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Endogenous Cost Lobbying: Theory and Evidence

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Abstract

Special interests attempt to influence lawmakers through campaign contributions and through informational lobbying. Both avenues have been explored extensively in theoretical models. Only the former, however, has received much empirical scrutiny. We provide the first empirical tests of the major class of models of costly legislative lobbying, the Potters-van Winden-Grossman-Helpman (PWGH) model. To do so, we extend a simple PWGH model to encompass situations in which a legislature adjusts a pre-existing policy only periodically. We then test predictions of the model using data derived from over 50,000 observations of annual lobbying expenditures by special interest groups in the American states. We find that, as predicted, special interest groups 1) increase lobbying expenditures when the legislature is controlled by "enemies" rather than by "friends"; 2) increase lobbying expenditures in budget years in states with biennial budgeting, relative to budget years in states with annual budgeting; and, 3) increasingly exit the lobbying process as lobbying costs rise. Overall, the results provide substantial empirical support for the PWGH class of signaling models of interest group lobbying in legislative settings.

1. Introduction

One of the primary instruments that special interests use to influence lawmakers is information. Information about the likely popularity, efficacy, distributional impact, cost, and legality of programs is extremely valuable to re-election-oriented legislators. Not surprisingly, multitudes of professional lobbyists gather whenever legislatures convene, whether in Washington or in state capitols.

As a practical matter lobbying requires the expenditure of money to pay lobbyists, maintain offices, commission studies, hire experts, and so on. In addition, as discussed below, such expenditures can enhance the credibility of information transmission. Thus, one may gain at least a rough measure of the significance of lobbying by examining the volume of lobbying expenditures. At the U.S. federal level, annual lobbying expenditures in the late 1990s totaled about $1.5 billion. By way of comparison, in the same period expenditures on campaign contributions totaled about $300 million annually (Milyo et al 2000). Perhaps surprisingly, lobbying, not campaign contributions, absorbs the bulk of "influence dollars" spent by special interest groups.

The theoretical foundations of campaign expenditures and lobbying have both been explored extensively; we review the latter shortly. But only the theory of campaign expenditures has been investigated in much depth empirically. Notable papers testing models of campaign contributions include (inter alia) papers such as Goldberger and Maggi (1999) and Snyder (1992). In contrast, very few papers test formal models of

informational lobbying.[1] Perhaps most prominently, Austen-Smith and Wright (1994) tests a model of cheap-talk lobbying, using data on lobbying activity during a single Supreme Court nomination. To the best of our knowledge, no paper empirically investigates the predictions of models of endogenous cost lobbying.

In this paper we empirically test predictions from the most prominent model of endogenous cost lobbying, the Potters-van Winden-Grossman-Helpman (PWGH) model. To do so, we employ some of the most extensive data yet collected on lobbying expenditures by special interest groups, distinct from campaign contributions. The data were collected from ethics commissions in the American states and include time series of aggregate expenditure data from 38 states as well as group-specific annual lobbying expenditures in each of twelve states, over 50,000 observations. We examine both sets of data. In addition, using the group-specific data, we construct panel data for groups operating in multiple states. The states involved employed a variety of legislative institutions, with varying political control and composition. This variation allows us to examine how legislative design and control affects lobbying expenditures independent of group-specific effects.

As we discuss below, the PWGH models predict that special interest groups increase lobbying expenditures when the legislature is controlled by "enemies" rather than by "friends"; increase lobbying expenditures in budget years in states with biennial budgeting, not only relative to non-budget years but relative to budget years in states with annual budgeting; and increasingly exit the lobbying process as lobbying costs rise. We

[1]There is an extensive descriptive literature on legislative lobbying, ranging from how-to manuals (Krasnow, Siddall, and Berg 2001), to qualitative case studies (Hrebenar and Thomas 1993), to statistical analysis of the number of lobbyist registrations across the states (Lowery and Gray 2000) or counts of federal lobbying reports filed with the Clerk of the House (Leech et al 2005).

find strong support for all these predictions. The predicted effects are substantively large, statistically significant, and robust to changes in specification and corrections for potential specification errors. Overall, the results provide substantial empirical support for the PWGH class of signaling models of interest group lobbying in legislative settings.

The paper is organized in the following way. Section 2 describes the data. Section 3 reviews the PWGH class of models and modestly extends them to encompass situations when a legislature changes pre-existing policy only periodically, as occurs in states with biennial budgeting. Several clear and rather distinctive predictions emerge. Section 4 uses the state data to investigate the PWGH predictions in a series of empirical tests. Section 5 discusses the findings and concludes. An Appendix contains proofs and additional empirical details.

2. The Lobbying Expenditure Data

The Lobbying Disclosure Act of 1995 provided data to scholars on lobbying expenditures at the federal level. But many state legislatures had already or concurrently passed similar legislation, creating state ethics commissions that collected substantial data on lobbying expenditures. Thus, extensive data now exists about lobbying expenditures in the American states. However, little of this data has been collected and analyzed heretofore.

We exploit the state ethics commission data to create three distinct data sets. The first comprises annual aggregate lobbying expenditures by all interest groups in a state in all states where such data had been kept for at least three years as reported in early 2005, thirty-eight states in all. Table 1 provides a list of the states, and the time periods for

which the data is available and employed in this paper. This data yields 408 state-year observations.[2]

****INSERT TABLE 1 ABOUT HERE****

The second and more detailed data set consists of annual lobbying expenditures by individual interest groups in a panel of twelve states: Georgia, Idaho, Indiana, Kentucky, Maryland, Massachusetts, Montana, New Jersey, Oregon, Virginia, Washington and Wisconsin. These states were chosen on the basis of data quality and availability. The individual interest group data encompasses more than 50,000 interest-group-state-year observations with positive expenditures on lobbying. The time periods in the panel average over six years but range from four years to ten years (see Table A1).[3] Each state averages just over 4,000 observations.

A third dataset is derived from this second. It consists of a panel of just over 5,155 interest group-state-year observations. In order to be included in this subsample, the interest group must be a firm or union and must have lobbied in more than one budget year in multiple states in the panel.[4] There are 590 interest groups which meet these criteria. This sample frame is largely driven by the theory, which is discussed below.

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[2] For idiosyncratic reasons, three states have series that stop in 2001. The Center for Public Integrity maintains a data base of this kind, but with much shorter panels (none before 1995). We have also found significant inconsistency in the data within some states in the CPI data.

[3] Typical data from an ethics commission consisted of expenditures by a lobbyist on behalf of a client (a group). Determining expenditures by group required carefully matching and assembling expenditures across lobbyists, a laborious procedure.

[4] In order to create congruence with the classification of campaign contributors used the Federal Elections Commission (FEC), we classified groups into four categories: membership organizations (e.g., AARP, ACLU, Sierra Club), firms (e.g., GE, Merck), trade associations (e.g., Pharmaceutical Manufacturers' Association (PHARMA)), and unions (e.g., United Auto Workers). In addition to these four categories, we

An obvious issue with the disclosure data is that reporting requirements differ across states. Hence, simple cross-state differences in lobbying expenditures may largely reflect different legal requirements for reporting expenditures. Accordingly, in the statistical analyses in the paper, to control for different reporting requirements as well as other time-invariant unmeasured characteristics, we employ state or interest group fixed effects whenever possible.

To provide an overview of the most striking feature of the data, Figure 1 displays annual lobbying expenditures in three states with important variation in legislative processes: New York, Wisconsin, and Oregon. New York has annual regular sessions and annual budgeting, Wisconsin has annual regular sessions but biennial budgeting, and Oregon has biennial regular sessions and biennial budgeting.

****INSERT FIGURE 1 ABOUT HERE****

The figure suggests a close relationship between lobbying and the budget cycle. In particular, Oregon's and Wisconsin's lobbying expenditures increase substantially in budget years, and drop in off-budget years, resulting in a saw-tooth pattern in expenditures. New York, with annual budgeting, displays no such pattern, however it suggests there may be non-stationarity in the data (which we will address later in the

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identified a fifth category—government—because it is common for governmental organizations (e.g., city and county governments, school districts, sanitation districts) to lobby the state legislature as well. (These groups are not permitted to provide campaign contributions, and hence do not appear in the FEC classification system.) Each group in the data base was classified into one of these five categories, using supplemental information from web searches when necessary.

paper). Finally, comparing Oregon to Wisconsin, it appears that regular sessions engender more lobbying effort than special sessions.

Because previous studies focused exclusively on the federal level, where budgeting is annual, the link between lobbying and budgeting seems to have escaped the notice of analysts. But the pattern is not difficult to understand. Budgeting forces reconsideration (if only nominally) of policy in virtually every arena in which a government is active. Budgeting thus affords a regular opportunity for aggressive claimants to make new or expanded bids on the public fisc. It also creates a threat – at least potentially – to the rents of virtually every vested interest, as well as the potential for taxation by the state government and thus rent dissipation for the interest group. In contrast, legislative action outside the institutionalized budget process requires substantial and sustained investments of time and effort by legislative entrepreneurs (Arnold 1990). Even modest changes must negotiate a torturous path through multiple, stringent veto points (Krehbiel 1998). Accordingly, serious change in existing policies, or innovation of new ones, is rare (Baumgartner and Jones 1992, Mayhew 1991). Because there is little reason to lobby when the status quo appears inviolable, and considerable reason to do so when the status quo seems vulnerable, it is no surprise state data reveal a close link between lobbying expenditures and budget years in states with biennial budgeting. Because regular sessions afford greater scope for legislative action than special sessions, lobbying expenditures predictably are greater in the former than the latter.

To insure that this is not merely a spurious correlation, we briefly present a multivariate statistical analysis confirming the patterns on display in the figure (see Table 2). A battery of augmented Dickey-Fuller and Fisher tests indicate that some of the

longer time series of expenditures, like New York, are not stationary. First differences eliminates the non-stationarity in each and every state.[5] Thus, the reported regressions are differences-in-differences regressions.[6]

We employ a number of independent variables (Table A2 defines each variable and indicates its source.) These include indicator variables for a budget year and election year for the state legislature. We also include variables that measure the number of days the legislature met in regular session and special session in that year. We characterize the makeup of the state government as unified Republican, unified Democratic, or divided government. All variables are differenced within state. In addition, we control for per capita income in the state, and, in all the regressions, use state fixed effects for the 38 states.

****INSERT TABLE 2 ABOUT HERE****

In Table 2 we use two different dependent variables: the difference in the log of annual, per capita interest group lobbying expenditures and the difference in the log of annual interest group lobbying expenditures**.** A positive coefficient on a variable means

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[5] The results of the ADF tests on the levels and differenced data are available from the authors.

[6] We have considered a number of different specifications. For each of two dependent variables, log of lobbying per capita in a state, and log of total lobbying in a state, we have run the analysis on a) levels on levels with state fixed effects for only those states with stationary series, b) on all states with state fixed effects with corrections for AR-1, c) on all states using the Arellano-Bond Dynamic Panel estimation techniques, and d) differences on differences using dummies for session and special session instead of number of days. All of these methods yield remarkably similar results to those presented in Table 2. [NOTE TO REFEREES: PLEASE SEE REFEREE APPENDIX, TABLE R1 FOR A TABLE PROVIDING THE RESULTS OF THESE ALTERNATIVE SPECIFICATIONS.]

[9] Krishna and Morgan 2001 and Battaglini 2004 illustrate recent analyses and provide citations to key papers.

an increase in the variable increases the difference in the amount of lobbying within a state relative to mean level of lobbying for that state; a negative coefficient means an increase in the variable of interest decreases the difference in the amount of lobbying. Standard errors of the coefficients are listed in parenthesis below the coefficient estimates. Statistical significance at the 99%, 95%, and 90% level are noted.

The results across the two models are nearly identical. Each 10 day change in the length of the legislative session results in 6% increase in the lobbying rates. The most pronounced effect, however, concerns budget years. Special interests increase their lobbying efforts substantially during budget years. The 23% increase in lobbying during budget years is robust across both specifications and statistically significant at the 99% level of confidence, controlling for other factors. The patterns shown in Figure 1 seem to be characteristic of broad patterns in the American states.

Having established the importance of the budget cycle to lobbying effort in this exploratory analysis, we wish to use this fact and variation in the institutional structures across the states to explore the validity of models of endogenous cost lobbying. We now turn to theory

3. Endogenous Cost Lobbying: Theory

Advice-giving by interested or biased parties has spawned a large and complex theoretical literature. Within this literature, existing models fall into two broad classes: cheap-talk models, in which a biased expert transmits information using a costless signal, and expenditure models, in which a biased expert pays to communicate. The first class of models, initiated by Crawford and Sobel (1982), is by far the more extensive. The key

research question is typically the specificity or truthfulness of the information supplied by the advisor or advisors.[9] Because our interest is expenditures on lobbying, however, we focus on the second class of models.

The lobby expenditure literature distinguishes two situations. In the first, the costly activism situation, the advisor pays a fee to engage in advocacy or acquire information. Lohmann (1993), for example, examines demonstrations by voters whose "fee" is the cost of participating in the demonstration. Grossman and Helpman (2001: Section 5.1) examines lobbying with exogenous fees. In Bennedsen and Feldmann (2002), a group pays to acquire district-level information and then assists a legislator in building a majority coalition. In Battaglini and Benabou (2003), multiple imperfectly informed advisors play a strategic participation game with each other; participating requires paying a fee. In this class of models, expenditures often are a small (usually exogenously determined) flat fee.[10] The focus of the analysis usually involves the micro-details of lobbying (e.g., which groups interact how much or how truthfully with which decision maker) or the response of the decision maker to increased levels of advocacy. Thus, data on aggregate expenditures by groups is poorly suited for testing these models.

The second group of lobbying expenditure models examines situations with endogenous spending. In these models, an observable, endogenously chosen expenditure level provides information about the group's private information. These models adapt the "standard" technology of costly signaling to a political setting. This type of analysis was initiated by Potters and Van Winden (1992) and Austen-Smith (1995) and extended in

[10] In Durr and Swank 2005, the advisor chooses an expenditure level in order to become better informed, but the expenditure level is assumed to be hidden from outside observers so that it does not signal the extent or quality of her private information.

Grossman and Helpman (2001: Section 5.2).[11] Data on groups' lobbying expenditures appears well-suited for testing this type of model, with one caveat. The base case in the endogenous spending framework involves a single signaler. In fact, because the signaler is perfectly informed about the policy-relevant information and separating equilibria exist, there is little real room for multiple signalers (for a discussion see Grossman and Helpman 2001: 163 ff.) Extending the PWGH framework to include partially informed groups who engage in strategic action within and across coalitions of signalers would be a significant theoretical departure.[12] Moreover, since the expenditure data is not issue-specific in any event, new propositions would probably not be testable with current data. Accordingly, in what follows we abstract from strategic interactions within or across coalitions of special interest groups to focus on the core comparative static predictions of the PWGH endogenous spending framework. However, we do need to extend the PWGH framework to encompass rational lobbying when the status quo receives only periodic reconsideration.

We proceed as follows. First, we review the basic framework, which we see as applicable in states with annual policy making due to annual budgeting. We then consider lobbying in the off-budget year of states with biennial budgeting. Here, because of the costliness of legislative action, the status quo is privileged absent a compelling reason for change. Finally, we consider rational lobbying in budget years for states with biennial budgeting. In the past, the state's policy receives active reconsideration but actors

[11] Austen-Smith 1995 differs significantly from the other two models, in that the expenditure is a campaign contribution signaling the group's preferences rather than any policy-relevant information per se. In the model, the group acquires policy-relevant information subsequent to its costly signal and then engages in cheap talk lobbying.

[12] Battaglini and Benabou 2003 takes a step in this direction.

anticipate that whatever policy emerges will likely remain in place for some time. In the model, lobbyists modify their behavior accordingly; in particular, the SIG must lobby more aggressively. We conclude the section by detailing testable propositions about lobbying expenditures under different political configurations and across states with different institutional arrangements.

A. The Basic Model: Lobbying Under Annual Budgeting

In the basic PWGH framework, a legislature (G) has public policy preferences that depend on the state of the world, a random variable θ. A special interest group (SIG) has preferences over θ as well, though in any state of the world the SIG may prefer higher (or lower) levels of the policy relative to the legislator. In this sense, the SIG is "biased." The SIG, knowing θ, signals this private information to the decision maker by expending money on lobbying. Within the basic framework, G sets policy *de novo*, based upon its beliefs about θ after observing the SIG's expenditure.

The policy space is the non-negative real line with $p \in P = \Re_+$. States of the world are a continuous random variable $\tilde{\theta}$ drawn from $\Theta = [\theta_{\min}, \theta_{\max}]$, $\theta_{\min} \geq 0$. The utility function of the policy maker is

$$G(p;\theta) = -(p-\theta)^2$$

While that of the SIG is:

$$U(l, p;\theta,\delta) = -(p-\theta-\delta)^2 - l$$

Where l denotes a monetary expenditure by the SIG.

The degree of SIG bias is parameterized as δ, which is common knowledge, making the SIG's ideal point $\theta + \delta$. Thus, if δ is positive the SIG wishes a somewhat higher policy than does the policymaker for any state of the world (positive bias), but if δ is negative, the SIG wishes a somewhat lower one (negative bias). We will associate positive bias with "liberal" groups and negative bias with "conservative" ones. Note that bias is defined relative to the legislature (that is, the median voter in the legislature).

The sequence of play is: 1) Nature draws θ using common knowledge distribution $F(\theta)$; 2) the SIG (costlessly) learns θ and publicly burns money *l*; 3) the legislature sets policy *p*.

We note here that "publicly burning money" is not necessarily required in a literal sense. The lobbyist could, for example, hire more expensive lobbyists or experts to makes its case, or could invest in expensive reports and spend more money to make its case to the legislature. The key requirements are a) the amount of money that the lobbyist spends is endogenous and chosen by the lobbyist, rather than exogenously determined, and b) the legislator knows the amount of money the lobbyist has spent.

A strategy for the SIG is a function mapping states of the world into expenditures, $l : \Theta \to \Re_+$. A strategy for the policy maker is a function mapping expenditures into policy, $r : \Re_+ \to P$. An obvious but important point is that, in any equilibrium, the policy maker will set *p* to θ if it knows it.

Grossman and Helpman focus on the following perfect Bayesian equilibrium, a fully separating equilibrium.[13] We begin by analyzing the equilibrium for positive bias of the SIG (the superscript distinguishes positive bias strategies from negative bias ones):

$$l\ (\delta,\theta,\theta_{\min})^{+} = 2\delta\left(\theta-\theta_{\min}\right)$$

$$p^{+}(l,\delta,\theta_{\min}) = r(l) = \frac{l}{2\delta}+\theta_{\min}$$

Beliefs are determined by Bayes Rule whenever possible. In words, a SIG with positive bias burns no money if the state of the world is the lowest possible value. Otherwise, it increases expenditures linearly. The policy maker simply inverts the lobby expenditure function to find the state of the world (which it then knows with certainty), and sets policy to match the state of the world.

Since the policy maker's strategy yields it the highest possible utility in any state of the world it clearly has no incentive to deviate from its prescribed strategy, which follows directly from its beliefs given the signal. The more difficult issue involves the SIG, who might have an incentive to inflate its report about the state of the world. However, the expenditure schedule is constructed to prevent this from happening. To see this, note that, *given* the strategy of the policy maker, the problem for the SIG is to maximize

$$-\left(\frac{l}{2\delta}+\theta_{\min}-\theta-\delta\right)^{2}-l$$

[13] There are other equilibria. For example: SIG never burns money, G interprets any money burned as a mistake uncorrelated with the state of the world. (This is possible, as burned money is off the equilibrium path.) Either no information is transmitted, or the game reduces to the cheap talk game.

The marginal gain from expenditures is $\frac{2\delta(\theta-\theta_{\min})-l}{2\delta^2}$. For all $\theta > \theta_{\min}$, this marginal gain is positive up to $l = 2\delta(\theta-\theta_{\min})$ and negative thereafter. Thus, the SIG has no incentive to deviate from its strategy.

We also consider the case of negative bias of the SIG, which occurs when Democratic legislatures are lobbied by conservative groups and possibly Republican legislatures lobbied by ultraconservatives. It is straightforward to construct the analogous separating equilibrium in the case of negative bias:

$$l(\theta)^{-} = 2\delta\left(\theta-\theta_{\max}\right)$$

$$p^{-} = r(l) = \theta_{\max} + \frac{l}{2\delta}$$

(Because δ is negative, the indicated expenditure function yields positive levels of expenditures.) Here, the SIG spends no money if the state of the world has its highest value, but otherwise spends money to drive policy down.

From an empirical point of view, perhaps the most striking feature of the equilibrium strategies is that the logarithm of expenditures is linear in a measure of ideological bias between the SIG and policy maker. In other words, if the SIG's bias relative to the legislature is small, it need not burn much money to persuade the policy maker about θ. But if its bias is large, it must burn more money. This relationship is shown in Figure 2.

*** INSERT FIGURE 2 HERE ***

B: Extension: Biennial Budgeting

1. Lobbying In Off-Budget Years in Biennial States

The PWGH model makes predictions about lobbying expenditures in states that set policy de novo. But it does not indicate how lobbying will proceed when there is substantial stickiness in a pre-existing status quo policy in some time periods, such as in off-budget years in states with biennial budgeting. We modify and extend the PWGH model to include two periods, a budgeting period and non-budgeting period. In the former policy is easy to change; in the latter, it is not.

Suppose there is a status quo policy in place at time 1, $p_1 = \theta_1$, and the politician faces a cost of legislating at time 2, k_2, to set new policy p_2. The cost of legislating in off-budget years in biennial states reflects the lack of an automatic procedure for reconsidering policies: doing so requires extraordinary effort. The utility function for the legislature becomes:

$$G(p_1, p_2; \theta_2, k_2) = \begin{cases} -(p_1 - \theta_2)^2 \text{ if the politician does nothing} \\ -(p_2 - \theta_2)^2 - k_2 \text{ if the politician sets new policy} \end{cases}$$

Two obvious implications arise. First, if the policy maker knew θ_2, it would not legislate unless θ_2 were sufficiently far from θ_1. More specifically, in such a situation the legislature will set $p_2 = \theta_2$ if it legislates, so that the relevant comparison is $-(\theta_1 - \theta_2)^2$ versus $-k_2$, implying: do not legislate if $\theta_2 \in \left[\theta_1 - \sqrt{k_2}, \theta_1 + \sqrt{k_2}\right]$.

Second, if the policy maker will not legislate, the SIG should not burn money since doing so only brings a loss.

We can now indicate an equilibrium that is similar to that constructed above (in fact, as $k \to 0$ the two become identical) where beliefs are determined by Bayes Rule wherever possible. Retention of the status quo means no policy change (so no expenditure of *k*):

1. If $\delta > 0$ (positive bias)

$$l_2^{+}(\theta_2, \theta_1) = \begin{cases} 2\delta(\theta_2 - \theta_{\min}) \text{if } \theta_2 \notin \left[\theta_1 - \sqrt{k_2}, \theta_1 + \sqrt{k_2}\right] \\ 0 \text{ otherwise} \end{cases}$$

$$p = r(l) = \begin{cases} \dfrac{l}{2\delta} + \theta_{\min} \text{ if } l > 0 \\ \theta_1 \text{ otherwise} \end{cases}$$

2. If $\delta < 0$ (negative bias)

$$l^{-}(\theta) = \begin{cases} 2\delta(\theta - \theta_{\max}) \text{if } \theta \notin \left[\text{(as above)}\right] \\ 0 \text{ otherwise} \end{cases}$$

$$p = r(l) = \begin{cases} \dfrac{l}{2\delta} + \theta_{\max} \text{ if } l > 0 \\ \hat{\theta} \text{ otherwise} \end{cases}$$

Figure 3 indicates lobbying expenditure as a function of the state of the world in the off-budget year, showing the "hole" created by costly movement of policy in off-budget years. The hole indicates that for those values of θ_2, the SIG will not lobby

because doing so will fail to move policy. Note that lobbying expenditure as a function of bias would appear identical to Figure 2, unless the SIG knew that θ_2 fell in the "hole," in which case lobbying expenditure would be zero.

*** INSERT FIGURE 3 ABOUT HERE ***

The "hole" has obvious empirical implications: on average we would expect to see fewer groups lobbying in off-budget years than on budget years.

2. Lobbying in Budget Years in Biennial States

Finally, we turn to lobbying in budget years in biennial states. To do this, we consider a two period model in which period 1 is the budget year while period 2 is the off-budget year. Clearly, strategies in period 2 will be those identified in the previous section (budgeting in off-years in biennial states). The task for the legislature in period 1, then, is to set p_1, anticipating rational play in period 2. We assume the cost of legislating in period 1, k_1, is zero because the budget process institutionalizes (many times constitutionally) consideration of policy.

A basic intuition is that if second period costs are low, first period policy will mostly reflect the first period state of the world θ_1. But if second period costs are high so subsequent action is unlikely, optimal first period policy involves a tradeoff between the first period state of the world θ_1 and expectations about the second period state of the world, θ_2. Thus, the legislature will down-weight extreme first period states of the world,

relative to a regime where it will recast policy annually. In turn, the first period lobbying expenditure function will need to reflect this.

Equilibrium strategies can be derived straightforwardly via backward induction. In particular, the second period strategies are simply those derived in the preceding section. Given θ_1 and k_2, the expected value of play in the second period may be found for each p_1. Then, the best p_1 may be found for each θ_1 and k_2. Finally, a first period lobbying function may be found that assures revelation of θ_1 (k_2 is assumed common knowledge). In the Mathematical Appendix, we employ this procedure to find equilibrium strategies for all values of θ_1 and k_2. Here we report these results, focusing on the positive bias case. Throughout this section we assume θ_2 is drawn from a uniform distribution on the unit interval.

**** INSERT FIGURE 4 HERE ***

Figure 4 indicates optimal first period policy for all values of θ_1 and k_2. As shown, there are four distinct cases. In the first, shown as Region I, k_2 is very high relative to the value of θ_1, so much so that the legislature will not change policy in the second period regardless of the realization of θ_2. We do not expect to see this equilibrium because while k_2 may be high, the governor in all states has the right to call a special session of the legislature. This somewhat mitigates the possibility of an extraordinarily high k_2. Though calling a special session is costly, it makes extremely high values of k_2 unobserved in the American states.

In the second case, labeled Region II in the figure, k_2 is moderate or low while θ_1 is moderate. Given the cost of movement in the second period, the legislature expects to alter a moderate p_1 if, but only if, θ_2 takes an unusually high or low value. In this case, optimal policy is simply to set p_1 equal to θ_1.

In the third case, shown as Region III in the figure, k_2 is moderate but θ_1 is unusually low. Given the cost of moving in the second period, the legislature expects a low first period policy to persist absent an unusually high second period θ_2. The optimal policy increases in θ_1 but always lies above it – the legislature somewhat down-weighs first period θ. The fourth case(shown as Region IV) is similar, but involves moderate k_2 and very high θ_1. The optimal policy increases in θ_1 but always lies below it – the legislature somewhat down-weighs first period θ.

Given the legislature's responses to θ_1 and k_2, it is possible to derive the lobby expenditure function that forces the SIG to reveal its information. These are shown in Figure 5.

*** INSERT FIGURE 5 HERE ***

From an empirical perspective, a notable feature of the lobbying expenditure functions is that, except for the unobserved "high *k*" scenario, all involve policy bias δ *plus legislating cost* k_2. The addition of the latter term contrasts with the lobbying expenditure function in annual states. The effect of k_2 is to increase lobbying effort in

budget years of states with biennial budgeting, relative to lobbying in states with annual budgeting.

Thus, the PWGH framework yields three key predictions which can be tested in the data. The most basic prediction is that the greater the bias, δ, the more money the SIG will have to burn to convince the legislator to adopt is chosen policy. Second, there will be an increase lobbying effort in budget years of states with biennial budgeting, relative to lobbying in states with annual budgeting. Finally, a number of groups will fall into the "hole" during off-budget years, causing the number of interest groups lobbying to shrink during this time. We test these three main predictions of the model using the state level lobbying data.

4. Data Analysis

In order to test the implications of the PWGH model, we conduct three sets of analyses. We start by discussing the econometric challenges in estimating the predictions of the PWGH model. We then examine the effect bias and ideological distance on the amount of endogenous lobbying expenditures that occur. Using a two-stage estimation procedure, we turn our efforts to estimating the effect of biennial budgeting on lobbying effort. Finally, we turn to an examination of the effect of budget cycles on interest group entry and exit in the lobbying process.

A. Estimating The Lobby Equation

We begin by returning to the lobbying expenditure equations for states with annual budgeting and the lobby equations in budget years for states with biennial budgeting.[15] Recall that these are:

$$l_1^+(\delta,\theta_1) = 2\delta\theta_1$$
$$l_1^-(\delta,\theta_1) = 2\delta(\theta_1 - 1) \qquad \text{(AA)}$$

$$l_1^+(\delta,\theta_1,k_2) = 2\delta\theta_1\left(1+2\sqrt{k_2}\right)$$
$$l_1^-(\delta,\theta_1,k_2) = 2\delta(\theta_1 - 1)\left(1+2\sqrt{k_2}\right) \qquad \text{(AB)}$$

While stopping well short of a structural estimation, given (AA) and (AB) we consider the following an obvious candidate for an estimating equation for lobbying expenditures of group *i* in state *j* at time *t*:

$$\ln(l_{ijt}) = a + b\ln(k) + c\ln(d_{ijt}) + v_{ijt} \qquad (1)$$

where *k* is a proxy for legislation costs in the off-budget year in biennial states only, and d_{ijt} is a measure of absolute ideological distance from group *i* to the state government in state *j* in year *t* (a measure of bias, θ) with an additive error term v_{ijt}.

In this subsection, we limit our sample frame to all firms and unions that have positive lobbying expenditures in a given year in a given state, using a subset of the dataset of 12 states with 50,000 interest group-state-year observations. These groups seem natural choices, since their interests frequently have an ideological dimension (i.e., liberal, conservative) and they are frequently allied with the major political parties

[15] In the latter case, we focus on the most likely of the four scenarios shown in Figure 4 that in the lower center portion of the figure.

(Democrats for labor, Republicans for firms). These two groups also provide an abundance of observations. We limit our analysis to interest groups that lobby in multiple states so that we can separate our interest group fixed effects from state fixed effects. We further limit our observation set to only those years when *regularly scheduled budgeting occurs in the state*. So, in annual budgeting states, this observation set is all years; in biennial budgeting states, it is only budgeting years. The net result is 5,515 interest group-year-state observations for analysis. This is the second dataset referred to in Section 2.

We could follow the specification directly from equations (AA) and (AB). To do this, we would use the log of lobbying expenditures by each interest group as the dependent variable. To proxy for *k*, we use a dummy variable which is equal to one for states with biennial budgeting, and zero otherwise. To measure absolute distance *d* we create a distance variable. This variable measures the ideological distance of the firm (union) to the legislature. The distance is coded as 0 for a firm if the government (house, senate, and governor) is entirely Republican, and 0 for a union if the government is entirely Democratic. It is coded as 0.5 for both firms and unions if there is divided government. And it is coded as a 1 for the firm if the government is unified Democratic, and 1 for a union if the government is entirely Republican.[16]

[16] Note that this coding imposes the restriction that the expenditure function slope is the same for a given group between unified opposed and divided government, and between divided government and unified supporting government.

The results of such an analysis can be found in Appendix A3.[17] Although the such a regression yields results supportive of the PWGH model, (large positive and statistically significant coefficients for both the parameters *b* and *c* in Eq. (1)), a statistical concern looms. As noted earlier, laws regarding lobbying disclosure requirements differ substantially across states. In states such as Wisconsin, one must disclose compensation levels for hired lobbyists, while in states such as Georgia, such compensation is not part of the disclosure process. Given this heterogeneity in state disclosure laws, one would ideally like to use state fixed effects. The problem that arises, though, is that states do not change their budgeting procedures.[19] Thus, biennial budgeting does not vary over time within state, causing there to be a lack of identification in the econometric estimation when both state fixed effects and the biennial budgeting variable are included.

B. ESTIMATING THE EFFECT OF BIAS

Given the importance of state fixed effects to any estimation, we proceed with the dataset, dropping the biennial variables and using state fixed effects. The dependent variable is still the log of lobbying expenditures for group i, in state j, at time t. Table 3 presents the results. Models 1 through 5 present results with levels on levels. Model 1 uses no fixed effects, Model 2 adds group fixed effects, Model 3 adds time-varying control variables, Model 4 adds state fixed effects, and Model 5 adds year fixed effects.

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[17] Table A3 in the appendix presents the results using the variables of interest. Model 1 incorporates group fixed-effects and Model 2 adds some control variables not included in the model, log of the population level and log of per capita personal income in the state. In both specifications, the coefficients on biennial budgeting and on distance are positive, as predicted by the model, and statistically significant at the 99% level of confidence or greater.

[19] See the note on Table 1 for a further discussion.

*** INSERT TABLE 3 HERE ***

The coefficient on distance is positive and statistically significant at the 99% level in all specifications. The inclusion of state fixed effects in Models 4 and 5 causes the size of the coefficient on distance to drop by almost half, but it remains positive. Substantively, Model 5, with the group, state, and year fixed effects and control variables, estimates there is a 38% increase in lobbying by firms (unions) when the government switches from being unified Republican (Democratic) to unified Democratic (Republican). Longer special sessions (but not regular sessions) also result in statistically more lobbying, with each additional 10 legislative days giving rise to 5% more lobbying expenditures by special interests.

In Models 6 through 10, we replicate the five earlier models using a differences on differences estimator.[20] Models 7 through 10 include group, state, and/or year fixed effects as noted, as well. In Model 10, all coefficients are statistically significant at the 99% level and all, except the coefficient on Population, have the same sign as in Model 5. The magnitude of the coefficient on Distance is somewhat larger than Model 5. It means that there is a 74% increase in lobbying by firms (unions) when the government switches from being unified Republican (Democratic) to unified Democratic (Republican). There is only a 7% increase in lobbying with each additional ten legislative days in the session. That is, a shift in unified government has almost the same effect as adding 105 session

[20] This specification addresses concerns of non-stationarity of the time series.

days to the legislative calendar. The effect for special sessions is the same as regular sessions in this specification.

One concern that may arise is that while the PWGH model focuses on one group, it does not address the question of strategic behavior (or something as simple as free-riding) when there are multiple groups. As discussed earlier, we do not model the strategic interaction between groups for a variety of reasons. However, empirically, we can examine whether the number of groups in an issue area makes a difference to a group's lobbying. We replicate Model 5 including a variable for the number of interest groups lobbying in the same issue area.[21] In this specification, the coefficient on this new variable is positive but not statistically significant.

C. ESTIMATING THE EFFECT OF BUDGETING

To capture the effects of the budget cycle, we can decompose the state fixed effects with cross section regressions (Card and Krueger 1992). The state fixed effects include all effects that do not vary within state. Thus, whether a state budgets biennially or annually is captured in the state fixed effect. We would normally run a regression of the estimated state fixed effects on the covariates that vary across state but not over time within state. Unfortunately, because micro interest group data is available for only twelve states, such an approach is not feasible.

[21] Gray et al (2002) have classified each registered lobbyist in each state according to one of twenty areas of interest, as of 1997. We update this and classify all interest groups in the dataset using their classification system, and we also add ten categories to further refine the analysis.

However, what we can do is to take aggregate level data of interest group lobbying by state and year (the data used in Section 2), and conduct a similar test.[22] In the first stage we use the state-year aggregate lobbying data for only those years in which budgeting occurred. Appendix A4 provides the results of those regressions with state fixed effects. Thirty-five state fixed effects are estimated.[23] In the second stage, we then use those fixed effects as the dependent variable, and regress it against a series of variables that vary across states, but are fixed across time. These include whether a state is an annual or biennial budgeter, whether the state has legislative term limits or budget caps, the size of the legislature, the veto override majority requirements, the standards for review of administrative agencies, and an index that describes the degree of professionalization of the legislature. A full description of the data is provided in Appendix A2.

The results of the second stage regression are found in Table 4. Model 1 uses the log of per capita lobbying in a state in a year as the dependent variable, while Model 2 uses log of total lobbying in a state in a year as the dependent variable. The results are quite similar to each other, despite the fact that there are only 35 observations in both models. The coefficient on Biennial is statistically significant at the 99% level in both specifications. Biennial budgeting states have nearly 47% more lobbying expenditures (by either measure) than annual budgeting states, controlling for other effects, in budget years. This prediction of the extended PWGH model seems to hold up quite well in this

[22] It is important to note that using this data to infer about the effect of biennial budgeting assumes that the state fixed effect is constant across all interest groups and across time. That is, the state fixed effect aggregates up to the aggregate level of lobbying expenditures in an additive way.
[23] We lose two state fixed effects when we difference the data in the first stage because of short series.

data. No other variable has a statistically significant effect at the 90% level or greater, except for budget caps in Model 2.

*** INSERT TABLE 4 HERE ***

D. ESTIMATING THE EFFECT OF THE HOLE ON INTEREST GROUP PARTICIPATION

A final prediction of the PWGH model is in those off-budget years in the biennial states, a hole will cause less lobbying to occur because of costly movement of policy in off-budget years. If we assume that that the magnitudes of the changes in θ across time are distributed across issue areas, and that groups are also distributed across issue areas, some groups in some issue areas will fall into the hole, and thus drop out of lobbying in off-budget years. We can examine in the second dataset (including micro-interest group data of 50,000 observations) whether the number of interest groups decline in the off-budget years, consistent with this prediction.[26]

Our dependent variables are the total number of interest groups (Models 1 and 3) and the log of the number of interest groups (Models 2 and 4) with positive lobbying

[26] A more powerful test would map the groups to the issue areas with big shifts in θ , and examine their lobbying behavior. Unfortunately, in this dataset we no way of identifying which groups and issue areas are subjected to large shifts in θ .

expenditures in a state in a year. This yields 77 observations (12 states, each with about 6.5 observations per year.) Our independent variables are as before. The results are presented in Table 5. Models 1 and 2 use a levels on levels specification, while Models 3 and 4 use a differences on differences specification. All models have robust standard errors and state fixed effects.

*** INSERT TABLE 5 HERE ***

The models estimate that in budget years, there are 7.9% to 16.8% (Models 1 and 3) more interest groups participating in legislative lobbying, or 47 to 73 (Models 2 and 4) more interest groups. These results are statistically significant at the 99% level in three specifications, and 90% level in Model 4. The only other statistically significant effect in some specifications is the number of days in the regular session, which can increase the number of interest groups lobbying. Each additional 10 legislative days in the regular session increases the number of interest groups lobbying by 2-4% (Models 1 and 3), or 2 to 7 more interest groups enter (Models 2 and 4). Again, the budget year effect is much larger than the session length effects.

Overall, the three key predictions of the model 1) increased bias (or ideological distance) resulting in more lobbying, 2) biennial budgeting states having more lobbying in budget years, and 3) in off-budget years, there will be an increase in the number of interest groups, find substantial support across various specifications in the data analyzed.

5. Discussion and Conclusion

The results of this paper are promising for the endogenous cost lobbying models and models that include the signaling features of the PWGH model. This model neatly captures some fundamental features of strategic information transmission: attempts to persuade make little sense except when a policy window is open; it is easier to persuade people whose biases are similar to your own; and persuasion is most important when policy is apt to last for a long time. The data – the most extensive yet collected on lobbying – seem clearly to show the fingerprints of strategic information transmission.

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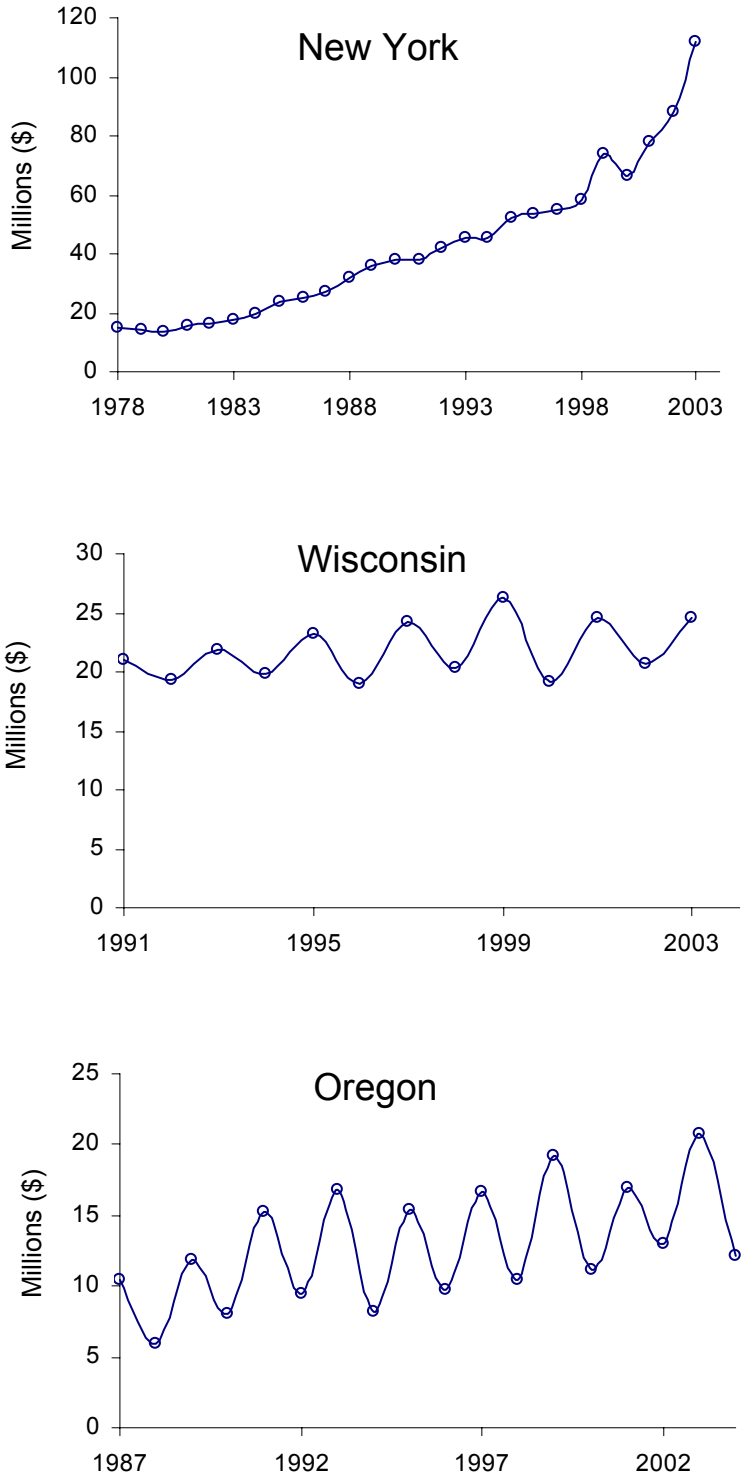
Figure 1: Lobbying Expenditures in States



All graphs in 2000 constant dollars.

Figure 2: Lobbying as a function of bias

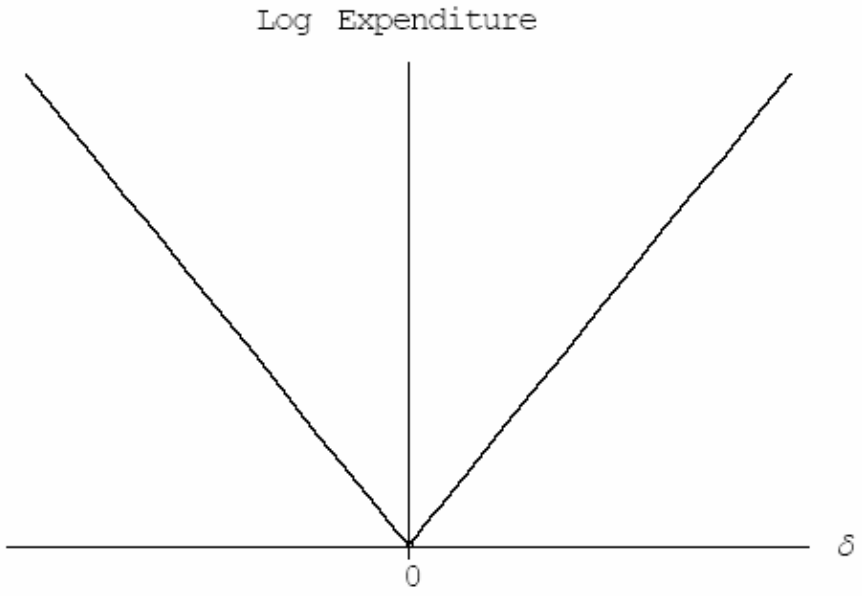


Figure 3: The hole in lobbying

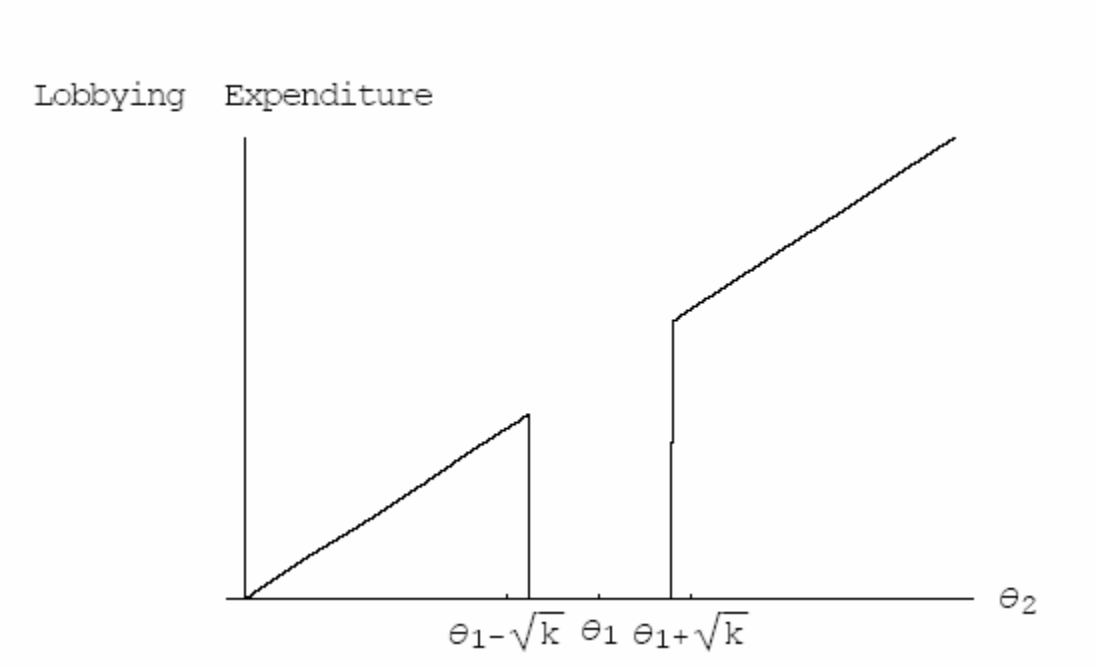


Figure 4: Optimal first period policy

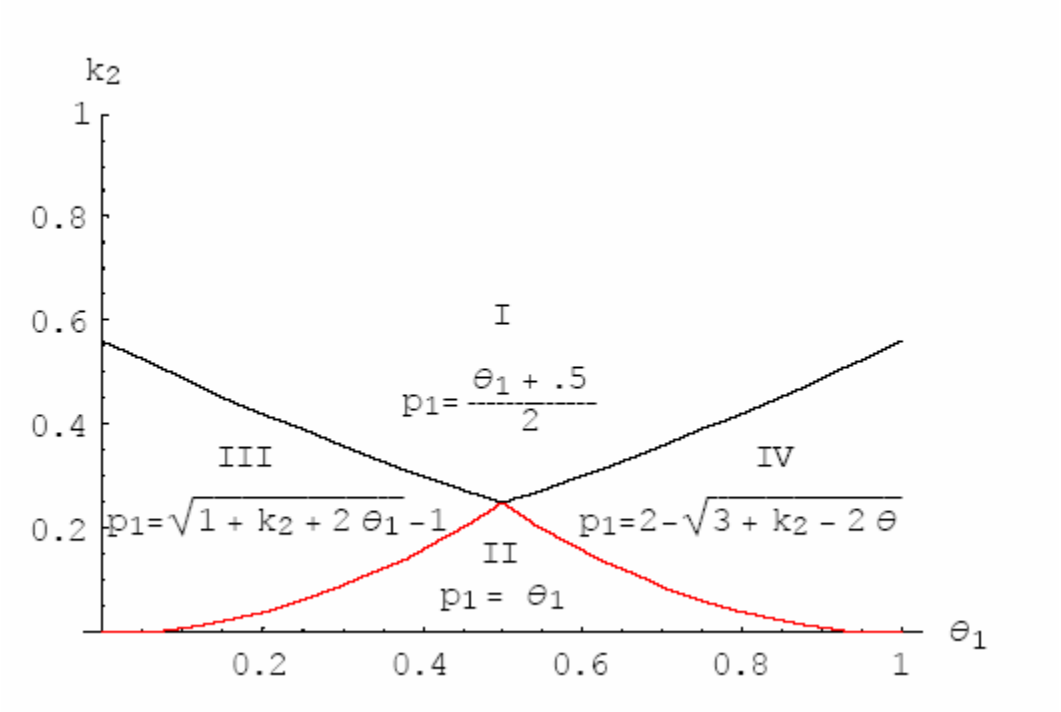


Figure 5: Optimal lobbying expenditures

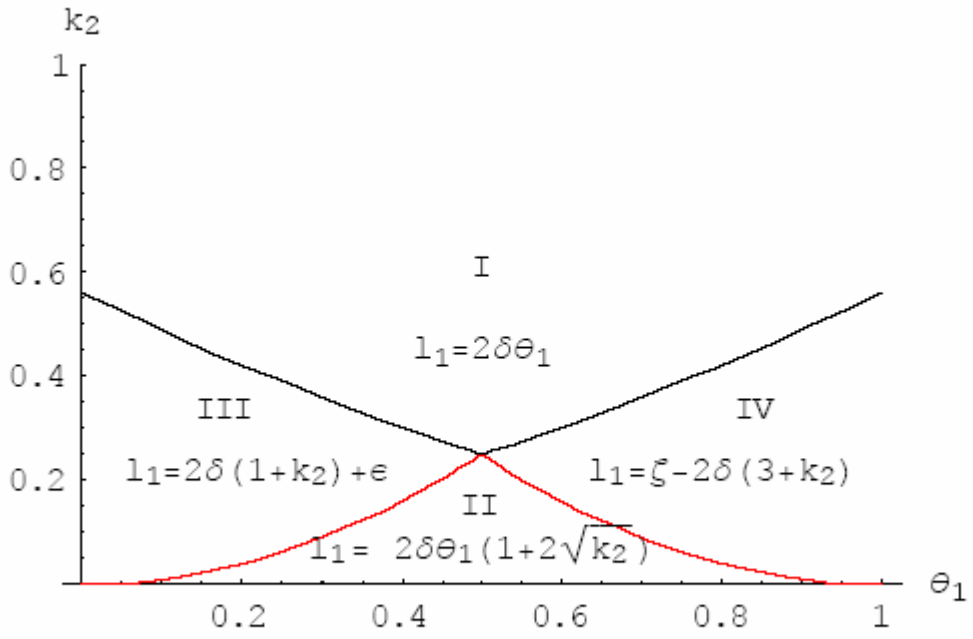


TABLE 1: DESCRIPTIVE STATISTICS FORAGGREGATE ANNUAL STATE LOBBYING EXPENDITURES

State	Mean Reported Lobbying Expenditures*	Minimum Reported Annual Lobbying Expenditures*	Maximum Annual Reported Lobbying Expenditures*	First Year Data Available	Last Year Data Available	Biennial Budgeting State
Alaska	$9,098,812	$4,297,268	$12,200,000	1978	2004	No
Arizona**	$2,371,891	$1,506,335	$3,156,176	1995	2004	No
California	$161,000,000	$142,000,000	$189,000,000	1991	2003	No
Colorado	$18,000,000	$17,100,000	$19,300,000	2001	2003	No
Connecticut	$15,900,000	$2,624,827	$35,400,000	1978	2003	Yes
Delaware	$152,093	$131,649	$177,082	2002	2004	No
Florida	$4,912,494	$4,091,011	$6,818,084	1997	2001	No
Georgia	$574,220	$315,283	$675,404	1997	2003	No
Hawaii	$3,322,758	$2,707,086	$3,917,630	1996	2003	Yes
Idaho	$408,472	$298,667	$482,954	1997	2003	No
Illinois	$1,147,851	$960,528	$1,437,774	1995	2003	No
Indiana	$15,500,000	$11,100,000	$19,100,000	1996	2001	Yes
Kansas	$626,738	$364,223	$978,735	1975	2003	No
Kentucky**	$6,785,246	$2,590,579	$9,879,419	1994	2003	Yes
Louisiana	$452,757	$362,303	$681,486	1997	2003	No
Massachusetts	$42,400,000	$27,100,000	$55,200,000	1995	2003	No
Maryland	$19,900,000	$13,700,000	$28,500,000	1988	2003	No
Maine	$3,316,610	$2,030,087	$4,420,563	1989	2003	Yes
Michigan	$23,400,000	$22,300,000	$24,900,000	2001	2003	No
Minnesota***	$5,082,912	$1,070,697	$10,900,000	1980	2004	Yes
Mississippi	$6,875,722	$4,331,805	$9,371,824	1995	2003	No
Montana	$2,733,623	$18,255	$5,154,875	1993	2001	Yes
North Carolina	$9,151,968	$7,999,181	$10,500,000	2001	2004	Yes
Nebraska	$8,133,817	$6,423,631	$9,161,878	2000	2003	Yes
New Jersey	$18,100,000	$14,800,000	$25,000,000	1993	2003	No
New York	$42,400,000	$13,800,000	$112,000,000	1978	2003	No
Ohio	$510,581	$346,473	$765,245	1999	2004	Yes
Oregon	$12,900,000	$5,948,027	$20,700,000	1987	2004	Yes
Pennsylvania	$48,400,000	$46,800,000	$50,100,000	2000	2001	No
South Carolina	$13,900,000	$13,200,000	$14,300,000	1998	2001	No
Texas	$4,792,169	$768,337	$15,000,000	1993	2001	Yes
Utah	$159,194	$105,123	$245,998	1995	2003	No
Virginia	$10,500,000	$8,293,575	$15,800,000	1996	2003	Yes
Vermont	$4,859,556	$4,414,832	$5,182,520	1998	2004	No
Washington	$29,200,000	$22,300,000	$39,000,000	1993	2004	Yes
Wisconsin	$21,800,000	$18,900,000	$26,200,000	1991	2003	Yes
West Virginia	$267,579	$212,544	$394,445	1992	2003	No
Wyoming	$262,105	$127,916	$496,434	2000	2003	Yes

* All reports are in 2000 real dollars

** Switched from annual to biennial or biennial to annual budgeting.

*** Has separate procedures for capital budgeting.

TABLE 2: LOBBYING IN THE STATES

	Model 1	Model 2
Dependent Variable	Ln(Lobbying Per Capita)	Ln(Lobbying)
Method	Differences on Differences	Differences on Differences
Variable		
Budget Year	0.215***	0.215***
	(0.06)	(0.06)
Session Days	0.006***	0.006***
	(0.00)	(0.00)
Special Session Days	0.002	0.002
	(0.00)	(0.00)
Election Year	-0.039	-0.039
	(0.04)	(0.04)
Republican Government	0.228*	0.228*
	(0.13)	(0.13)
Democratic Government	-0.015	-0.016
	(0.11)	(0.11)
Ln(Per Capita Income)	1.415	1.440
	(1.20)	(1.20)
Constant	-0.040	-0.031
	(0.06)	(0.06)
State Fixed Effects	Yes	Yes
Total R-squared	0.344	0.343
F-stat	22.968	22.937
n	352	352

Two-sided t-tests: * p<.10 ** p<.05 *** p<.01

Note: Dependent variables and method used are noted. An observation is a state-year.

TABLE 3: INTERST GROUP LEVEL ANALYSIS FOR MULTI-STATE GROUPS

Variable	Levels on Levels					Differences on Differences				
	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6	Model 7	Model 8	Model 9	Model 10
Distance	0.606***	0.587***	0.580***	0.282**	0.324***	0.687***	0.682***	0.764***	0.611***	0.553***
	(0.18)	(0.09)	(0.10)	(0.12)	(0.13)	(0.20)	(0.10)	(0.10)	(0.12)	(0.12)
Ln(Population)			0.301***	-0.001	1.881			-0.284***	-0.246**	-0.248**
			(0.08)	(1.84)	(2.35)			(0.08)	(0.11)	(0.11)
Ln(Per Capita Income)			2.081***	1.151**	2.466			5.448***	5.276***	5.301***
			(0.20)	(0.45)	(1.55)			(0.26)	(0.35)	(0.36)
Session Days			0.010***	0.001	0.003			0.007***	0.006***	0.007***
			(0.00)	(0.00)	(0.00)			(0.00)	(0.00)	(0.00)
Special Session Days			0.006***	0.001	0.005**			0.005**	0.005**	0.007***
			(0.00)	(0.00)	(0.00)			(0.00)	(0.00)	(0.00)
Constant	9.056***	9.068***	-17.639***	-6.043	-48.613	-0.016	-0.016	-0.173***	-3.049***	-3.294***
	(0.10)	(0.06)	(1.76)	(25.27)	(44.64)	(0.01)	(0.04)	(0.04)	(0.16)	(0.62)
Group Fixed Effects	No	Yes	Yes	Yes	Yes	No	Yes	Yes	Yes	Yes
State Fixed Effects	No	No	No	Yes	Yes	No	No	No	Yes	Yes
Year Fixed Effects	No	No	No	No	Yes	No	No	No	No	Yes
Total R-squared	0.008	0.008	0.108	0.497	0.5	0.012	0.012	0.187	0.364	0.373
F-stat	11.97	38.65	109.99	281.15	181.47	11.47	47.42	184.15	143.13	94.64
n	5,155	5,155	5,155	5,155	5,155	4,556	4,556	4,556	4,556	4,556

Two-sided t-tests: ** p<.05 *** p<.01

Note: The sample frame is interest groups that engage in multi-state lobbying in 12 states under analysis. The dependent variable is the log of lobbying expenditures by an interest group lobbying in a state-year. Models 1-5 are level on level regression; Models 6-10 are differences on differences regressions. Standard errors, statistical significance, and use of fixed effects are noted. Models 1 and 6 report standard errors clustered on interest group.

TABLE 4: DECOMPOSITION OF STATE FIXED EFFECTS FROM FIRST STAGE REGRESSIONS

	Model 1	Model 2
Dependent Variable	Ln(Lobbying Per Capita)	Ln(Lobbying)
Method	Cross Sectional OLS	Cross Sectional OLS
Variable		
Biennial	0.391***	0.388***
	(0.15)	(0.15)
Budget Caps	0.237	0.243*
	(0.14)	(0.14)
Term Limits	0.150	0.150
	(0.16)	(0.16)
Total Number of Legislators	0.001	0.001
	(0.00)	(0.00)
Veto Override Requirement	0.501	0.543
	(1.15)	(1.16)
Admin Review Standard	0.029	0.031
	(0.15)	(0.15)
Professionalization Index	-0.023	-0.023
	(0.02)	(0.02)
Constant	-0.269	-0.291
	(0.70)	(0.71)
R-squared	0.3805	0.3811
F-stat	2.63	2.59
n	35	35

Two-sided t-tests: ** p<.05 *** p<.01

Note: The dependent variable is the state fixed effect calculated from the first stage regressions in Table A4. Model 1 uses log of lobbying per capita as the dependent variable; Model 2 uses log of total lobbying per capita in the first stage regressions. Robust standard errors, statistical significance, and use of fixed effects are noted.

TABLE 5: NUMBER OF INTEREST GROUPS LOBBYING

	Model 1	Model 2	Model 3	Model 4
Dependent Variable	Number of Interest Groups	Ln(Number of Interest Groups)	Number of Interest Groups	Ln(Number of Interest Groups)
Method	Levels on Levels	Levels on Levels	Differences on Differences	Differences on Differences
Variable				
Budget Year	72.995***	0.168***	46.792***	0.079*
	(16.78)	(0.05)	(13.61)	(0.04)
Days in Session	0.713**	0.002	1.370***	0.004**
	(0.35)	(0.00)	(0.39)	(0.00)
Days in Special Session	0.161	0	0.095	0.001
	(0.56)	(0.00)	(0.78)	(0.00)
Election Year	-6.873	-0.024	-14.717	-0.054
	(11.25)	(0.05)	(9.55)	(0.04)
Democratic Government	-19.941	-0.043	-39.379	-0.118*
	(30.03)	(0.10)	(24.29)	(0.06)
Republican Government	-16.837	-0.047	-3.184	0.043
	(17.40)	(0.05)	(62.87)	(0.15)
Ln(Per Capita Income)	274.107	-0.519	125.474	0.499
	(245.13)	(0.94)	(364.00)	(1.14)
Year	1,025.09	3.472		
	(3802.98)	(15.62)		
$Year^2$	-0.256	-0.001		
	(0.95)	(0.00)		
Constant	-1,027,584.00	-3,516.14	2.45	0.008
	(3,800,000.00)	(15,625.82)	(21.75)	(0.09)
State Fixed Effects	Yes	Yes	Yes	Yes
Total R-squared	0.976	0.924	0.68	0.457
F-Stat	.	.	3.722	1.488
n	77	77	65	65

Two-sided t-tests: * p<.10 ** p<.05 *** p<.01

Note: Dependent variables and method used are noted. An observation is a state-year.

TABLE A1: TOTAL AVERAGE ANNUAL LOBBYING EXPENDITURES BY INTEREST GROUP CATEGORY

	Firms	Trade Associations	Unions	Membership Groups	Government
Georgia	$203,087 35.03%	$337,992 58.30%	$5,861 1.01%	$14,066 2.43%	$18,788 3.24%
Idaho	$106,992 26.86%	$248,792 62.46%	$7,333 1.84%	$34,038 8.54%	$1,193 0.30%
Indiana	$7,410,237 51.26%	$5,381,184 37.23%	$402,977 2.79%	$479,810 3.32%	$780,632 5.40%
Kentucky	$3,112,450 47.60%	$2,874,744 43.96%	$199,902 3.06%	$204,986 3.13%	$147,242 2.25%
Maryland	$8,629,497 53.30%	$6,072,596 37.51%	$254,010 1.57%	$1,053,157 6.51%	$179,949 1.11%
Massachusetts	$24,500,000 68.03%	$9,065,445 25.17%	$973,783 2.70%	$953,398 2.65%	$520,111 1.44%
Montana	$1,159,269 32.82%	$1,670,386 47.30%	$130,734 3.70%	$313,453 8.88%	$257,908 7.30%
New Jersey	$14,300,000 77.09%	$3,667,637 19.77%	$380,041 2.05%	$201,421 1.09%	$0 0.00%
Oregon	$4,806,318 34.68%	$6,282,698 45.34%	$565,691 4.08%	$1,010,955 7.30%	$1,192,322 8.60%
Virginia	$4,281,013 39.31%	$4,531,930 41.61%	$108,179 0.99%	$920,756 8.45%	$1,049,186 9.63%
Washington	$11,100,000 43.92%	$9,931,242 39.30%	$1,556,676 6.16%	$1,502,012 5.94%	$1,182,857 4.68%
Wisconsin	$7,168,874 34.61%	$10,200,000 49.25%	$796,687 3.85%	$1,478,579 7.14%	$1,068,476 5.16%

Notes: Data is for all available years for each state. Table A2 figures may differ from Table 1 figures because the time period covered in each table is different. Firms and trade associations comprise on average 88% of lobbying expenditures in every state, and no less than 80% of lobby expenditures in any state. Some large figures have been rounded.

TABLE A2: VARIABLE DEFINITIONS AND SOURCES

Ln(Lobbying Per Capita)	State Aggregate Lobbying Expenditures Divided by the Population of the State in a given year, logged (Ethics Commission of Each State where data is available; includes 38 states. Most data is obtain from official disclosures provided.) Population Data from Census and BEA.
Ln(Lobbying)	State Aggregate Lobbying Expenditures in a given year, logged. (Ethics Commission of Each State where data is available; includes 38 states. Most data is obtain from official disclosures provided.)
Interest Group Lobbying Data and Categories	For twelve states, annual lobbying expenditures by registered interest group by year. Categorization of each interest group into each of five categories: corporate, trade association, membership organization, union, and government; for each state for each year. (Ethics Commission of Each State. Most data is obtain from official disclosures provided. N > 50,000)
Number of Interest Groups	Number of Interest Groups with Positive Lobbying Expenditures in a State in a Year; Count is for 12 states with interest group data (Ethics Commission of Each State. Count is derived from official disclosures provided. N > 50,000)
Ln(Number of Interest Groups)	Log of Number of Interest Groups with Positive Lobbying Expenditures in a State in a Year; Count is for 12 states with interest group data (Ethics Commission of Each State. Count is derived from official disclosures provided. N > 50,000)
Budget Year	Equal to 1 if the state budget is legally mandated to be created in the year; 0 otherwise. (NCSL)
Session Days	The number of legislative days the legislature was in session in that year. For those that reported in calendar days, we divided the number of calendar days by 2.5 to retrieve an approximate number of legislative days. This ratio was determined from a subset of data where both total days and legislative days were reported for the same state-year. Session Dummy is a dummy variable = 1 if the legislature is in regular session and 0 otherwise (Book of the States)
Special Session Days	The number of legislative days the legislature was in session in that year. For those that reported in calendar days, we divided the number of calendar days by 2.5 to retrieve an approximate number of legislative days. This ratio was determined from a subset of data where both total days and legislative days were reported for the same state-year. Special Session Dummy is a dummy variable = 1 if the legislature is in regular session and 0 otherwise (Book of the States)
Election Year	Equal to 1 if the legislature holds regularly scheduled election in that year; = 0 otherwise (NCSL)
Republican Government	Equal to 1 when the Republican Party holds the governorship, state senate, and state house; = 0 otherwise (Book of the States)
Democratic Government	Equal to 1 when the Democratic Party holds the governorship, state senate, and state house; = 0 otherwise (Book of the States)
Ln(Per Capita Income)	Log of Per Capita Personal Income of the State in a given year (Bureau of Economic Analysis, Department of Commerce (BEA))
Ln(Population)	Log of Population of the State (Census and BEA)
Year	Year
Biennial	Equal to 1 if a state budgets biennially; = 0 otherwise (NCSL)
Budget Caps	Equal to 1 if the state has budget caps; =0 otherwise (Primo, 2003)
Term Limits	Equal to 1 if the state has legislative term limits; = 0 otherwise (Primo and Milyo 2004)
Total Number of Legislators	The total number of legislators in the state senate and house combined (Book of the States)
Veto Override Requirement	The percentage of legislators that must vote for an override of the governor's veto in a given state (Book of the States)
Admin Review Standard	Equal to 1 if a statute must be passed to override a regulatory agency in the state; = 0 otherwise (Book of the States)
Professionalization Index	A measure of the degree of professionalization of the legislature. This measure is comprised of a rating of the length of the sessions of the legislature, the compensation of legislators, and the amount of staff they have. (Kurtz, NCSL)
Distance	A measure of the ideological distance of the interest group to the median of the government. It is = 1 if the interest group is a firm (union), and there is Democratic (Republican) unified government. It is = .5 if the interest group is a firm (union), and there is divided government. It is equal to 0 if the interest group is a firm (union) and there is Republican (Democratic) unified government.

TABLE A3: ESTIMATION OF THEORETICAL EQUATION (1)

	Model 1	Model 2
Dependent Variable	Ln(Lobbying)	Ln(Lobbying)
Method	Levels on Levels	Levels on Levels
Variable		
Distance	1.261***	1.487***
	(0.10)	(0.09)
Biennial	0.850***	2.508***
	(0.06)	(0.07)
Session Days	0.014***	0.004***
	(0.00)	(0.00)
Special Session Days	0.000	-0.010***
	(0.00)	(0.00)
Ln(Population)		-1.347***
		(0.07)
Ln(Per Capita Income)		12.039***
		(0.28)
Constant	8.164***	-92.153***
	(0.19)	(2.26)
Group Fixed Effects	yes	yes
State Fixed Effects	no	no
Year Fixed Effects	yes	yes
Total R-squared	0.127	0.394
F-stat	50.99	197.401
n	5,155	5,155

Two-sided t-tests: *** p<.01

Note: If one were to attempt to nearly structurally estimate Equation (1) of the theoretical section, the regression equation would look like this table. However, without state fixed effects, it is unclear this estimation is meaningful.

TABLE A4: FIRST-STAGE REGRESSION ON STATE BUDGETING YEARS ONLY

	Model 1	Model 2
Dependent Variable	Ln(Lobbying Per Capita)	Ln(Lobbying)
Method	Differences on Differences	Differences on Differences
Variable		
Ln(Per Capita Income)	0.5969 (0.69)	0.6359 (0.70)
Days in Session	0.0005 (0.00)	0.0005 (0.00)
Days in Special Session	-0.0006 (0.00)	-0.0006 (0.00)
Election Year	-0.0272 (0.02)	-0.0270 (0.02)
Republican Unified Govt	0.1730** (0.07)	0.1735** (0.07)
Democratic Unified Govt	-0.0478 (0.06)	-0.0484 (0.06)
Constant	0.1150*** (0.04)	0.1237*** (0.04)
State Fixed Effects	Yes	Yes
Total R-squared	0.1057	0.1028
F-stat	1.66	1.66
n	278	278

Two-sided t-tests: ** p<.05 *** p<.01

Note: The dependent variable in Model 1 is the log of total aggregate lobbying expenditures per capita in the state in a year. The dependent variable in Model 2 is the log of total aggregate lobbying expenditures in the state in a year. Standard errors, statistical significance, and use of fixed effects are noted.

REFEREE TABLE R1: ROBUSTNESS CHECKS OF LOBBYING IN THE STATES

	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6	Model 7	Model 8
Dependent Variable	Ln(Lobbying Per Capita)	Ln(Lobbying)	Ln(Lobbying Per Capita)	Ln(Lobbying)	Ln(Lobbying Per Capita)	Ln(Lobbying)	Ln(Lobbying Per Capita)	Ln(Lobbying)
Method	Levels on Levels (Only Stationary States)	Levels on Levels (Only Stationary States)	AR-1 Corrected Fixed Effects	AR-1 Corrected Fixed Effects	Arellano-Bond Dynamic Panel Estimation	Arellano-Bond Dynamic Panel Estimation	Differences on Differences	Differences on Differences
Variable								
Budget Year	0.356***	0.356***	0.320***	0.323***	0.302***	0.310***	0.173***	0.173***
	(0.12)	(0.12)	(0.08)	(0.08)	(0.07)	(0.09)	(0.05)	(0.05)
Session Days	0.007***	0.007***	0.003***	0.003***	0.003*	0.003*		
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)		
Session Dummy							1.044***	1.043***
							(0.09)	(0.09)
Special Session Days	0.006*	0.006*	0.001	0.001	0.001	0.000		
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)		
Special Session Dummy							0.057	0.056
							(0.04)	(0.04)
Election Year	0.015	0.019	-0.014	-0.017	-0.019	-0.010	-0.04	-0.04
	(0.08)	(0.08)	(0.05)	(0.05)	(0.02)	(0.02)	(0.03)	(0.03)
Republican Government	0.311**	0.300**	0.032	0.032	-0.018	-0.043	0.229**	0.229**
	(0.14)	(0.14)	(0.09)	(0.09)	(0.18)	(0.14)	(0.11)	(0.11)
Democratic Government	-0.002	-0.02	-0.111*	-0.115*	-0.113*	-0.177**	-0.01	-0.011
	(0.09)	(0.09)	(0.07)	(0.07)	(0.06)	(0.07)	(0.09)	(0.09)
Ln(Per Capita Income)	0.917	0.928	0.894***	1.061***	1.517**	1.591**	1.587	1.612
	(1.52)	(1.52)	(0.09)	(0.09)	(0.69)	(0.67)	(1.07)	(1.07)
Year	12.152*	12.248*						
	-6.364	-6.374						
$Year^2$	-0.003*	-0.003*						
	-0.002	-0.002						
Constant	-1.21e+04*	-1.22e+04*	-9.074***	4.227***	-0.032*	-0.024	-0.045	-0.036
	(6386.13)	(6396.06)	(0.88)	(0.88)	(0.02)	(0.02)	(0.05)	(0.05)
State Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Total R-squared	0.44	0.47	.	.	.	.	0.48	0.48
F-stat	12.91	14.60	27.50	34.32	.	.	40.64	40.61
n	178.00	178.00	352.00	352.00	313.00	313.00	351.00	351.00

Two-sided t-tests: * p<.10 ** p<.05 *** p<.01

Note: Dependent variables and method used are noted. An observation is a state-year.

Mathematical Appendix

In this Appendix we provide details of the two-period game.

The Government's Policy Making

The utility function for an unbiased government is:

$$-(p_1-\theta_1)^2-\int_{\theta}(\theta_2-p_2(\theta_2))^2\,f(\theta)d\theta-k\int_{\theta}I(\theta_2)\,f(\theta)d\theta \qquad \text{(A1)}$$

Where $I(\theta)$ is an indicator variable taking the value 0 if $p_2 = p_1$ and 1 otherwise.

Although this appears rather complicated, it actually breaks down into four somewhat simpler cases.

Case 1: High *k*

Assume $\sqrt{k_2} > \max\{p_1, 1-p_1\}$. So even if the initial policy is set to the level associated with θ_1 = 0 or 1 and the SIG subsequently indicates a new theta at 1 or 0, respectively, G won't change the initial policy. In this case (A1) becomes

$$-(p_1-\theta_1)^2-\int_{\theta}(p_1-\theta_2)^2\,f(\theta)d\theta$$

Which, using the standard mean-variance result on quadratics, is just

$$-(p_1-\theta_1)^2-(p_1-\theta_{mean})^2-\frac{1}{12}$$

And a little algebra shows that the best initial policy is: $p_1=\frac{\theta_1+\theta_{mean}}{2}$, that is, $\frac{1}{4}+\frac{1}{2}\theta_1$.

Combining this result with the requirement that $\sqrt{k_2} > \max\{p_1, 1-p_1\}$ results in the top, v-shaped line in Figures 5 and 6 (Region I). We regard this scenario as very unlikely because it implies no lobbying in the second period.

Case 2: Low or moderate *k* and moderate θ_1

Assume a low value for *k* and a moderate θ_1 and the policy maker sets a moderate initial policy. Then, in the second period, he modifies this moderate policy only if he learns the new theta is quite far away (low or high) from the initial moderate policy (Figure 4 represents this scenario.) This scenario requires $\sqrt{k} < p_1 < 1-\sqrt{k}$ (otherwise, the policymaker will never modify the initial policy regardless of the values of θ_2 on one end of the spectrum or the other). Given these assumptions, (A1) becomes:

$$-(p_1-\theta_1)^2 - \int_{p_1-\sqrt{k}}^{p_1+\sqrt{k}} (p_1-\theta_2)^2 f(\theta)d\theta - k(p-\sqrt{k}) - k(1-p-\sqrt{k})$$

$$= -(p_1-\theta_1)^2 - (p_1-\theta_M)^2 - \frac{(2\sqrt{k})^2}{12} - k(1-2\sqrt{k})$$

Where $\theta_M = p_1$, so

$$= -(p_1-\theta_1)^2 - \frac{k}{3} - k(1-2\sqrt{k})$$

Clearly optimal $p_1 = \theta_1$. This solution requires $\sqrt{k} < \theta_1 < 1-\sqrt{k}$, which yields the lower peaked line in Figures 5 and 6 (Region II).

Case 3. Moderate *k* and low θ_1

Assume $p_1 < \sqrt{k_2}$ (so the policy maker does not change the initial policy if $\theta_2 < p_1 + \sqrt{k}$) but $p_1 + \sqrt{k_2} < 1$ (that is, $p_1 < 1-\sqrt{k_2}$) so it does change the initial policy if $\theta_2 > p_1 + \sqrt{k}$. That is, the "hole" in Figure 4 lies at the left-hand side of the figure.

Then equation (A1) becomes:

$$-(p_1-\theta_1)^2+\left(p+\sqrt{k}\right)\left[-(p_1-\theta_M)^2-\frac{1}{12}\left(p_1+\sqrt{k}\right)^2\right]+\left(1-p_1-\sqrt{k}\right)(-k)$$

θ_M, the expected value of theta conditional on being within $\sqrt{k}$ distance of p_1 (that is, lying between 0 and $p_1+\sqrt{k}$), is $\frac{p_1+\sqrt{k}}{2}$. Given this objective function, some algebra shows that the best p_1 is $\sqrt{1+k_2+2\theta_1}-1$. From the above discussion, if $\sqrt{k}$ >.5 we require $\sqrt{1+k_2+2\theta_1}-1\le 1-\sqrt{k} \Rightarrow k\le\left(\frac{3}{4}-\frac{1}{2}\theta_1\right)^2$. But if $\sqrt{k}$ <.5 we require $\sqrt{1+k_2+2\theta_1}-1\le\sqrt{k} \Rightarrow k>\theta^2$. This yields the scalloped portion on the left of Figures 5 and 6 (Region III).

Case 4. Moderate *k* and high θ_1

Now consider the mirror case, on the high side. In this case, given a high θ_1, the policy maker set a rather high p_1, which he retains in the second period unless θ_2 is quite low. In terms of constraints, this case requires $p_1\ge\sqrt{k}, 1-\sqrt{k}$. The first of these will bind if $\sqrt{k}>.5$, the second if $\sqrt{k}<.5$. Expected utility is

$$-(p_1-\theta_1)^2+\left(1-p+\sqrt{k}\right)\left(-(p_1-\theta_M)^2-\frac{1}{12}\left(1-p_1+\sqrt{k}\right)^2\right)+\left(p_1-\sqrt{k}\right)(-k)$$

Where $\theta_M=\frac{1+p-\sqrt{k}}{2}$. Some algebra shows that the optimal $p_1=2-\sqrt{3+k-2\theta}$.

This yields the lower portion in the center of Figures 5 and 6 (Region IV).

Lobbying Expenditure Functions

Case 1: High *k*

In this case, the expected utility function for the SIG is:

$$-(p_1-\theta_1-\delta)^2-l_1-\int_{\theta}(p_1-\theta_2-\delta)^2\,f(\theta)d\theta$$

$$=-(p_1-\theta_1-\delta)^2-l_1-\left(p_1-\frac{1}{2}-\delta\right)^2-\frac{1}{12}$$

Recall that $p_1=\frac{\theta_1+\theta_{mean}}{2}$. Let μ denote G's beliefs about θ_1. Then the marginal gain to the SIG of a slightly higher belief about θ_1 by G is:

$$\frac{\partial}{\partial\mu}\left(-\left(\frac{\mu+.5}{2}-\theta_1-\delta\right)^2-\left(\frac{\mu+.5}{2}-\frac{1}{2}-\delta\right)^2-\frac{1}{12}\right)=2\delta-\theta_1-\mu$$

At $\mu=\theta_1$, this is just 2δ, which must equal the marginal cost of lobbying. Integrating over θ_1 yields $l_1(\theta_1)=2\delta\theta_1$, which is just the solution to the one-period game.

Case 2: Low or moderate *k* and moderate θ_1

For the SIG, expected period 2 utility (given the equilibrium strategies in period 2) is:

$$-\int_{p_1-\sqrt{k}}^{p_1+\sqrt{k}}(p_1-\theta_2-\delta)^2\,f(\theta)d\theta-\int_{0}^{p_1-\sqrt{k}}(\delta^2+2\delta\theta)\,f(\theta)d\theta-\int_{p_1+\sqrt{k}}^{1}(\delta^2+2\delta\theta)\,f(\theta)d\theta$$

That is, the expected loss if θ_2 lies in the hole, with no lobbying if that happens; minus what the SIG gets if θ_2 lies below the hole, including the associated lobbying cost; minus what the SIG gets if θ_2 lies above the hole, including the associated lobbying cost. But the first term (which occurs with probability $2\sqrt{k}$) is: $-\delta^2-\frac{(2\sqrt{k})^2}{12}$ (this is because the

hole is symmetric around p_1). The second term (which occurs with probability $p-\sqrt{k}$) is: $-\delta^2-2\delta\frac{p-\sqrt{k}}{2}$ (the SIG definitely gets $-\delta^2$, minus the expected cost of lobbying). The third term (which occurs with probability $1-p-\sqrt{k}$) is similar: $-\delta^2-2\delta\frac{1+p+\sqrt{k}}{2}$. Putting all three pieces together, and taking into account the probabilities they occur, yields: $-\frac{2k^{3/2}}{3}+4\sqrt{k}p\delta-\delta(1+\delta)$. Thus the SIG's two period utility function is:

$$-(p_1-\theta_1-\delta)^2-l_1+4p_1\delta\sqrt{k_2}-\delta(1-\delta)-\frac{2}{3}k_2^{3/2}$$

Using the same methods as in the previous case yields the first period lobbying function: $l_1(\theta_1)=2\delta\theta_1\left(1+2\sqrt{k_2}\right)$.

Case 3. Moderate *k* and low θ_1

The SIG's 2 period expected utility function is:

$$-(p_1-\theta_1-\delta)^2-l-\int_0^{p_1+\sqrt{k}}(p_1-\theta_2-\delta)^2\,f(\theta)d\theta-\int_{p_1+\sqrt{k}}^{1}(\delta^2+2\delta\theta)\,f(\theta)d\theta$$

The third term, which occurs with probability $p_1+\sqrt{k}$, is $-\left(p_1-\frac{p_1+\sqrt{k}}{2}-\delta\right)^2-\frac{\left(p_1+\sqrt{k}\right)^2}{12}$. The fourth term occurs with probability $1-p_1-\sqrt{k}$ and is composed of two parts: δ^2 and the expected value of $2\delta\theta$, which is $2\delta\frac{1+p_1+\sqrt{k}}{2}$. Given these facts, the SIG's utility function may be re-written as

$$-(p_1-\theta_1-\delta)^2-l_1(\theta_1,k_2)+\left(p_1+\sqrt{k}\right)\left(-\left(\frac{p_1-\sqrt{k}}{2}-\delta\right)^2-\frac{\left(p_1+\sqrt{k}\right)^2}{12}\right)$$

$$+\left(1-p_1-\sqrt{k}\right)\left(-\delta^2-\delta(1+p_1+\sqrt{k})\right)$$

Recall from above that G sets $p_1=\sqrt{1+k_2+2\mu}-1$, where μ denotes G's beliefs about θ_1. Some algebra shows that the marginal gain to the SIG of higher beliefs by G about θ_1 is: $\frac{-k-2\delta+2\sqrt{k}\delta+2\theta-2\mu+4\delta\sqrt{1+k+2\mu}}{\sqrt{1+k+2\mu}}$, which at $\mu=\theta$ is $\frac{-k-2\delta+2\sqrt{k}\delta+4\delta\sqrt{1+k+2\theta}}{\sqrt{1+k+2\theta}}$. This must equal the marginal cost of lobbying, implying (using integration) that $l_1(\theta_1,k_2,\delta)=$ $-\left(k+2\delta-2\sqrt{k}\delta\right)\sqrt{1+k+2\theta}+2\delta(1+k+2\theta)$. This appears rather complicated; but it is easy to see that in fact it is $l_1(\theta_1,k_2,\delta)=2\delta+2\delta k_2+\varepsilon$, where ε is a (complicated) expression involving θ_1. In other words, expenditure involves bias, an interaction term between high cost and bias, and a heteroskedastic error term.

Case 4. Moderate *k* and high θ_1

This case is similar to Case 3; accordingly we are brief. The SIG's expected utility function is:

$$-(p_1-\theta_1-\delta)^2-l-\int_{p-\sqrt{k}}^{1}(p_1-\theta_2-\delta)^2\,f(\theta)d\theta-\int_{0}^{p-\sqrt{k}}(\delta^2+2\delta\theta)\,f(\theta)d\theta$$

Which is:

$$-(p_1-\theta_1-\delta)^2-l+\left(1-p_1+\sqrt{k_2}\right)\left(-\left(p_1-\frac{1+p_1-\sqrt{k_2}}{2}-\delta\right)^2-\frac{\left(1-p_1+\sqrt{k_2}\right)}{12}\right)+$$

$$(p_1-\sqrt{k_2})\left(-\delta^2-2\delta\left(\frac{p_1-\sqrt{k_2}}{2}\right)\right)$$

Recalling that $p_1=2-\sqrt{3+k-2\theta}$, an analysis exactly like that in Case 3 yields $l_1(\theta_1,k_2,\delta)=-\left(k_2-4\delta+2\sqrt{k_2}\delta\right)\sqrt{3+k_2-2\theta_1}-2\delta(3-k_2-2\theta_1)$. Again, this appears complicated but it will be seen that is: $l_1(\theta_1,k_2,\delta)=\varsigma-6\delta-2\delta k_2$, where ς is a complicated expression involving θ_1.