous. Here, however, we seek to explain the level of government action in land reform by endogenizing government activity. This is done through a multiple-principal, multiple-task principal-agent model where the government faces pressure from several interest groups and the electorate to pursue several different policy objectives. Each interest group exerts pressure by providing the government with votes (political support or opposition), contributions, or by affecting the information asymmetries faced by all interest groups and the voters concerning the government's true level of effort on each policy. The choice of which channels of influence to pursue depends on each interest groups' comparative advantage with each of these instruments. We argue that the MST has characteristics that make it particularly effective at influencing policy by increasing the electorate's awareness of what the government is actually doing to implement land reform.

The multiple-principal, multiple-task model of interest group pressure is presented in the next section. This model captures three important aspects of the relation between interest groups, the electorate and the government: i) the moral hazard that arises from the information asymmetries in the relation between interest groups and the policy makers; ii) the existence of multiple groups simultaneously pressuring the government for competing policies; and iii) the possibility that some groups may affect the level of information asymmetries between other groups and the government thereby indirectly changing the equilibrium level of effort on some policies. From the model we derive several characteristics that make an interest group more inclined to use the information channel on the electorate rather than contributions or votes. Then in Section IV we argue that the MST

---

<sup>9</sup> According to Reuben (2002), "Most of the information literature has concentrated on the information transmission between the interest group and the policymaker. It has neglected to look into the information flow among and within the interest groups." Some exceptions are Grossman and Helpman (1999, 2001) and Cameron and Jung (1995).

matches those characteristics and provide evidence that their actions do have the effect of increasing the pressure of the electorate on the government for land reform.

### III. A Multiprincipal, Multitask Model of Interest Group.<sup>10</sup>

In this section we present the multiprincipal, multitask model of interest group pressure specifically applied to the case of land reform in Brazil. In the appendix the more general model for  $n+1$  groups ( $n$  interest groups plus voters) is presented and can be referred to for details not shown in the more streamlined presentation in the text. The agent in the model is the government (Executive) who is in charge of creating and pursuing all policies including land reform. There are three principals, which we denote with superscripts  $m$ ,  $l$ , and  $v$ , for MST, landowners and voters, respectively. Each principal is interested in a specific policy (task) and would like to see the government satisfy their preferences. The tasks sought by each principal are denoted with the following subscripts:  $s$  for a policy of expropriation of private land and creation of settlement projects defended by the MST;  $p$  for the (non-) reform polices sought by landowners; and  $q$  for the reform policies sought by voters.<sup>11</sup> Given the limits on the agent's time and resources, effort expended on one task reduces the level of effort that can be allocated to another. The vector of government effort toward land reform is  $t' = \begin{vmatrix} t_p & t_q & t_s \end{vmatrix}$ , where the prime denotes a transpose.

In general the principals do not observe the level of effort placed by the government in each task, instead they observe the outcome of that effort. The vector of outcomes is modeled as  $x = t + \varepsilon$ , or:

$$\begin{vmatrix} x_p \\ x_q \\ x_s \end{vmatrix} = \begin{vmatrix} t_p \\ t_q \\ t_s \end{vmatrix} + \begin{vmatrix} \varepsilon_p \\ \varepsilon_q \\ \varepsilon_s \end{vmatrix} \quad (1)$$

where  $\varepsilon \sim N(0, \Omega)$  and  $\Omega$  is the covariance matrix of the random noise variable  $\varepsilon$ .  $\Omega$  is a 3x3 matrix with principal diagonal  $\omega_{ii}$ ,  $i=1, 2, 3$ , and zeros elsewhere. The larger the value of  $\omega_{ii}$  the more difficult it is for the principals to infer the level of effort  $t_i$  from the observation of the outcome  $x_i$ .

<sup>10</sup> This model is based on that by Dixit (1996, pg.157-171), which is a combination of the multitask model of Holmström and Milgrom (1991) and the multiprincipal model of Bernheim and Whinston (1986).

<sup>11</sup> Note that the land reform policies desired by the voters can be the same as those pursued by the MST. In the next sections we will provide more information on the nature of each groups' preferences.

Principal  $i$  benefits from policy outcomes according to the benefit functions  $b_i$ , which can be written as:

$$\text{benefit to principal } i = \begin{vmatrix} b_p^i & b_q^i & b_s^i \\ x_p \\ x_q \\ x_s \end{vmatrix} = \mathbf{b}^i \cdot \mathbf{x} \quad (2)$$

Following Dixit (1996) the cost to the government of directing effort to all the tasks is modeled as the following quadratic function:

$$\frac{1}{2} \mathbf{t}' \mathbf{C} \mathbf{t} \text{ where } \mathbf{C} = \begin{vmatrix} c_{pp} & c_{pq} & c_{ps} \\ c_{qp} & c_{qq} & c_{qs} \\ c_{sp} & c_{sq} & c_{ss} \end{vmatrix} \quad (3)$$

where the matrix  $\mathbf{C}$  is assumed positive definite. If the off-diagonal terms are positive there will be substitution amongst types of effort, so that an increase in  $t_i$  will imply a decrease in  $t_j$ , and vice-versa. If these terms are negative the types of effort will be complementary.

In the appendix we present the detailed derivation of the general model. Here we discuss only the main steps of the model so as to focus on the results. The derivation is done in four steps, starting with a first-best benchmark and adding additional elements in each step; (i) asymmetric information, (ii) multiple-principals and (iii) information manipulation. We will present and discuss the optimality conditions for each of these steps.

The benchmark case is one where the principals observe the levels of effort chosen by politicians and additionally are able to act cooperatively. As shown in the appendix, the optimal level of effort in this scenario is obtained by maximizing the sum of the agent's and the principals' net benefit from their interaction in the policymaking process. This yields the first-order condition  $\mathbf{b} - \mathbf{C}\mathbf{t} = 0$ , so that the first best level of effort is:

$$\mathbf{t} = \mathbf{C}^{-1} \mathbf{b} \quad (4)$$

where  $\mathbf{C}^{-1}$  is the inverse of the  $\mathbf{C}$  matrix. This result simply states that the marginal cost of effort in each task equals the marginal benefit to all parties.

The second step is to relax the assumption of observable effort. In this situation contracts between the principals and politicians must be made contingent on  $\mathbf{x}$  (outcomes) and no longer on  $\mathbf{t}$  (effort). As shown in the appendix, a linear reward scheme is used to stipulate the government's pay-offs given outcomes  $\mathbf{x}$ . That is, given the observed outcomes  $\mathbf{x}$ , the united principals provide politicians political support in terms of votes and

contributions that has a monetary equivalent equal to  $\alpha'x + \beta$ , where the  $\alpha$ s are the value of the marginal support given by the principals to government effort and  $\beta$  is a fixed payment that can be adjusted to assure the agent's reservation utility is at least matched. In this scenario the first-order conditions are:

$$t = C^J \alpha \quad (5)$$

Comparison of (4) and (5) shows that the addition of asymmetric information leads to a substitution of  $\alpha$  for  $b$  in those equations. In the appendix it is shown that the relationship between  $\alpha$  and  $b$  is:

$$b = (I + rC\Omega)\alpha \quad (6)$$

where  $I$  is an identity matrix and  $r$  is the coefficient of risk aversion of the government. Given that (i) all elements of  $C$  are positive (assuming outweighing substitutability amongst tasks); (ii) the elements of  $\Omega$  are positive, because they are variances; (iii) the  $\alpha$ s are positive, because the united principals will not want negative effort, it must be that  $b_j > \alpha_j$  where  $j=p, q, s$ . Thus the government optimally chooses less effort when effort is not observable than in the first-best situation where it is. This is the standard second-best story where, as a result of moral hazard arising from information asymmetries, less effort is realized in each task. In other words, the incentives in the case of asymmetric information are more low-powered than in the full-information case, which is due to the fact that in the second-best case there is a sharing of risk between the principals and legislators.

The third step is to allow non-cooperative behavior among the principals. This involves finding the Nash equilibrium of the game where each principal provides his own incentives to the agent and strategically takes into account the actions of the other principals. Now each principal  $i$ 's incentive scheme for task  $j$  is  $\alpha_j^i x_j + \beta_j^i$  for  $j=p, q, s$  and  $i=l, v, m$ , while the total for each principal is  $\alpha^i x + \beta^i$ . In the appendix we show that the expression for the total benefit arising from the Nash equilibrium, adding the benefit of all individual principals, is:

$$b = \alpha + 3r\Omega C \alpha \quad (7)$$

This equation can be compared to equation (6), the total benefit that resulted when principals were able to act cooperatively.<sup>12</sup> Remembering that when  $\alpha=b$  and the first-best solution is achieved, we can see that with non-cooperative principals a situation is reached that is even further from first-best than with unified principals, since  $r$  is now multiplied by the number of principals. The situation is therefore a third-best, characterized by apparent inefficiencies and low-powered incentives. In fact the inefficiencies are simply a direct consequence of the multiprincipal multitask nature of the problem.

To take the final step in modeling land reform politics in Brazil, suppose now that each of the three principals can influence policy not only through direct incentives (contributions, votes) represented by  $\alpha^j$ , but also by affecting the level of information available concerning the government's efforts in each task, that is, by affecting  $\omega_{pp}$ ,  $\omega_{qq}$  and  $\omega_{ss}$ . The problem faced by each group then becomes that of deciding not only the optimal level of  $\alpha^j$  to allocate for each task  $j$ , but also how much effort it will place towards affecting the information available to all parties (and especially voters) regarding each of the tasks. Let this effort by each interest group  $i=l, v, m$  to influence the information concerning efforts in each task be  $e^i = [e_p^i \quad e_q^i \quad e_s^i]$ . When deciding on the optimal level of  $e^i$  the interest group will take two factors into account. The first is that effort is costly, where the cost of that effort is represented by the cost function  $G^i(e^i)$ . The second is the fact that all other groups may also expend efforts to affect information availability, so that the solution will be a Nash equilibrium. Let  $e^{-i}$  be the vector of effort of all interest groups other than  $i$ . It is shown in the appendix that interest group  $i$ 's problem is now to maximize the following objective function with respect to  $\alpha^i$  and  $e^i$  taking  $\alpha^{-i}$  and  $e^{-i}$  as given:

$$b^i C^{-1} \alpha^i - r \alpha^{-i} \Omega(e^i, e^{-i}) \alpha^i - \frac{1}{2} \alpha^{i'} (C^{-1} + r \Omega(e^i, e^{-i})) \alpha^i - G^i(e^i) \quad (8)$$

The change compared to the previous objective function is the cost function at the end and the fact that the matrix of variances is now a function of the level of effort by each principal to influence information. The first order conditions for the maximization of (8) in extended form are:

---

<sup>12</sup> In the more general case of  $n+1$  principals this equation is  $b = \alpha + (n+1)r\Omega\alpha$ .

$$b_s^i = \alpha_s^i + rc_{ss}\omega_{ss}\alpha_s + rc_{sp}\omega_{pp}\alpha_p + rc_{sq}\omega_{qq}\alpha_q \quad (9)$$

$$b_p^i = \alpha_p^i + rc_{ps}\omega_{ss}\alpha_s + rc_{pp}\omega_{pp}\alpha_p + rc_{pq}\omega_{qq}\alpha_q \quad (10)$$

$$b_q^i = \alpha_q^i + rc_{qs}\omega_{ss}\alpha_s + rc_{qp}\omega_{pp}\alpha_p + rc_{qq}\omega_{qq}\alpha_q \quad (11)$$

$$-r\omega_{ss}^i\alpha_s^{-i}\alpha_s^i - \frac{1}{2}r\omega_{ss}^i(\alpha_s^i)^2 = G_{e_s}^i \quad (12)$$

$$-r\omega_{pp}^i\alpha_p^{-i}\alpha_p^i - \frac{1}{2}r\omega_{pp}^i(\alpha_p^i)^2 = G_{e_p}^i \quad (13)$$

$$-r\omega_{qq}^i\alpha_q^{-i}\alpha_q^i - \frac{1}{2}r\omega_{qq}^i(\alpha_q^i)^2 = G_{e_q}^i \quad (14)$$

The first order conditions (9), (10) and (11) define  $\alpha^i$ \*, the optimal incentives by principal  $i$  for each task. These equations show, as before, that the principal will offer a third-best level of incentive for each task due to the information asymmetries and the existence of other principals who are also providing incentives to the government.

The first order conditions (12), (13) and (14) define  $e^i$ \*, the optimal level of effort that principal  $i$  will place towards affecting information availability on each of the  $n+1$  tasks. The two terms on the left of each equation in that system show how much the marginal effort increases or reduces the wedge between the first-best situation  $b^i = \alpha^i$  and the third-best situation  $b^i = \alpha^i + r C \Omega \alpha$ . Those two terms are therefore the marginal benefit from effort  $e^i$ , whereas the term  $G_e^i$  is the marginal cost.

It is possible to perform comparative statics on this system to see what happens to optimal incentives for political action with a change in the level of information available. The direction of change depends on all parameters of the model. Intuitively, each principal will alter the incentives provided for a given task when more information becomes available regarding the government's effort. Those who benefit from that task will want to provide more incentives now that they have a better notion of what they are getting from politicians in exchange. Those who oppose the task will give fewer negative incentives, since the returns from opposition are reduced. However these reactions may be reversed depending of the relative values of the cost and benefit functions,  $C$  and  $b^i$ . Whatever the case, each interest group can strategically calculate how much and in which direction to affect information so as to pursue its policy preferences.

#### Implications from the model for interest groups' choice of instrument

In order to illustrate the working of the model for land reform policy in Brazil, assume that the government's main constraint are voters so that value of  $\alpha^v$ , the support (or opposition) given by the voters, is the largest part of the total support received by the government for all the tasks in this policy issue. Take from (9) the expression that defines  $\alpha_q^v$ , the optimal level of incentives that the voters will offer politicians for an additional unit of effort on land reform policy:<sup>13</sup>

$$b_q^v = \alpha_q^v + (rC\Omega\alpha)_q \quad (15)$$

Because the MST is interested in task  $q$ , it would gain if the voters increased their incentives to politicians for that task. At a given level of information availability, that is a given  $\Omega$ , the voters will be offering  $\alpha_q^{v*}$ , which is less than the first best level  $b_q^v$ , the difference between them being  $(rC\Omega\alpha)_q$ .<sup>14</sup> Since the voters are favorable to task  $q$ ,  $b_q^v$  - which is an exogenous parameter - will be positive. Therefore the MST can gain by putting effort towards reducing  $\omega_{qq}$  in  $\Omega$  so as to diminish the term  $(rC\Omega\alpha)_q$ .<sup>15</sup> Greater incentives lead to more effort by the government on land reform being accomplished, thus benefiting the MST. How much effort the MST will choose to apply towards pursuing this benefit is determined by the first order conditions in (12), (13) and (14), which show the marginal gains and marginal costs of an additional unit of effort to affect information.

The model in its general form has each principal giving incentives  $\alpha^i$  for each  $n+1$  tasks and affecting information on each task through  $e^i$ . In addition each principal is aware that the others will also act this way and takes that into account when making his decisions. The final effect on government effort, and consequently on outcomes, thus depends on the net result of all these simultaneous forces.

---

<sup>13</sup> Where  $(rC\Omega\alpha)_j$  is the  $j^{\text{th}}$  element of this 3 x 1 vector. Note that the voters' desired policy  $q$  is the same as the MST's desired policy  $s$ .

<sup>14</sup> Note that if there were no risk aversion,  $r=0$ , or if there were no information asymmetries,  $\Omega=0$ , then  $rC\Omega\alpha$  would equal a null vector and the first-best level of incentives would be offered.

<sup>15</sup> More generally, affecting information may entail either increasing  $\omega_{ji}$  (obfuscation) or reducing it (making truthful information available), depending on the signs of the elements in  $\alpha$  and  $C$  since  $r$  and  $\Omega$  are always positive. Note that  $\alpha$  includes the incentive of each principal for each task, which are endogenously determined, and  $C$  includes parameters that are negative if another task is a complement to task  $j$  and positive if a substitute. Interest group  $i$  will assess all this information and either obfuscate or provide more information so as to lead the voters to provide a higher level of  $\alpha_j^{v*}$ .

In practice we would not expect all interest groups to be able to influence information on each task, but rather that each group would have a comparative advantage in influencing particular tasks. That is, in real applications we would expect that the optimal incentives provided by each principal on some of the tasks, as well as the optimal effort expended to influence information, to be corner solutions and equal zero. The reason for this is that it is typically not easy for an interest group to be able to affect the level of information, either to make things more transparent or to obfuscate. Doing so often requires special characteristics of the interest group that are hard to acquire, and indeed, may not be readily purchased or emulated. In some cases, for example, it may be credibility that leads voters to believe the interest group's claims about what the government is actually doing.

Whether an interest group will be successful in pursuing its policy interests through the manipulation of information depends on the characteristics of the interest group and the policy that it is pursuing. By isolating some of the elements in the first order conditions (10), (11) and (12) we can analyze three such characteristics of an interest group:

i) The higher the marginal cost of influencing information,  $G_{e_j}^i$ , the lower will be the optimal level of such effort chosen by that group, *ceteris paribus*. If the marginal cost is sufficiently high, then it may be above the marginal benefit for all positive level of effort, so that the group will not try to influence information on that task. The fact that some interest groups pursue their objectives through contributions, rather than manipulating information may be due to the relative costs of the manipulating information being too high. Interest groups that are successful in pursuing policy goals through information manipulation thus have comparative cost advantages in these activities.

ii) The derivative  $\frac{\partial \omega_{jj}(e_j^i, e_j^{-i})}{\partial e_j^i}$  can be interpreted as the productivity of effort by an interest group to influence information. The more an additional unit of effort changes  $\omega_{jj}$ , the more productive the group and the more influence it will have over policy for each dollar spent in effort. Low productivity for some groups may be due to their lack of credibility among voters. Accordingly interest groups that work through the information channel will tend to have reputation advantages and effective means of getting noticed.

iii) The ability of an interest group to affect policy through information depends on the preferences of all  $n+1$  principals, that is  $\mathbf{b}$ . If voters care strongly about a given policy,

either favorably or in opposition, then changes in the level of information they receive can have large impacts on the government's effort level for that policy. If they are closer to indifference however, then pursuing that task by influencing information will be less fruitful *ceteris paribus*, even for a group well endowed with the other characteristics.

In the next section we argue that the MST matches the characteristics described above and pursues its policy objectives by influencing the information held by voters.

#### **IV. The Informational Role of the MST**

In this section we analyze the recent history of land reform in Brazil in the light of that model and show that the MST's methods and characteristics fit our portrayal of an interest group that pursues its goals by affecting the level and quality of information received by the other groups and voters concerning the government's actions.

In order to understand the impact of the landless peasant movement it is useful to apply the model to land reform politics in Brazil with and without the MST, so as to capture the period before and after that group became active throughout the country. In the pre-MST period the model would have as principals the landowners and voters. The landless peasants and rural workers could also be considered principals, but because they lacked organization they had little power to affect government policy. The "task" for landowners was to either block expropriations or if some land reform had to occur, it should include policies that benefited them as well, through government credit and other subsidies. Both of these actions would reduce the resources available for actual land reform.

The second group, urban voters sympathize with land reform.<sup>16</sup> Voters often mistakenly view land reform as costless to them and the country.<sup>17</sup> Although urban voters

---

<sup>16</sup> Several public opinion polls have been conducted over time to gauge society's position towards land reform. Almeida (1998) reviews eight opinion polls from 1962 to 1998, thus covering a large span of land reform history, and shows that there has consistently been broad support towards land reform. These polls were undertaken under very different methodologies and samples, but all overwhelmingly reflect the fact that Brazilian society has consistently viewed land reform favorably. In 1998, for example, a poll conducted by IBOPE revealed that 80% of those interviewed were "in favor of land reform."

<sup>17</sup> Expropriation for the purpose of land reform in Brazil is, by constitutional mandate, compensated at 'fair' value, though much of it in Titles of the Agrarian Debt, so that there are high costs for obtaining land as well as the expenditures to settle and maintain the beneficiary families. In 2004 the budget for INCRA, the federal land reform agency, was R\$ 2.5 billion (approximately US\$ 833 million) though in the end 5.98% of this was frozen by the central government to contribute towards primary surplus targets. In 2004 81,254 families are claimed by the government to have been settled.

support land reform, it is not a central preoccupation. They naturally are more concerned about issues which affect them more directly such as unemployment, inflation, health and crime. Consequently, they are only imperfectly informed on what the government is really doing in terms of land reform. Before the MST became active, voter information on land reform was essentially what the government presented.

The equilibrium resulting from this situation was one where the government announced land reform programs but never really implemented them. This equilibrium changed once the MST is introduced into the model. The MST is a well-organized interest group with a comparative advantage in influencing the information received by voters. This is done through highly-publicized farm occupations, marches, invasions of governmental offices, roadblocks, and accusations that the government is stalling. Through these actions voters revised their views regarding the government's commitment toward land reform and increased their political pressure for more action. In this new scenario the equilibrium level of government effort for the land reform 'task' is greater than in the pre-MST scenario. That this corresponds to reality is suggested by Graphs 1 and 2, which show that *circa* 1993 the MST became more active, increasing the number of invasions and occupations of private farms (Graph 1). This resulted in greater budgets for land reform (Graph 2) which in turn led to greater numbers of settled families of landless peasants (Graph 1).<sup>18</sup>

To illustrate, consider the situation regarding land reform after the election of President Lula in late 2002. The President and his party stressed land reform, but to avoid past inaction that followed elections and that seemed to be occurring in 2003, MST's leader announced that in April 2004 the movement would initiate a campaign of occupations that would lead to a "red April." This threat of violence forced the new government to increase

---

<sup>18</sup> Heredia et al. (2002) find that in a large sample 96% of land reform settlement projects emerge from some form of conflict rather than government initiative. They also show that although there are several other groups, the MST is by far the most active. The drop in occupations and settlements after 1999 can be attributed to several factors. By that time so many families had been settled that the MST's main focus shifted to pressuring the government to make good on its pledges of credit to those families rather than obtaining more land for new families. This is important for the MST as it receives 1-4% of all the credit provided to settled families. Also, in 1999 the economy passed through a severe crisis involving a large devaluation of the *real*. In the following years the government successfully dealt with this crisis by pursuing strict fiscal restraint (Alston, Melo, Mueller and Pereira, 2006), which severely constrained the governments land reform effort. Finally, in the year before the 2002 presidential election, the MST purposefully reduce the number of invasions so as not to harm the electoral chances of Lula.

its pace of land reform, expropriating 34 farms in April (Ornaghi, 2004). Its most important effect, however, was to make voters aware that land reform was still not moving forward.

The MST has the characteristics outlined in the model that underlie a comparative advantage in information control: (i) low marginal cost of affecting information received by other groups; (ii) high productivity of effort in affecting information; (iii) extreme configuration of preferences of other principals, particularly voters; and (iv) favorable cost relations (complementarities and substitutabilities) between its favored task and other principals' tasks.

i) Low marginal cost of affecting information ( $G_{e_j}^i$ ).

It is straightforward that interest groups that have low marginal costs of affecting information will pursue more of that strategy, *ceteris paribus*. The MST works closely with the media and maintains a flow of newsworthy events. The purpose here is to show that the MST is able to pursue these actions at relatively low cost. Before doing so, however, it is important to note that our argument does not require that voters approve of the MST and invasions of private farms. What is important is that the MST is continually able to elicit press coverage, that voters approve of land reform, and that the MST's actions impart information to them on the government's efforts towards that end.

An important characteristic affecting the costs of the MST's strategies is that they are extremely labor intensive, requiring large contingents of people to be mobilized for long periods of time. The invasion and occupation of a farm, and the process of transforming the occupied farm into an official land reform settlement, are procedures that can take several years, during which the potential beneficiaries go through extreme and unrelenting physical and emotional stress. An invasion typically requires the group (generally 30 to 500 people) camp out in neutral territory, such as by the side of a highway, for long periods, often months, awaiting the right time to act. The camps are traditionally composed of cheap black plastic and cardboard tents that have become so much associated with the image of landless peasants. The invasion may go through peacefully or may involve violent conflict.<sup>19</sup> The occupied farm is similarly made up of makeshift tents and living conditions are only slightly better than in the previous camps. After an invasion there are eviction attempts,

---

<sup>19</sup> From 1985 to 2003 there were 13,524 conflicts for land in Brazil, most of which involved an invasion and the subsequent resistance to eviction (Comissão Pastoral da Terra, 2004). A graph of the number of conflicts follows closely the number of occupations in Graph 1.

either by the landowner with private militia or by police following a court order for “reintegration of possession.” If there is an eviction, the group generally will return to a provisional camp to await the right time to reinvade the same property or start over on another one. This cycle can be repeated several times and many years can go by before progress is made. To maintain order the MST imposes strict discipline in its camps, where, for example, no alcohol is allowed, settlers can only leave with permission and for limited periods of time, and all work is done collectively. In addition there is constant indoctrination of the settlers on the goals of land reform and other political objectives. The movement has more than 1,000 schools in their settlements where they teach their own curriculum despite being financed by the state (Weinberg, 2004).<sup>20</sup>

This description shows that the means used by the MST to affect the information received by other parties on the government’s land reform effort involves mobilizing very large numbers of people and convincing them to undergo extreme hardship for long periods of time.<sup>21</sup> Practically all of the interest group literature since Olson (1965) and Stigler (1971) has recognized the ability to overcome free-rider problems and low costs of organization as key determinants of interest group success. MST’s ability to maneuver a large contingent of people for whatever task is necessary to attract attention, no matter how grueling, tedious or dangerous, is key to the MST’s success. It is the low opportunity cost of landless peasants that enables the MST to control its members. Most MST members are extremely poor with little to lose and nowhere to return.<sup>22</sup> The lack of alternatives makes them more receptive to accept the hardships imposed on them by the movement without rebellion or desertion. With such low opportunity costs, the distant promise of a piece of

---

<sup>20</sup> Despite the biased content of the education that is provided in the schools in settlement projects (Karl Marx, Che Guevara and the Chinese revolution are major topics), it is nevertheless education and children that otherwise might not have had the chance, learn to read and write. In 1995 the MST received a prize from UNICEF in recognition of their work in educating children.

<sup>21</sup> From 1995 to 2002 423,813 families were settled in 5,100 official land reform projects most of which arisen from MST occupations, Heredeia et al. (2002). This number indicates that the MST is quite adept at recruiting members.

<sup>22</sup> In this regard Wright and Wolford (2003: 54) cite a settler’s recollection of his days in an MST occupation: “We lost what little we had when we went to the encampment. We could take little even of those few things that we owned into the new encampment, the only thing we took was our (wood-burning) cook stove. What little savings we had were soon gone, because we were earning nothing. We had no house nor land to return to, no household goods, hardly any clothing, very few of our tools – everything was lost. And there was no way to go back and be the same person again to the old neighbors, the friends on the outside.” In other passages the authors also document several positive memories that settlers held from the occupation days, in particular the camaraderie and the sense of empowerment from participating in the movement.

land is sufficiently attractive so as to make participation in an occupation a worthwhile prospect.<sup>23</sup>

It is important to consider not only the MST's cost of influencing information, but also that of their chief competitor, landowners. As noted by Becker (1983) what matters in competition between interest groups is not absolute but rather relative pressure.

Landowners have considerable financial resources that could be used to influence the availability of information if that proved to be a productive means of affecting policy. Land owners are well organized and have overcome the free-rider problem. In the late 1980s the landowners even formed a political party, the UDR (*União Democrática Rural*) to fight land reform. What is relevant for our analysis is the marginal cost facing land owners of influencing voter information as compared to the benefits they receive from doing so.

Marginal cost includes the opportunity cost of not using those resources on direct influence, as well as on other productive activities or consumption. It is reasonable to assume that those opportunity costs are considerably higher for landowners, relatively, than they are for the landless peasants, where the resources are mostly in the form of time and effort for which they have much fewer alternative uses.

ii) Productivity of effort in affecting information ( $\frac{\partial \omega_{ij}(e_j^i, e_j^{-i})}{\partial e_j^i}$ )

The second characteristic for an interest group to be successful at influencing information received by other groups is the productivity of those efforts. Even if an interest group manages to get its message through it may have no effect if it has no credibility. A high value of  $\frac{\partial \omega_{ij}(e_j^i, e_j^{-i})}{\partial e_j^i}$  means that the information asymmetry between the government's actions and the other groups' (especially the voters') perceptions of those efforts can be greatly affected by additional efforts of group  $i$  at reducing or increasing that asymmetry. A low value means that those efforts have low payoffs. The derivative thus measures the productivity of efforts to affect information. This is an important characteristic as it is one that is difficult to attain. Even an interest group that commands resources may find that its

---

<sup>23</sup> With the large number of landless peasants that have been settled and given land in the past fifteen years, the stock of actual landless peasants, that is, those that really have aptitude to work the land rather than simply being poor, has reduced and it may become harder for the MST to recruit in the future. Graziano (2004) argues that there are no more true landless in Brazil and that current MST occupations are filled mostly with poor, unemployed people living in bad conditions in the cities.

investments in advertising bring little persuasion. They lack credibility or reputation. This is why interest groups typically link their objectives with the broader public interest. The MST, by ostensibly helping the landless poor in a country riddled by an extremely skewed land distribution, has been able to garner credibility, despite its illegal nature and disrespect for private property, which otherwise most Brazilians support. As noted by the *Economist* (1997) in 1996 the MST “won the ultimate accolade: sympathetic portrayal in a prime-time soap opera on Globo, Brazil’s leading television station.” By contrast, landowners have found it hard to appeal to public sympathy. All their attempts at publicity have had very little effect in changing their image as wealthy and trigger-happy hoarders of large unproductive tracts of land.

Thus far, we have argued that the MST is not only more adept than landowners and other groups at getting their message through, but also that their message is more effective at altering the level of pressure exerted by voters on the government. Aware that their claims regarding the problems with the government’s land reform will sound self-serving, the landowners prefer to center their efforts at pressuring the government through their representatives in Congress, which is consistent with what the model would predict for a group with high marginal costs of affecting information and low productivity of effort.

iii) Extreme configuration of preferences of other principals (b)

The third characteristic which the model indicates that an interest group should have for it to be successful in controlling information is an extreme configuration of the preferences of the other actors. If several of the principals, and especially voters, feel strongly about the cause pursued by an interest group, then it has the opportunity to manipulate their demands on government by altering the information received about the government’s actions ( $\Omega$  in the model). If, for example, an interest group pursues a task that voters approve (abhor) then they can elicit more (less) pressure from the voter on the government by reducing (increasing) the noise in the information received by voters on the government’s effort. If the voters are indifferent to, or only mildly interested in, that policy, then affecting the information they receive will have little effect on the incentives they provide politicians and the interest group would do better by pressuring through another channel.

Voters are sympathetic to land reform and this is critical for MST. To illustrate the importance of land reform and the political pressure placed on the Brazilian President to implement it, we estimate a model of Presidential popularity, adding to the usual specification of economic and political explanatory variables another variable that includes the number of farm occupations by MST in the corresponding month. If we show that more MST farm occupations reduces the President's popularity because they demonstrate a lack of effective policy, this will be evidence of the MST's effectiveness in manipulating voter perceptions and forcing subsequent government action.

There is a large literature which suggests testing the determinants of presidential popularity by regressing measures of popularity, usually opinion poll data, against a series of variables that capture the state of the economy and political events (Price and Sanders, 1993; Edwards, 1991; Erikson, 1989; Markus, 1988; Monroe, 1984, Mueller, 1973). There are no such studies for presidential popularity in Brazil. Our dependant variable is the percentage of the electorate that finds the President's performance 'very good / good' or 'regular' (versus 'very bad / bad' and 'don't know') in periodic public opinion polls performed by Datafolha Insituto de Pesquisas (2002).<sup>24</sup> As explanatory variables we use monthly data on inflation, interest rate, exchange rate, plus lagged popularity. In addition to these variables we add another that measures the number of occupations promoted by the MST and other landless groups in each month. This variable proxies the level of activity of the MST and should capture the perception of voters regarding the government's effort on land reform. In order to rule out that our results may be spurious, we used only variables that were found to be integrated to the first order I(1), as most macroeconomic variables tend to be, and subsequently tested for cointegration. This allows us to estimate both the

---

<sup>24</sup> Our period of analysis is January 1997 to December 2002. The initial date is constrained by the availability of monthly data on land occupations ([www.cpt.org.br](http://www.cpt.org.br)) and the final date is the last month of the second Cardoso term. There is data on Presidential approval rates for most months in the period. When no poll was performed that month, we repeat the value of the previous month. Using only 'very good / good' as dependant variables yields similar results. In order to use logarithms on inflation, 0.5 was added to each observation. Descriptive statistics are shown below:

<b>Variable</b>	<b>Mean</b>	<b>Std. Dev.</b>	<b>Max.</b>	<b>Min.</b>
Popularity	66.35	11.45	40	85
Occupations	32.09	23.54	2	131
Inflation	0.98	1.11	-0.38	5.84
Exchange rate	1.88	0.72	1.05	3.89
Interest rate	1.68	0.49	1.02	3.33

long-term (or equilibrium) relationship between popularity and the explanatory variables, and subsequently to estimate the short term relationships through an error correction model. Counterintuitively, the value of monthly GDP was found to be stationary in the sample period and consequently this variable was not included in the regression, despite being a theoretically important predictor of popularity.<sup>25</sup> Note however that the effect of GDP is captured in the other macroeconomic variables.<sup>26</sup>

The results are presented in Table 1. The estimated coefficients can be interpreted as constant elasticities as the data are in logarithms. Newey-West standard errors are shown.<sup>27</sup> Lagged popularity is positive and significant at 1% showing a strong inertia in presidential popularity with an elasticity of 0.88. The exchange rate was found to be negatively and significantly associated with popularity. The sample period includes periods of overvalued exchange rate, prior to January 1999, as well as the devaluation shock that occurred that month. A one standard deviation increase in the exchange rate (that is, a devaluation) decreases popularity from 65% to 64%. The estimated coefficient for inflation is negative and significant, with a one standard deviation increase in inflation leading to a fall in popularity of -1.33 percentage points, given all other variables in their means. In the same manner interest rates are estimated to be negatively related to popularity with a one standard deviation increase found to reduce popularity by -0.76 percentage points. Note that the sign of each of these variables are as expected, as inflation, interest rates and devaluations all reduce voters' real income.

[Table 1 here]

The estimated coefficient for the number of farm occupations, our variable of interest, is negative and significant. The estimation indicates that a one standard deviation

---

<sup>25</sup> When we included GDP in the regression, ignoring the unit root problem, the estimated coefficient was found to be positive and significant. Its exclusion did not impact the other results significantly.

<sup>26</sup> The relationship between macroeconomic variables such as inflation, exchange rates, interest rates may raise concerns about multicollinearity. In this regard we note that: (i) examination of the correlation matrix for the sample period does not indicate that multicollinearity is severe in the sample used; (ii) using subsets of the explanatory variables does not alter the result for the occupations variable; and (iii) multicollinearity affects (increases) only the standard errors of the estimated coefficients and not their consistency, so that even in the presence of the problem the result for the occupation variable will still be valid.

<sup>27</sup> Cointegration is tested through a residual-based version of the Augmented Dickey-Fuller test using appropriate critical values from Charemza and Deadman (1997, Table 3), including an intercept, at 1%,  $N=75$ , six explanatory variables, which are lower bound = -6.01, upper bound = -5.83. Additional evidence of cointegration is given by the Durbin-Watson statistic on the deviations from the regression in Table 1, which was CRDW (6, 71) = 1.94. Finally, cointegration is also indicated by a Johansen test which yields an eigenvalue of 0.3317 and a trace statistic of 21.646 which accepts cointegration at 5%.

increase of the number of farms occupied, with all other variables at their means, reduces presidential popularity by 1.06 percentage points from 65.00% to 63.96%. This is a strong effect for a non-economic variable that doesn't really affect most (urban) voters' well-being directly. This result is consistent with our statements that Brazilians are strongly favorable towards land reform. Furthermore, it shows that there really is scope for the MST, through its occupations and other actions, to increase the pressure that voters put on the government for land reform. The more active the MST, the more resources the President dedicates to land reform, not because he wants to placate the MST itself, but rather because voters would punish the President (loss of popularity) when they perceive that land reform is not progressing as expected.

Because the series in Table 1 are cointegrated, they have an error correction representation (Engle and Granger, 1987) and we can estimate an error correction model that allows us to analyze both the short term effects of the explanatory variables on presidential popularity as well as the rate at which deviations from the long term equilibrium are corrected in each period.<sup>28</sup> The results are shown in Table 2. Past popularity remains the major determinant of current popularity in the short term, with a positive and significant estimated coefficient. Nevertheless, in the short term occupations still have a negative effect on popularity. The impact is low, -0.025, however it is significant at 1%. Interestingly the effect of inflation in the short term is positive and significant, even though the long term effect is negative. Exchange rates and interest rates are not found to have a short-term effect. The error correction term is negative and significant at nearly 1%, with a value of -0.60, which indicates that in each period 60% of deviations from the long term equilibrium are corrected. This is a relatively large coefficient, which indicates that the speed of adjustment of popularity to shocks in the explanatory variables is high. This suggests that popular opinion about the President reacts quickly to new information of issues such as inflation, interest rates, exchange rates and occupations of farms by the MST and other groups.<sup>29</sup>

---

<sup>28</sup> The error correction equation is  $\Delta Y_t = \alpha_0 - \alpha_1 (Y_{t-1} - \mathbf{X}_{t-1}\boldsymbol{\beta}_1) + \boldsymbol{\beta}_0 \Delta \mathbf{X}_t + \varepsilon_t$ , where  $Y_t$  is popularity and  $\mathbf{X}_t$  is the matrix of explanatory variables. In this model  $\alpha_1$  is the rate at which deviations from the long term equilibrium are corrected,  $\boldsymbol{\beta}_0$  is the short term effect of the explanatory variables on popularity, and  $\boldsymbol{\beta}_1$  is the vector of equilibrium relations between the explanatory variables and popularity.

<sup>29</sup> Another characteristic of interest groups is whether their task is a complement or a substitute to the tasks of other principals, that is, the structure of the  $\mathbf{C}$  matrix. A group whose task is a substitute (complement) to

[Table 2 here]

## V. Concluding Remarks.

Our objective has been to explain how an interest group without using financial resources influences public policy by molding the information available to general voters. We focused on the demonstrated success of the landless organization in Brazil, the MST. Since the mid 1990s, the MST has forced political action on land reform, which historically has languished, by dramatizing the plight of the landless peasants whenever government policy seems to drift, often in response to the lobby efforts of rural property owners. We examined three characteristics which the model predicts as giving interest groups a comparative advantage in pursuing their goals by changing the amount and quality of the information received by other groups. We presented evidence to show that the MST possesses these characteristics. It is an interest group that has: i) a low cost means of attracting attention, due mainly to its ready supply of landless settlers willing to undertake extreme hardships in their quest for land; ii) credibility and a worthy cause which make the information they impart to other groups on the government's land reform effort noticeable and believable; and iii) they benefit from voters caring about land reform and seeing the President as responsible for delivering results, so that the MST's efforts to convince voters that the President could do more results in more being done.

In May 2005 the MST organized another high profile march of 12,000 landless peasants that ended in Brasilia where President Lula met them and admitted that he had not

---

other groups' tasks will observe negative (positive) incentives (that is, the  $\alpha^{-1}$ 's) from those groups to the government for their task of interest. In the model the  $C$  matrix is common knowledge so by design an interest group can not try to manipulate the other groups' perception of how their tasks affects these other groups cost. For this reason this characteristic was not included in the text. In principle, however, the model could be extended to include this additional information asymmetry. The MST does put much effort into influencing policy through this additional channel by portraying land reform as complementary to other policies such as reducing poverty and crime in the cities as many landless often end up in urban slums. The MST also consistently portrays environmental policies as being complementary to land reform, such as in a document they released called "The MST and the Environment: Land Reform is a Way to Care for the Environment" (translated from Portuguese, cited in Lacey and Oliveira, 2001). For discussion on the relationship of the MST and the environment see Alston, Libecap and Mueller 1999a and 2000; Wright and Wolford, 2003: chap. 3; and Harnecker, 2003: chap. 9, 600-602). Despite their pro-environmental rhetoric, it is likely that the large number of settlement projects harm the environment. The experience has been that most settlements already have a very hard time at becoming economically viable even in the best of circumstances. Being additionally constrained not to exploit the natural resources within their reach would necessarily make it more difficult. Faced with this trade-off (which the rhetoric tries to play down) the natural choice is to choose survival over nature.

met the number of settled families he announced as targets in the beginning of his term. He promised: 1) to send a presidential decree to Congress by the end of the month to provide an additional R\$ 700 million for settlement projects; to hire 1,300 new staff members for INCRA, the land reform institute; and 3) to tighten the criteria which determines how productive farms have to be so that they are immune from expropriation (Estado de São Paulo, May 17, 2005; The *Economist*, May 19, 2005). The way which this event unfolded, with the MST calling attention to society about the President's land reform record, and getting promises of more effort in return, conforms very closely to the argument of this paper. Our model of interest group behavior can be generalized to any interest group that has the sympathy of the public at large.

## References

- Almeida, A. J. F. S. (1998) “Reforma Agrária no ar: o povo na TV, de objeto a sujeito” Universidade e Sociedade, Brasília, ANDES.
- Alston, L. J., G. D. Libecap, and B. Mueller. (1997). Violence and the Development of Property Rights to Land in the Brazilian Amazon. Frontiers of the New Institutional Economics. J. V. C. a. J. N. D. Nye. San Diego, Academic Press: 145-163.
- Alston, L. J., G. D. Libecap, and B. Mueller. (1999a). “A Model of Rural Conflict: Violence and Land Reform Policy in Brazil.” Environment and Development Economics **4**: 135-160.
- Alston, L. J., G. D. Libecap, and B. Mueller. (1999b). Titles, Conflict, and Land Use: The Development of Property Rights and Land Reform on the Brazilian Amazon Frontier. Ann Arbor, The University of Michigan Press.
- Alston, L. J., G. D. Libecap, and B. Mueller. (2000). “Land Reform Policies : The Sources of Violent Conflict, and Implications for Deforestation in the Brazilian Amazon.” Journal of Environmental Economics and Management **39**(2): 162.
- Alston, L.J and B. Mueller. (2006) “Pork for Policy: Executive and Legislative Exchange in Brazil” Journal of Law Economics and Organization, Vol. 22 Spring.
- Alston, L.J., M.A, Melo, B. Mueller and C. Pereira. (2006). “Political Institutions, Policymaking Processes and Policy Outcomes in Brazil”, (Orgs.) P.T. Spiller, E. Stein and M. Tomassi, Political Institutions, Policymaking Processes and Policy Outcomes in Latin America, Washington, IADB.
- Austen-Smith, D. (1997). “Interest groups: Money, Information and Influence”. In D.C. Mueller (ed.), Perspectives on Public Choice, Cambridge, Cambridge University Press.
- Bernheim, D. B. and M. Whinston (1986). “Common Agency.” Econometrica **54**(4): 911-930.
- Cameron, C.M. and J.P. Jung. (1995). “Strategic Endorsements in Hidden Offer Bargaining”, Mimeo. Stanford University.
- Charemza, Wojciech W. and Derek F. Deadman (1997). New Directions in Econometric Practice: General to Specific Modelling, Cointegration and Vector Autoregression, Cheltenham, Edward Elgar, second edition.
- Comissão Pastoral da Terra. (2004). Conflitos no Campo Brasil: 2003, Goiânia.

Datafolha Instituto de Pesquisas. (2002) “Opinião Pública”  
[http://www1.folha.uol.com.br/folha/datafolha/po/aval\\_pres\\_15122002a.shtml](http://www1.folha.uol.com.br/folha/datafolha/po/aval_pres_15122002a.shtml).

Dean, Warren (1971). “Latifundia and Land Policy in Nineteenth-Century Brazil”  
*Hispanic-American History Review*, Nov: 606-625.

Dixit, A. K. (1996). The Making of Economic Policy : A Transaction-cost Politics Perspective. Cambridge, Mass, MIT Press.

The Economist, (1997). “Land Rights, Land Wrongs” **344**: 30-32.

The Economist, (2004). “My Own Bit of Land.” Jan. 8.

The Economist. (2005). “Brazil’s Landless Farmers Protest.” May 19.

Edwards, G. III and A.M. Gallup. (1991). Presidential Approval: A Sourcebook.  
Baltimore: Johns Hopkins University Press.

Engle, R.F. and Granger, C.W.J. (1987). "Cointegration and Error Correction:  
Representation, Estimation and Testing" *Econometrica*, Vol. 55: 251-276.

Erikson, R. (1989). "Economic Conditions and the Presidential Vote." *American Political Science Review* 86: 567-573.

Estado de São Paulo. (2005). “Reunido com MST, Lula Reconhece Dívida com  
Reforma Agrária,” Agência Estado, May 17, 2005,  
[www.estadao.com.br/nacional/noticias/2005/mai/17/223.htm](http://www.estadao.com.br/nacional/noticias/2005/mai/17/223.htm).

FAO/United Nations (2004). “Agricultural Data” FAOSTAT, [www.faostat.org](http://www.faostat.org).

Gasques, J. G. and C. M. V. Verde (1999). “O Financiamento da Reforma Agrária no  
Brasil” Texto Para Discussão N° 652, IPEA, Brasília.

Graziano, X. (2004). O Carma da Terra no Brasil, São Paulo, Girafa.

Grossman, G.M. and E. Helpman, (1999). “Competing for endorsements”,  
*American Economic Review*, 89: 501-524.

Grossman, G.M. and E. Helpman, (2001). Special Interest Politics, The MIT Press,  
Cambridge.

Harnecker, M. (2003). Landless People: Building a Social Movement. São Paulo:  
Editora Expressão Popular.

Heredia, B. et al. (2002) “Análise dos impactos regionais da reforma agrária no  
Brasil.” *Estudos, Sociedade e Agricultura*, Rio de Janeiro, April, N° 18, p. 73-111.

Holmstrom, B. and P. Milgrom (1991). "Multitask Principal-Agent Analysis: Incentive Contracts, Asset Ownership, and Job Design." Journal Of Law ,Economics, and Organization 7(Special Issue): 24-51.

INCRA (2001) Índice de Gini. Brasília, Incra, maio: anexo 18.

Kalt, J. P. and M. A. Zupan (1984). "Capture and Ideology in the Economic Theory of Politics." American Economic Review 74(3): 279-300.

Kalt, J. P. and M. A. Zupan (1990). "The Apparent Ideological Behavior of Legislators - Testing for Principal-Agent Slack in Political Institutions." Journal of Law and Economics 1: 103-131.

Kau, J. B. and P. H. Rubin (1984). "Economic and Ideological Factors in [US] Congressional Voting : the 1980 Election." Public Choice 44(2): 385-388.

Lacey, H. and M.B. Oliviera. (2001). "Prefácio a Vandana Shiva, Biopirataria" in V. Shiva, Biopirataria, Petrópolis: Editora Vozes.

Markus, Gregory B. 1988. "The Impact of Personal and National Economic Conditions on the Presidential Vote: a Pooled Cross-sectional Analysis." American Journal of Political Science, 32: 137-154

Mayhew, D. (1974). Congress: The Electoral Connection. New Haven: Yale University Press.

McCubbins, M. D., R. Noll and B.R. Weingast. (1989). "Structure and Process, Politics and Policy: Administrative Arrangements and Political Control of Agencies." Virginia Law Review 75: 431-482.

McCubbins, M. D., R. Noll and B. R. Weingast. (1987). "Administrative Procedures as Instruments of Political Control." Journal of Law, Economics and Organization 3: 234-277.

Ministério do Desenvolvimneto Agrário. (2004). II Plano Nacional de Reforma Agrária: Paz, Produção e Qualidade de Vida no Meio Rural, Brasília.

Monroe, K. (1984). Presidential Popularity and the Economy. New York: Praeger.

Mueller, B. (1998). "The Economic Theory of Regulation: the Case of Agrarian Reform Legislation in Brazil", Revista Brasileira de Economia, Vol. 52 N°1 Jan./Mar, pg:83-110.

Mueller, J.E. (1973). War, Presidents, and Public Opinion. New York: Wiley.

Neri, M., G. Gonzaga and J.M. Camargo. (2001). "Salário Mínimo, Efeito Farol e Pobreza" Revista de Economia Política Vol.21 No. 2.

Olson, Mancur, Jr. (1965). The Logic of Collective Actions. Cambridge, Mass., Harvard University Press.

Ornaghi, T. (2004). “No ‘Abril Vermelho’, Governo Acelera as Desapropriações” Folha de São Paulo, Folha Online 9/04/2004, <http://www1.folha.uol.com.br/folha/brasil/ult96u59924.shtml>.

Price, S. and D. Sanders. (1993). “Modeling Government Popularity in Postwar Britain: A Methodological Example” American Journal of Political Science, Vol. 37, No. 1, Feb: 317-334.

Reuben, E. 2002. “Interest Groups and Politics: The Need to Concentrate on Group Formation” Mimeo. Department of Economics, University of Amsterdam.

Romeiro, A., C. Guanziroli, M. Palmeira, S. Leite (org.) (1994). Reforma Agrária - O Relatório da FAO em Debate, Editora Vozes, Ibase, FAO.

Stigler, G. (1971). “The Theory of Economic Regulation.” Bell Journal of Economics 2(Spring): 3-21.

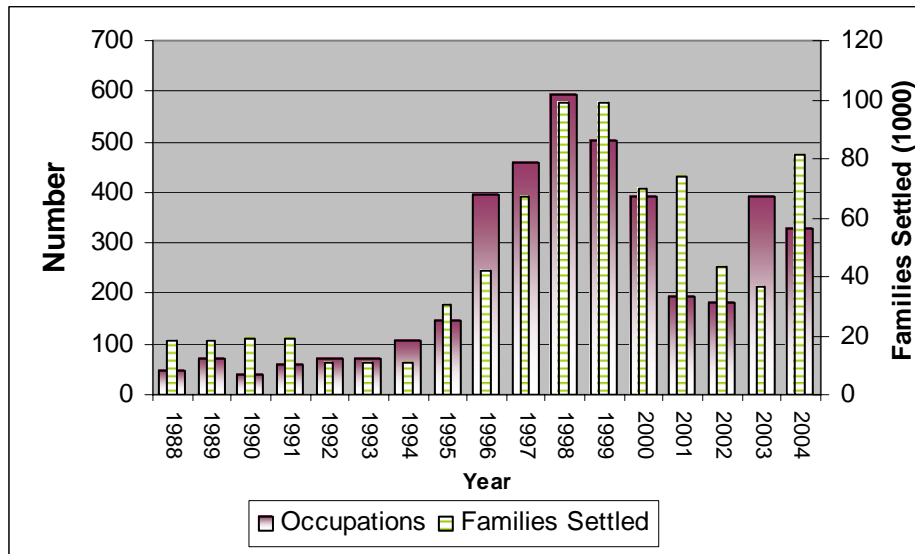
Van Winden, F. (1999). “On the Economic Theory of Interest Groups: Towards a Group Frame of Reference in Political Economics”, Public Choice, 100: 1-29.

Van Winden, Frans (2003). “Interest Group Behavior and Influence” in. C. K. Rowley and F. Schneider (eds.), Encyclopedia of Public Choice, Boston: Kluwer Academic Publishers.

Weinberg, M. (2004). “Madracais do MST” Veja, Editora Abril, edição 1870, Ano 37, Nº 36, Sept. 8: 47-50

Wright, A. and W. Wolford. (2003). To Inherit the Earth: The Landless Movement and the Struggle for a New Brazil. Food First Books.

Graph 1 – MST Action (Occupations) and Government Reaction (Settled Families).<sup>30</sup>

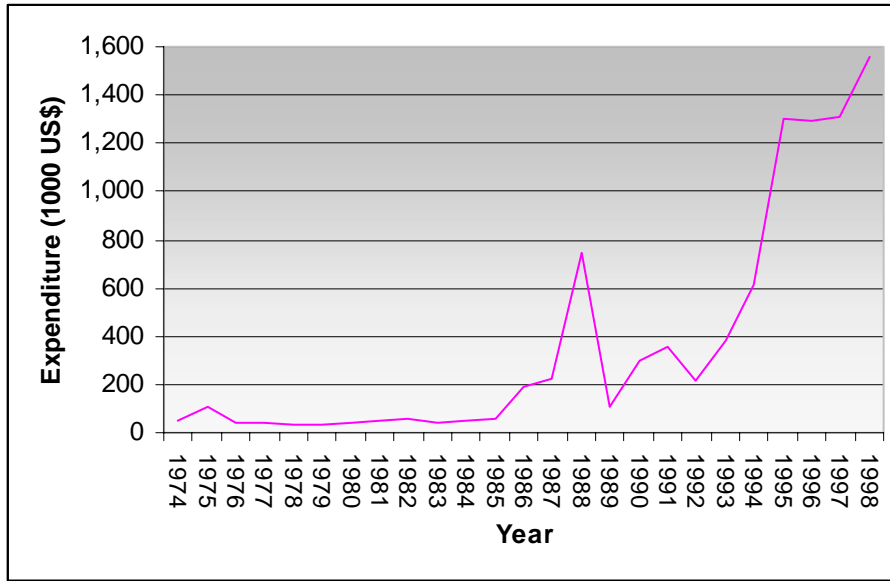


Source: Ministério do Desenvolvimento Agrário (2004: 20), Comissão Pastoral da Terra (2004:13).

Note: Data for number of families settled from 1988 to 1994 is the average for each government; Sarney (1988-89), Collor (1990-91), Franco (1992-94).

<sup>30</sup> Data on the number of families settled is highly controversial as this is the main indicator in the public debate on how much land reform the government has achieved. There is a constant war of numbers between the government and the MST, involving also academia and the media, as to what has in fact been accomplished. Despite some attempts at doing a census of settlement projects the controversy persists in part due to the political nature of the issue and in part due to the sheer logistic difficulty of counting settled families in what is a very dynamic setting where new settlements are constantly being created and where beneficiaries are constantly selling, trading and abandoning their land. If, for example, new families have been settled in an old abandoned settlement project, should they be counted as fulfilling part of the government's target? The numbers in Graph 1 are from the Lula government and revise downward the claims by the Cardoso government for 1995-2002.

Graph 2 – Expenditures on Land Reform and Agrarian Organization.



Source: Gasques and Verde (1999). Constant Sept. 1998 US\$.

Table 1 – Presidential Popularity and Land Reform.

Dependant Variable:	
<b>Popularity</b>	
Popularity <sub>t-1</sub>	0.879 <sup>***</sup> (13.84)
Occupations <sub>t-1</sub>	-0.02 <sup>**</sup> (-2.05)
Exchange Rate <sub>t-1</sub>	-0.042 <sup>*</sup> (-1.76)
Inflation	0.028 <sup>***</sup> (0.44)
Interest <sub>t-1</sub>	-0.047 <sup>***</sup> (-2.63)
Constant	0.616 <sup>**</sup> (2.27)
N	71
F(5, 65)	104.32
Prob>F	0.0000
H <sub>0</sub> : No Cointegration (ADF 2 lags, const.)	-6.043 <sup>***</sup>

Notes: Ordinary least squares with Newey-West standard errors in parentheses. 1% <sup>\*\*\*</sup>, 5% <sup>\*\*</sup>, 10% <sup>\*</sup>. All variables in logarithms. All variables I(1). Residual based cointegration test uses ADF with critical values from Charemza and Deadman (1997) (Table 3, intercept, 1%, N=75, m=6) lower bound = -6.01, upper bound = -5.83.

Table 2 – Error Correction Model of Presidential Popularity.

Dependent Variable:	
<b>ΔPopularity</b>	
ΔPopularity <sub>t-1</sub>	0.547 <sup>***</sup> (2.81)
ΔOccupations <sub>t-1</sub>	-0.025 <sup>***</sup> (-2.62)
Exchange Rate <sub>t-1</sub>	-0.200 (1.45)
ΔInflation <sub>t-1</sub>	0.018 <sup>**</sup> (-2.37)
ΔInterest <sub>t-1</sub>	-0.013 (-0.27)
Error Correction Term	-0.597 <sup>**</sup> (-2.60)
Constant	0.0006 (0.09)
N	70
F(6, 63)	4.05
Prob>F	0.0017

Newey-West t-stats in parentheses. 1% <sup>\*\*\*</sup>, 5% <sup>\*\*</sup>, 10% <sup>\*</sup>.



## Appendix

### General version of the multiprincipal, multitask model of interest group politics.

Suppose  $n+1$  principals, composed of  $n$  interest groups plus voters and the government as the agent. Each of the  $n+1$  principals is interested in a specific task that they would like the agent to perform. In general the principals do not observe the level of effort,  $t$ , placed by the government in each task, instead they observe the outcome,  $x$ , of that effort. The vector of outcomes is modeled as  $\mathbf{x} = \mathbf{t} + \boldsymbol{\varepsilon}$ , or:

$$\begin{pmatrix} x_1 \\ x_2 \\ \vdots \\ x_{n+1} \end{pmatrix} = \begin{pmatrix} t_1 \\ t_2 \\ \vdots \\ t_{n+1} \end{pmatrix} + \begin{pmatrix} \varepsilon_1 \\ \varepsilon_2 \\ \vdots \\ \varepsilon_{n+1} \end{pmatrix} \quad (\text{A1})$$

where  $\boldsymbol{\varepsilon} \sim N(0, \boldsymbol{\Omega})$  and  $\boldsymbol{\Omega}$  is the covariance matrix of the random noise variable  $\boldsymbol{\varepsilon}$ .  $\boldsymbol{\Omega}$  is a  $(n+1) \times (n+1)$  matrix with principal diagonal  $\omega_{ii}$ ,  $i=1, 2, \dots, n+1$ , and zeros elsewhere.

Principal  $i$  benefits from the government's actions according to the benefit functions  $b_i$ , which can be written as  $\mathbf{b}^i \mathbf{x}$ , where  $b_j^i$  is the benefit of outcome  $j$ ,  $j=1, 2, \dots, n+1$ , to principal  $i$ . The cost to politicians of directing effort in both of the tasks is modeled as the

following quadratic function  $\frac{1}{2} \mathbf{t}' \mathbf{C} \mathbf{t}$  where the  $(n+1) \times (n+1)$  matrix  $\mathbf{C}$  is assumed positive

definite. If the off-diagonal terms are positive there will be substitution amongst types of effort, so that an increase in  $t_i$  will imply a decrease in  $t_j$ , and vice-versa. If these terms are negative the types of effort will be complementary

Following Dixit (1996) we first assume a benchmark case where the principals observe the levels of effort chosen by politicians and additionally are able to act cooperatively so as to reach the first-best solution.

#### Observable effort and united principals

We assume that the agent's efforts in pursuing the  $n+1$  tasks are rewarded with political support from each of the principals. The support is in the form of monetary contributions and votes. Let the support provided by each principal be  $p_i$ . The total level of political support received is the sum of the support contributed by each  $n+1$  principals,

$p = \sum_{i=1}^{n+1} p_i$ . Offering political support imposes on the principals an opportunity cost so we can treat  $p$  in monetary terms. That is,  $p$  can be thought of as the amount of resources that the politicians would require for advertising and campaigning to achieve an equivalent amount of support. The pay-off to politicians is thus  $w = p - \frac{1}{2} \mathbf{t}' \mathbf{C} \mathbf{t}$ . The politicians' utility function is assumed to have the following constant risk-aversion form:

$$U(w) = -\exp(-rw) \text{ or } -\exp(-r(p - \frac{1}{2} \mathbf{t}' \mathbf{C} \mathbf{t})) \quad (\text{A2})$$

where  $r$  is the risk-aversion coefficient. Note that politicians will maximize  $w = p - \frac{1}{2} \mathbf{t}' \mathbf{C} \mathbf{t}$ , the income equivalent of their utility.

The expected return to the principals acting together is their benefit minus the value or cost of providing political support to politicians.

$$E[b' \mathbf{x} - p] = E[b'(t + \boldsymbol{\varepsilon}) - p] = b' t - p \quad (\text{A3})$$

The total surplus is therefore the sum of the agent's and the principals' net benefit

$b't - p + p - 1/2t'Ct = b't - 1/2t'Ct$ . Note that the level of political support cancels out, so we assume that  $p$  is high enough for the agent to stay in the game, that is, the government will not abandon these policies. The level of effort will be chosen to maximize this function, giving as the first-order condition  $\mathbf{b} - \mathbf{C}\mathbf{t} = 0$ , so that the first best level of effort is:

$$\mathbf{t} = \mathbf{C}^{-1}\mathbf{b} \quad (\text{A4})$$

where  $\mathbf{C}^{-1}$  is the inverse of the  $\mathbf{C}$  matrix.

#### Asymmetric information and united principals

Because effort is now no longer observable to general voters, contracts between the principals and politicians must be made contingent on  $\mathbf{x}$  (outcomes) and no longer on  $\mathbf{t}$  (effort). Following Dixit (1996) and Holmström and Milgrom (1991) we use a linear reward scheme to stipulate the legislators' pay-offs given outcomes  $\mathbf{x}$ . That is, given the observed outcomes  $\mathbf{x}$ , the united principals provide politicians political support that has the following monetary equivalent:

$$\alpha'x + \beta \text{ or } \left| \begin{array}{c} \alpha_1 \\ \alpha_2 \\ \dots \\ \alpha_{n+1} \end{array} \right| \left| \begin{array}{c} x_1 \\ x_2 \\ \vdots \\ x_{n+1} \end{array} \right| + \beta \quad (\text{A5})$$

where the  $\alpha$ s are the value of the marginal support given by the principals to government effort and  $\beta$  is a fixed payment that can be adjusted to assure the agent's reservation utility is at least matched.

Thus the politicians' utility is now  $-\exp(-r(\alpha'x + \beta - 1/2 \mathbf{t}'\mathbf{C}\mathbf{t}))$ , which can be shown to equal<sup>31</sup>  $-\exp(-r\alpha'\mathbf{t} + 1/2 r^2 \alpha'\mathbf{\Omega}\alpha - r\beta + 1/2 r\mathbf{t}'\mathbf{C}\mathbf{t})$  so that the government will now maximize the income equivalent of their utility, which is  $z = \alpha'\mathbf{t} - 1/2 r\alpha'\mathbf{\Omega}\alpha + \beta - 1/2 \mathbf{t}'\mathbf{C}\mathbf{t}$ . This yields the following first-order conditions:

$$\mathbf{t} = \mathbf{C}^{-1}\alpha \quad (\text{A6})$$

Note that the  $\alpha$ s are the value of the marginal support given by the principals to reward the government's effort. Letting  $k$  be the elements of  $\mathbf{C}^{-1}$ ,  $k_{jj} > 0$  and  $k_{jh} \geq 0$  or  $\leq 0$ , for  $j \neq h$ , so an increase in the marginal support of the united principals to politicians,  $\alpha_j$ , leads to increased effort in task  $j$  and an increase or a decrease in effort towards the other tasks.

In order to understand the relationship of  $\alpha$  in (A6) and  $\mathbf{b}$  in (A4) substitute (A6) into the government's income equivalent of utility,  $z$ , to get  $z = 1/2 \alpha'\mathbf{C}^{-1}\alpha - 1/2 r\alpha'\mathbf{\Omega}\alpha + \beta$ . The net benefit of the principals is the expected value of their total benefit minus the value, or cost, of the support they give the government,  $E[\mathbf{b}'\mathbf{x} - \alpha'\mathbf{x} - \beta] = (\mathbf{b} - \alpha)'\mathbf{t} - \beta$ . The joint surplus of the united principals and politicians is the sum of their net benefits:

$$\mathbf{b}'\mathbf{C}^{-1}\alpha - 1/2 \alpha'(r\mathbf{\Omega} + \mathbf{C}^{-1})\alpha \quad (\text{A7})$$

This can be maximized with respect to  $\alpha$  to obtain the following first-order condition:

$$\mathbf{b} = (\mathbf{I} + r\mathbf{C}\mathbf{\Omega})\alpha \quad (\text{A8})$$

Note that if; (i) all elements of  $\mathbf{C}$  are positive (assuming substitutability amongst tasks); (ii) the elements of  $\mathbf{\Omega}$  are positive, because they are variances; (iii) the  $\alpha$ s are positive, because the united principals will not want negative effort, it must be that  $b_j > \alpha_j$ .

<sup>31</sup> See Dixit (1996, pg. 161).

Consequently, comparing (A4) to (A6) it turns out that the government optimally chooses less effort when effort is not observable than in the first-best situation where it is, that is, it is a second-best due to moral hazard arising from information asymmetries.

#### Asymmetric information and multiple principals

In general principals do not act cooperatively, so we now derive the optimal levels of effort allowing for non-cooperative behavior in addition to asymmetric information. In order to do this we will find the Nash equilibrium of the game where each principal strategically takes into account the actions of the other principals. Now each principal provides his own agenda to politicians. Principal  $i$ 's incentive scheme for task  $j$  is  $\alpha^i_j x + \beta^i$  while the total for each principal is  $\alpha^i x + \beta^i$ . The aggregate incentive scheme faced by legislators is the sum of that offered by each principal and is simply  $\alpha x + \beta$ , where  $\alpha = \sum \alpha^i$  and  $\beta = \sum \beta^i$ . The marginal benefit function for principal  $i$  is  $b^i = [b^i_1 \ b^i_2 \ \dots \ b^i_{n+1}]$ .

The government still maximizes its certainty equivalent and choose effort according to  $t = C^{-1} \alpha$ . In order to find the Nash equilibrium of this game we follow Dixit (1996:163-166) and consider the contribution of each of the principals to the legislators' certainty equivalent. This is then added to the benefit that each principal receives from the relationship with politicians. The resulting bilateral surplus between principal  $i$  and politicians is:

$$b^i C^{-1} \alpha^i - r \alpha^{-i} \Omega \alpha^i - \frac{1}{2} \alpha^i (C^{-1} + r \Omega) \alpha^i \quad (A9)$$

where  $\alpha^{-i} = \sum_{h \neq i} \alpha^h$ , the sum of the incentives by all other principals apart from  $i$ .

If we assume that the only choice variable available to principal  $i$  is the support it gives directly to legislators through votes and/or money, then the maximization of this objective function with respect to  $\alpha^i$  gives:

$$b^i = (I + r C \Omega) \alpha^i + r C \Omega \alpha^{-i} \quad (A10)$$

Adding the individual benefit of each principal gives us an expression for the total benefit arising from the Nash equilibrium:

$$b = \alpha + (n+1) r \Omega C \alpha \quad (A11)$$

This equation can be compared to equation (A8), the total benefit that resulted when principals were able to act cooperatively:  $b = (I + r C \Omega) \alpha$ . Remembering that when  $\alpha = b$  and the first-best solution is achieved, we can see that with non-cooperative principals a situation is reached that is even further from first-best than with unified principals, since  $r$  is now multiplied by  $n+1$ . The situation is therefore a third-best, characterized by apparent inefficiencies and low-powered incentives.

For greater ease in visualization, the system of equations in (A11) can be written as follows:

$$b_i^j = \alpha_i^j + r \sum_{k=1}^{n+1} (c_{i,k} \omega_{kk} (\sum_{h=1}^{n+1} \alpha_k^h)) \quad \forall i, j, k, h = 1, 2, \dots, n+1 \quad (A12)$$

Note that each of the  $(n+1)^2$  equations in this system contains the terms  $\omega_{kk}$  ( $k=1, 2, \dots, n+1$ ), which represent the variance of the noise between the observable outcomes  $x^k$  and the unobservable effort  $t^k$ . Therefore, the higher the value of any given  $\omega_{kk}$ , the larger will be the wedge between the first-best situation,  $b_i^j = \alpha_i^j$ , and the third-best situation depicted in (A12). In other words, the greater the information asymmetry concerning

legislators' efforts in any given task, the more low powered will be the incentives given by the principals for efforts towards that task.

Affecting information availability to pursue policy

The above suggests that each of the  $n+1$  principals can influence policy not only through direct incentives (cash, votes) represented by  $\alpha^i$ , but also by affecting the level of information available concerning politicians' efforts in each task, that is, on each of the  $n+1$   $\omega_{kk}$ 's. The problem faced by each interest group then becomes that of deciding not only the optimal level of  $\alpha^i_j$  to allocate for each task  $j$ , but also on how much effort it will place towards affecting the information available to general voters regarding each of the tasks. Let the effort by each interest group  $i$  to influence the information concerning legislators' efforts in each task  $j$  be  $e^i = [e^i_1 \ e^i_2 \ \dots \ e^i_{n+1}]$ . Note that effort is costly, where the cost of that effort is represented by the cost function  $G^i(e^i)$ . Note also that all other interest groups may also expend efforts to affect information availability, so that the solution will be a Nash Equilibrium. Let  $e^{-i}$  be the vector of effort of all interest groups other than  $i$ . Interest group  $i$ 's objective is no longer to maximize (A9) with respect to  $\alpha^i$  but rather to maximize the following objective function with respect to  $\alpha^i$  and  $e^i$  taking  $\alpha^{-i}$  and  $e^{-i}$  as given:

$$b^i C^{-1} \alpha^i - r \alpha^{-i} \Omega(e^i, e^{-i}) \alpha^i - \frac{1}{2} \alpha^i (C^{-1} + r \Omega(e^i, e^{-i})) \alpha^i - G^i(e^i) \quad (\text{A13})$$

Note that the difference of (A13) to (A9) is the cost function and the fact that the matrix of information variances is now a function of the level of effort by each principal to influence information. The first order conditions for the maximization of (A13) are:

$$C^{-1} b^i - r \Omega \alpha^{-i} - (C^{-1} + r \Omega) \alpha^i = 0 \quad (\text{A14})$$

$$-r \Omega^i a^i - \frac{1}{2} r \Omega^i \alpha^{2i} - G^i_e = 0 \quad (\text{A15})$$

where  $a^i = [\alpha_1^{-i} \alpha_1^i \ \alpha_2^{-i} \alpha_2^i \ \dots \ \alpha_{n+1}^{-i} \alpha_{n+1}^i]$ ,  $\alpha^{2i} = [(\alpha_1^i)^2 \ (\alpha_2^i)^2 \ \dots \ (\alpha_{n+1}^i)^2]$ ,

$$G^i_e = \left| \begin{array}{cccc} \frac{\partial G^i(e^i)}{\partial e^i_1} & \frac{\partial G^i(e^i)}{\partial e^i_2} & \dots & \frac{\partial G^i(e^i)}{\partial e^i_{n+1}} \end{array} \right| \text{ and } \Omega^i = \left| \begin{array}{cccc} \frac{\partial \omega_{11}(e^i_1, e^{-i}_1)}{\partial e^i_1} & 0 & \dots & 0 \\ 0 & \frac{\partial \omega_{22}(e_2, e_2^{-i})}{\partial e^i_2} & \dots & 0 \\ \vdots & \vdots & \ddots & \vdots \\ 0 & 0 & \dots & \frac{\partial \omega_{n+1, n+1}(e_{n+1}, e_{n+1}^{-i})}{\partial e^i_{n+1}} \end{array} \right|$$

The first order conditions in (A14) are a system of  $n+1$  equations that define  $\alpha^{i*}$ , the  $n+1$  optimal incentives by principal  $i$  for each task. The interpretation of these equations is as before in (A10); the principal will offer a third-best level of incentive for each task due to the information asymmetries and the existence of  $n$  other principals who are also providing incentives to the government.

The first order conditions in (A15) are also a system of  $n+1$  equations. They define  $e^{i*}$ , the optimal level of effort that principal  $i$  will place towards affecting information availability on each of the  $n+1$  tasks. The two terms on the left of each equation in that system shows how much the marginal effort increases or reduces the wedge between the first-best situation  $b^i = \alpha^i$  and the third-best situation  $b^i = \alpha^i + r C \Omega \alpha$  (derived from (A14)).