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Competitive lobbying for a legislator's vote*

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Abstract. This paper develops a model of interest group lobbying based on the central premise that such lobbying is fundamentally an exercise in strategic information transmission. Lobbyists typically possess information that legislators do not and, inter alia, such information is relevant to legislators when it concerns the consequences – either policy or political – of supporting one bill rather than another. However, given that the interests of lobbyists do not necessarily coincide with those of legislators, the extent to which a lobbyist is able to persuade a legislator to act in his or her interest is moot. The paper explores the extent to which lobbyists can influence a legislative decision in such a setting; in particular, we are concerned with the incentives for interest groups to acquire costly information and lobby a legislator when there exist other groups that do not share the same interests. Among the results are that a legislator will on average make "better" decisions with lobbying than without, and that the more important is an issue to a special interest group, the more likely is the legislator to make the correct full-information decision.

Introduction

Organized interests spend millions of dollars each year lobbying members of the U.S. Congress. The orthodox view of lobbying is that these expenditures help reinforce, but seldom shape, representatives' policy positions [4, 12, 18, 20, 21, 28, 37]. Several factors combine to limit group influence: members have limited resources for mobilizing electoral opposition or support, and groups are often opposed by other groups with contrary views [4]. So instead of exerting pressure to change legislators' minds about policy, groups lobby representatives who are

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"already convinced" [18]. The lobbyist, in the widely cited words of Bauer, Pool, and Dexter [4, p. 353], is primarily a "service bureau" for "congressmen already agreeing with him."

The standard literature on lobbying is important for understanding the limits of interest group influence, but it falls short of explaining how and when groups might actually exercise influence. In fact, there is no regular explanation of group influence in the literature generally – aside from the view that groups "buy" influence with campaign contributions. Yet few would argue that interest groups never exert influence, and considerably more money is devoted to lobbying legislators than is devoted to campaign contributions per se [36]. The organizational presence of groups in Washington and the vast amount of money they spend on lobbying each year suggest that their influence may be considerable [3, 26, 27]. Indeed, recent empirical studies have shown that lobbying can yield significant dividends in legislative support, both in committee and on the floor [14, 23, 29, 30, 31, 36].

In this paper, we develop a model of lobbying that yields propositions about when and how groups influence legislators' policy choices. Interest groups in our model may acquire information – about policy consequences or about district politics – that legislators do not have, and groups can influence legislators' voting choices by strategically sharing this information. Lobbying is modelled as a game between two interest groups and a single legislator, where the groups are assumed to have conflicting policy interests, and each seeks to win the legislator's vote for one of two competing bills. The principal issues addressed in this setting concern when groups will devote resources to lobbying, and how and when lobbying will make a difference in legislators' voting decisions.

Our analysis yields several propositions. One is that legislators are often lobbied by just one of two competing groups. A second proposition is that when only one group lobbies a legislator, it typically is the group that disagrees with the legislator's voting predisposition. This result is contrary to the conventional wisdom that holds that a group lobbies only legislators who agree with its preferred policy (but see [32]). In *equilibrium*, however, the legislator's and the lobbyist's induced preferences over how to vote will typically appear coincident. And a third result is that legislators will be better informed about policy consequences, or about constituent preferences, in the presence than in the absence of lobbying.

In the following two sections, we present our view of the lobbying process and describe the model formally. Next, we present the results of the analysis and, in the final section of the paper, we discuss the main results and their substantive implications. An Appendix contains formal statements and proofs of our assertions.

Assumptions about legislators and lobbying

We assume legislators are primarily, but not necessarily exclusively, reelection seekers [19]. In pursuing reelection, we assume that legislators vote for the bill that carries the greatest support in their districts. By district support, we mean that, were a legislator to have complete information about the electoral consequences of two different bills, then he or she would surely vote for the one that promised the greatest electoral reward. This may or may not imply that the bill has the support of a literal majority of constituents. In many cases, an issue is relevant only to a minority in the district, in which case we assume the legislator's voting choice depends on a judgment regarding the electoral importance of some minority relative to another [22][1]. Also, our notion of district support is not confined to support only among organized voters. Even a very large group may constitute only a small fraction of the concerned voters in a district, so by district support, we mean support within the district at large.

Legislators, of course, have goals other than reelection. As it turns out, our formal results obtain even if one assumes legislators are interested primarily in making policy rather than in getting reelected. We think both goals are important and although the model admits of either interpretation, we impute a reelection goal to legislators and interpret the model accordingly.

For any two competing bills, we assume legislators are uncertain about which carries the greatest support in their districts [2]. Legislators have prior beliefs about support patterns in their districts, and we assume that these are not dogmatic; thus beliefs can change in the light of additional information. In this regard, we agree with Kingdon [16] who argues that, contrary to the usual modelling assumption, constituency preferences are not always "readily discernible."

We make three assumptions about lobbying. First, groups in our model seek narrow influence over a legislator's vote on a particular agenda, as opposed to broader influence over support for a general philosophy. We recognize that groups may sometimes lobby with long-term goals in mind; we adopt the short-term perspective simply to narrow the focus of the model [3]. Second, we assume groups often possess information that the legislator does not. This information concerns either district support (assuming a reelection goal) or policy consequences (assuming a policy motivation). Third, we conceptualize lobbying as a two-stage process in which the first stage involves the acquisition of specialized information, and the second involves the strategic communication of a message to the legislator concerning this information.

Several additional points need to be emphasized with regard to the acquisition of information. First, any information a lobbyist provides will be influential only if it is information the legislator does not already have. Moreover, a mere assertion by a lobbyist that he or she is better informed than the legislator is not credible. What makes an assertion prima facie credible, and therefore what makes it possible for the group to achieve influence through the provision of information, is evidence that the group does in fact possess information that the legislator does not. Evidence that the group has incurred a cost in acquiring information is one natural indication of credibility. A legislator can verify that a group has devoted resources to obtaining the information, but may not be sure what the information

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[1] "It is not the omniscient constituent armed with information on all their votes that concerns them [the legislators]. It is the individual of group armed with information and feeling deeply aggrieved about one vote or a cluster of votes that is most worrisome" [13, p. 142].

[2] As one Congressman put it to Richard Fenno [13, p. 146]: "I sponsored a bill to increase the size of trucks on our highways. But I got an awful lot of mail on that and it would have cost me a lot of good people... confidentially, I tell you it was a good bill; and I'm still in favor of it. But because so many people were opposed to it, I decided not to support it. I'm not here to vote my own convictions. I'm here to represent my people."

[3] Lobbyists might also go to "friendly" legislators to ask them to act as lobbyists for their cause with other, less friendly, legislators. We informally discuss the implications of our results for such indirect lobbying in the concluding section of the paper.

happens to be. Only if information is costly will there be asymmetry between the lobbyist and the legislator; otherwise, the legislator would be fully informed.

The cost of lobbying in our model is the cost of acquiring information [4]. These costs are quite general and may take several forms. If one assumes groups provide information about policy consequences, then information costs are expenditures undertaken to determine the distributional or technical consequences of implementing one policy rather than another. These costs may be R & D expenditures by an industry, or expenditures to commission special studies. If one assumes groups provide information about electoral consequences, then information costs are expenditures to determine district support. Such costs include canvassing, informal surveys of activists, polling, and grassroots mobilization more generally [5].

A group may acquire information prior to, and independent of, the introduction of a legislative agenda; or it may acquire information only after an agenda is revealed. For example, the auto companies are likely to undertake research on the implications of emission constraints long before any clean air legislation is put forward, although conceivably they could wait until after legislation is introduced to conduct research. Similarly, realtors may engage in public opinion sampling or other means to discover how various constituencies would be affected by, and respond to, proposals to limit tax credits for home mortgages prior to or following the initiation of legistion. The important consideration for groups to be influential is not *when* expenses are incurred, but *whether* expenses have been incurred. Conditional upon costs being incurred, our results on the structure and consequences of lobbying are unaffected by the timing of the costs.

Finally, we assume that legislators can - if they are willing to expend the effort - check on the information lobbyists provide. One means of checking on information about district support is to make a trip home and examine local political activities and sentiments firsthand [13]. Legislators, of course, cannot and do not go home and take an in-depth sounding in the district on every issue that comes up for a vote. If organized interests are not concerned about a vote, then there is no reason for the legislator to invest his or her own resources to discover the true district opinion. But if a lobbyist makes a claim about the political situation in the district that conflicts with the representative's prior beliefs, then the legislator may want to check for herself. In this sense, legislators have resources of their own to monitor lobbyists [18].

Our model differs in several important respects from other formal models of interest group politics. First, we introduce uncertainty into the calculations of groups and legislators. Other models of interest group competition assume that groups and other actors have perfect information about all relevant parameters (e.g. [6]). Second, we allow two different groups to compete for legislators' votes. Denzau and Munger [11] model the situation where an organized group competes with unorganized voters, but not directly with other organized groups; and Ainsworth [1] considers lobbying by only a single group. Third, our model is

[4] We assume the marginal cost to a lobbyist of contacting a legislator and delivering the group's message is zero. Insofar as groups have permanent lobbying offices in Washington, or regular access to legislators, this assumption is harmless.

[5] We suggest that groups acquire important information about district support through grassroots mobilization efforts. By actually making expenditures to educate voters about an issue and to encourage their participation, group leaders learn how receptive voters in the district are to an issue and how divided are their views.

explicitly about interest groups and legislators. The institutional actors in some models (e.g. [9]) are unspecified, or else treated generically as "the government".

We now turn to the formal specification of the model.

The model

We consider a fixed agenda $\{A, B\}$ and focus on a given legislator, L, assumed to be pivotal in the vote between A and B[6]. There is no abstention. As discussed in the introductory sections above, L is assumed to vote for the bill believed to carry the most support, or perceived to be the least costly in terms of subsequent reelection chances, in the district (e.g. [19]). The problem for the legislator is that it is uncertain exactly which bill carries the most support. However, we assume there exists a noisy signal, s, that provides some relevant information and that can in principle be observed prior to the vote. Let $s \in \{a, b\}$ and interpret the signal $s=b$, for example, as constituting evidence that the district supports a vote for B. Specifically, letting $D \in \{A, B\}$ be the decision L would make under complete information, we assume

$$\Pr[D=A \mid s=a] = \Pr[D=B \mid s=b] = q \in (1/2, 1) \ .$$

The idea here is straightforward. If the signal were unequivocal, the legislator, on observing $s=a$ $[b]$, would have complete information about the electoral consequences of her vote and so would vote for $A\,[B]$ with certainty. However, the predictive content of the information in the signal is not without error, if only because other events can occur subsequent to the vote but prior to the election that affect how the legislator's action is evaluated by voters. Thus the conditional probability $q < 1$, and the lower is q the less reliable is the signal. For example, Kingdon [16] and Fenno [13] both document how legislators are never sure exactly which votes they will be called upon to defend in a reelection compaign, or what arguments will be offered by challengers that might be difficult to defend[7].

The probabilities specified above are conditionals; without loss of generality, assume the prior probability that $s=a$ is $p \in (0, 1/2]$. So, as shown in the Appendix, in the absence of any further information the legislator's belief is that voting for B is most likely to benefit her reelection chances. The prior p and the conditionals $\Pr[\cdot \mid \cdot]$ are assumed to be common knowledge.

We suppose there exist two interest groups, G_A and G_B, concerned with the outcome of the legislative vote. As the notation suggests, the groups are assumed to have well-defined preferences over which bill is passed, irrespective of which vote is most in the legislator's interest. Group G_j wishes to see bill $j \in \{A, B\}$ become legislation, and these preferences are common knowledge.

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[6] This assumption is stronger than necessary. All we require is that the legislator's vote-decision carries consequences for both the groups and the legislator.

[7] As remarked above, an alternative interpretation of legislator uncertainty is available here. If the bills A and B are taken to have uncertain technical consequences – as is the case, for example, if they represent alternative proposals for a revised Clean Air Act, where the tradeoff between unemployment and health is uncertain – then the noisy signal represents statistical evidence on how the bills are likely to map into final consequences. Under such circumstances, the legislator might well be concerned to vote for the "better" policy, and so seek technical, policy-specific, information (e.g. [15]).

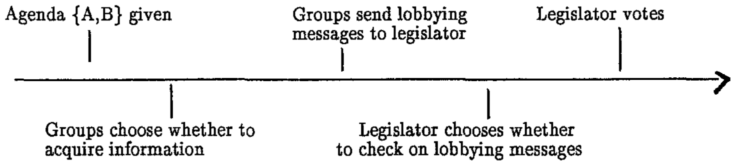

Fig. 1. Sequence of decisions

Following our discussion in the previous section, we model four distinct decision stages. Consider these in turn: the time-line summarizing the sequence is described in Fig. 1.

Stage I: information acquisition. When the agenda is announced, group G_j, $j=A$, B, is supposed to have no more information than the legislator. However, at cost $C_j>0$, group G_j can observe the value of the signal s without uncertainty [8]. We assume both groups decide whether or not to acquire the information on s simultaneously. An *information acquisition strategy* for group G_j is thus a number,

$$\eta_j \in [0,1],\ j=A,B\ ,$$

with interpretation $\eta_j=$ the probability that G_j pays C_j and learns the value of s, and $1-\eta_j=$ the probability that G_j expends no resources on information acquisition. Let $c_j \in \{0, C_j\}$ denote the realization of G_j's mixed strategy η_j. The groups' stage I decisions, (c_A, c_B), are observed by the legislator and the groups but the information so acquired is private knowledge to the groups.

Stage II: messages. Having made their information acquisition decisions, the groups choose whether or not to send a message to the legislator. Fundamental to the model is the idea that lobbying is essentially an exercise in strategic information transmission. A group makes a speech (sends a message) to try and persuade the legislator to vote for the bill the group prefers. However, irrespective of the eloquence or argument of the lobbyist (equivalently, the group), the only thing of relevance for the legislator's decision is whether $s=a$ or $s=b$. Clearly, if the group has invested no resources in learning the value of s, $c_j=0$, then the legislator knows that the group knows no more than she. Hence, no speech by the lobbyist can be influential; i.e. can alter the legislator's intended vote-choice from what it was absent the speech. Without loss of generality, therefore, we assume that lobbying speeches are only made by a group if the group has acquired the information, $c_j=C_j$. Similarly, if a group has devoted resources to information acquisition but chooses not to send a message to the legislator then, because acquisition decisions are observed, the legislator rationally infers that the group has learned the value of s to be contrary to the group's interests; i.e. $s=a$ if the group in question is G_B, or $s=b$ if the group is G_A (this fact is demonstrated formally in the Appendix). Consequently, without loss of generality we assume a group surely sends a message to the legislator if it has acquired the information on the value of the signal, s. Lobbyists' speeches are assumed to be

[8] It is natural to imagine that the quality of such signals is an increasing function of the resources invested in their acquisition, in which case s would be a continuous variable. We leave this generalization to future work.

private, and so a *message strategy* for group G_j, conditional on $c_j = C_j$, is a map,

$$\mu_j : \{a, b\} \to [0, 1], j = A, B$$

with interpretation $\mu_j(s)$ = the probability that G_j, having observed $s \in \{a, b\}$, tells the legislator that $s = a$. Let m_j denote the realization of G_j's mixed strategy, μ_j; we call m_j group G_j's message. If G_j chooses not to acquire information ($c_j = 0$) and, therefore, is incapable of influencing the legislator, then, by convention, we write $\mu_j \equiv \phi$ and $m_j \equiv \phi$. Hence, $m_j \in \{\phi, a, b\}$.

Stage III: legislator checking. In this model we assume the cost to the legislator of acquiring firsthand information on the value of s is sufficiently large to prohibit such activity. Later we demonstrate that in fact such a cost need not be very large at all before the legislator prefers acquiring information secondhand (through lobbyists) to acquiring it firsthand. For now, however, we simply make the assumption and acknowledge that its plausibility will depend on the issue of concern [9]. Having said this, we assume that while the legislator will not acquire firsthand information, she has, as we discussed in the previous section, the resources to check on the veracity of the message any lobbyist volunteers. In particular, if she hears a message contrary to her prior beliefs about which bill is most in her electoral interests, then she has a prima facie incentive to check on this information. The cost of running such an audit is $C_L > 0$, and we assume the audit is perfect. Thus a *checking strategy* for the legislator is a map,

$$\gamma : \{a, b\} \times \{a, b\} \to [0, 1] ,$$

with interpretation $\gamma(m_A, m_B)$ = the probability that L incurs cost C_L to check on the value of s, given messages $(m_A, m_B) \neq (\phi, \phi)$ (clearly, if $m_j \equiv \phi$, $j = A, B$, then there is no message to check). By definition of the signal, it is not possible for G_A and G_B to observe different values of s, given both groups acquire the information. Hence, checking on any message is equivalent to checking on both messages [10]. Let $c_L \in \{0, C_L\}$ denote the realization of the legislator's mixed strategy, γ.

Stage IV: voting. Having heard the groups' lobbying speeches (if any) and completed any checks on the content of the messages (if any), the legislator then votes. Given there is no abstention, a *voting strategy* for L is a map,

$$\rho : \{\phi, a, b\} \times \{\phi, a, b\} \times \{\phi, a, b\} \to [0, 1] ,$$

with interpretation $\rho(m_A, m_B, m_L)$ = the probability that L votes for A, having heard messages m_A, m_B, m_L. Here, $m_L \in \{\phi, a, b\}$ is what the legislator learns consequent on her checking decision; by convention, if there is no checking ($c_L = 0$) we set $m_L \equiv \phi$.

Once the vote is cast, the legislator and the two groups receive their respective payoffs. Let $\Pi_i, i = A, B, L$, denote final payoffs to the two groups, G_A and G_B,

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[9] And, indeed, on whether the interpretation of legislator uncertainty is with respect to the political or the (technical) policy consequences of voting for A or B.

[10] In an earlier working paper [2], we study the case of two-dimensional bills. In that setting, the signal is also two-dimensional and it is possible for groups to give messages concerning different dimensions. This in turn makes it nontrivial for L to check neither message, either message, or both messages.

and the legislator, respectively. Then we assume:

$$\Pi_L = \begin{cases} 1 - c_L & \text{if } L \text{ votes "correctly" for } D \in \{A, B\} \\ -c_L & \text{otherwise} \end{cases}$$

$$\Pi_j = \begin{cases} R_j - c_j - f & \text{if } L \text{ votes for } j \\ -c_j - f & \text{otherwise} \end{cases}, \quad j = A, B$$

where $R_j > c_j$; $f \geqq 0$ and $f > 0$ if and only if L checks $m_j \neq \phi$ and discovers the lobbyist to have lied, i.e. $m_L \neq m_j$. The parameter f is a penalty levied on G_j if the group is caught dissembling, The penalty can be thought of in terms of the opportunity costs incurred by being refused access to the legislator, or other legislator, in the future once it becomes apparent that the lobbyist is unreliable. It will turn out that if ever L checks a group's message and discovers the group to have lied, then L will surely not vote in the group's favor. Hence, if L votes for $j \in \{A, B\}$, G_j receives $R_j - c_j$.

The structure described above constitutes a sequential game with incomplete information. The natural solution concept is thus sequential equilibrium and this is what we use, with an innocuous refinement to avoid absurdities arising from how the signal s is labelled (a formal definition is given in the Appendix).

Results

Recall from the preceding discussion that if a group sends a message to the legislator without having acquired information on the value of s, then the legislator's voting decision will remain unaffected by the lobbyist's arguments. With this in mind, in what follows statements of the form "G_j lobbies" should be read as shorthand for "With positive probability, G_j acquires information on the value of s ($\eta_j > 0$) and gives messages to L capable of influencing L's vote ($m_j \neq \phi$)". Similarly, "No group lobbies" is shorthand for "Neither group acquires information on s with positive probability ($\eta_A = \eta_B = 0$), etc. etc.".

By assumption, the common prior probability that the value of $s = \mathrm{a}$ is $p \in (0, 1/2]$. As we demonstrate in the Appendix, this implies that in the absence of any further information the legislator will vote surely for alternative B when $p < 1/2$, and will be indifferent between voting for A or for B when $p = 1/2$. The case of $p = 1/2$ is discussed later; so unless explicitly stated otherwise, assume $p < 1/2$. Given this, the first result provides necessary and sufficient conditions for any group to lobby. (Comprehensive formal statements of the results to follow, along with their proofs, are confined to the Appendix.)

Proposition 1. *Suppose $p < 1/2$. Then, generically, some group lobbies L if and only if both conditions (1.1) and (1.2), below, hold:* [11]

(1.1) $pR_A > C_A$; *(1.2)* $C_L < q - (1/2)$.

Furthermore, G_B lobbies only if G_A lobbies.

[11] The qualification "generically" here refers to the fact that the strict inequalities, although sufficient, are not always necessary for lobbying to occur: some lobbying could occur on the boundaries, $pR_A = C_A$ and $(2q - 1) = 2C_L$; but these cases are of technical interest only, and we ignore them here.

There are two necessary conditions for any information acquisition or influential lobbying to occur in equilibrium. First, the prior probability that the district supports A (i.e. the probability that $s=a$) must be sufficiently high ($p \geqq C_A/R_A$); and second, the legislator's checking cost must be sufficiently low ($C_L \leqq q-(1/2)$). Both conditions make good sense. Because the prior p is presumed less than one-half, in the absence of lobbying the legislator will surely vote for B. So, ceteris paribus, only group G_A has an incentive to acquire costly information; and this is the final statement of the proposition. But if $p < C_A/R_A$, the prior expectation that incurring such costs will result in the group being able to alter the legislator's decision is too low to warrant the investment. And with respect to the second necessary condition, if the legislator's cost of checking any message is sufficiently high then he or she will have no incentive to check on groups' messages. But then a group, say G_A, that has acquired information has every reason to tell the legislator that the district supports voting for A, irrespective of what G_A in fact discovers. Recognizing this, a rational legislator will simply ignore any lobbying message he or she receives; in which case, there is no reason for the group to incur the information acquisition costs.

The next result describes the principal sorts of lobbying behavior observable in equilibrium, conditional on there being any lobbying at all[12]. Not surprisingly, the details of equilibrium behavior depend on the values of parameters such as the importance of the issue to the groups (R_A, R_B), the cost of checking to the legislator (C_L), and so on. Fortunately, it turns out that the equilibria can be succinctly described with two summary parameters, α, β. These parameters are strictly positive and such that $\alpha \geqq [<] \beta$ as $R_A \leqq [>] R_B$[13].

Proposition 2. *Suppose $p < 1/2$, and conditions (1.1) and (1.2) obtain. Then, in equilibrium:*

(2.1) $p < \beta C_B$ implies G_A lobbies surely; G_B does not lobby at all; and only some information is credibly transmitted to L.
(2.2) $\beta C_B \leqq p \leqq 1-\alpha C_A$ implies both G_A and G_B lobby surely; and all information is credibly transmitted to L.
(2.3) $p > \max.\{\beta C_B, 1-\alpha C_A\}$ implies both G_A and G_B lobby with positive probability, but not surely; all information is credibly transmitted to L iff both groups de facto lobby; otherwise, at most some information is credibly transmitted to L.

Discussion of Proposition 2 is facilitated by Figs. 2 and 3, below. These diagrams describe the identified equilibria under two regimes: consider these in turn.

Regime 1: $\alpha C_A > \beta C_B$. Figure 2 illustrates the situation for Regime 1.

Given $\alpha C_A > \beta C_B$, all three type of equilibria - (2.1), (2.2) and (2.3) - exist and are labelled in Fig. 2. Suppose $C_L < q-(1/2)$, and consider the situation in Fig. 2 as p increases from C_A/R_A to $1/2$. Initially, only G_A lobbies in equilibrium and only some information is revealed to the legislator. To see why this is so, recall that it is G_A that has the prima facie incentive to lobby the legislator when

[12] Additional possibilities can occur on "boundaries". But since these are knife-edge equilibria, exclusively involving mixes of the main sorts of behavior identified in Proposition 2, we relegate discussion of them to the Appendix. For completeness in stating Proposition 2, however, we assume that, ceteris paribus, when indifferent between lobbying and not lobbying a group elects to lobby.
[13] Specifically, $\alpha \equiv (2q-1-C_L)(R_B+f)/R_A f C_L$; and $\beta \equiv (2q-1-C_L)(R_A+f)/R_B f C_L$.

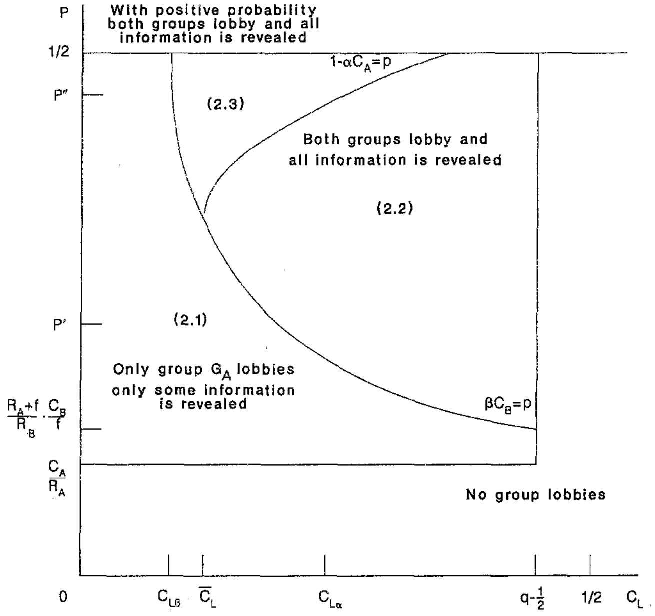

Fig. 2. Equilibria under Regime 1

$p < 1/2$. (Group G_B prefers there to be no lobbying activity at all, leaving the legislator to vote with her priors for B). G_A's lobbying message can only be credible with the legislator if the group has incurred the costs of acquiring information on s. Further, G_A will only incur such costs if, ex ante, it anticipates being able to "persuade" the legislator to vote for A. Given $p > C_A/R_A$, this excpectation obtains in equilibrium. Now, while a group that has observed a value of s favorable to its cause – in this case, $s = a$ – can be expected to announce this fact to the legislator, a group that has observed unfavorable information has an incentive to dissemble. For any message to be credible, therefore, groups observing unfavorable information must also report the truth at least some of the time. To provide the appropriate incentives for truthful revelation, the legislator must periodically check the messages favoring the relevant group's interests. And because the costs of doing this, C_L, are here supposed to be suitably low, the legislator can indeed credibly threaten to check lobbying messages. In particular, in equilibrium only messages that conflict with the legislator's prior beliefs about the locus of district support are ever checked. However, not every such message is checked so truthful revelation cannot be guaranteed. On occasion the legislator will vote for A on the basis of G_A's message when in fact $s = b$ and G_A misled the legislator. Later, we examine the extent to which such "incorrect" voting can be expected to occur.

If C_L is not "too small" – in particular, if $C_L > C_{L\alpha}$ in Fig. 2 – there is a value of p above which both groups surely acquire information and lobby in equilibrium. In this case, the legislator invariably learns the true value of s, always votes "correctly", and never has to check the lobbying messages. As remarked above, when $p < 1/2$, only G_A has an incentive to lobby to change the legislator's mind about how to vote. Hence the only incentive for G_B to invest in data acquisition and lobby is to counteract any influence G_A might be having on the legislator.

In other words, group G_B is lobbying more against G_A than for policy B per se. And being rational, G_B will only do this if it feels that there is a sufficiently good change for G_A to persuade the legislator to vote for A.

When the prior p is low, there is insufficient incentive for G_B ever to counter G_A's lobbying activity: the expectation is that G_A will discover $s=b$, and either tell the truth or dissemble with the legislator subsequently checking the message. In both cases, the legislator will vote for B without any additional persuasive effort on the part of G_B. However, as p increases so does the chance that a lobbying message by G_A indicating $s=a$ is truthful; and this in turn leads to an increase in the probability that G_A can successfully mislead the legislator [14]. Consequently, it becomes worthwhile for G_B to acquire information and lobby too, since then the truth will surely emerge in equilibrium.

The intuition behind truthful revelation for sure when both groups lobby is straightforward. Since the two groups are known to have diametrically opposed interests with respect to how the legislator votes, the legislator will only check a message if the lobbying messages conflict; in this instance, he or she knows that at least one group must be lying. And given conflicting messages, it turns out that the legislator's threat to check *for sure* is credible. Hence no group has an incentive to lie, in which case their messages will never conflict and the truth is revealed without the legislator ever in fact having to bear the costs of monitoring the information.

It is apparent from Fig. 2 that the value of the prior at which G_B will choose to lobby with G_A is a decreasing function of C_L; the higher the legislator's checking cost, the lower the value of p necessary to induce both groups to lobby. Again, the reason here is intuitive. Ceteris paribus, the higher is C_L the more frequently can G_A be expected to dissemble successfully (see note 14). Therefore, the more likely it is that G_B will benefit by generating the truth through counteractive lobbying. In effect, G_B's lobbying activity acts as a substitute for the legislator checking on G_A's messages. Or, to turn it around, the easier it is for the legislator to monitor lobbying messages, the less often can we expect to observe counteractive lobbying (i.e. both groups lobbying the legislator). In the limit, if C_L is small enough (i.e. $C_L < C_{L\beta}$), or if p is small enough (i.e. $p < (R_A + f)\, C_B / f R_B$), at most G_A will ever choose to lobby the legislator.

Now suppose $C_L \in (C_{L\beta}, C_{L\alpha})$ in Fig. 2. Then there exists a value of the prior $p < 1/2$ (for example, p'' in Fig. 2) such that the only equilibrium is that of (2.3). In this case, both groups use mixed strategies at the information acquisition stage of the process ($\eta_j \in (0,1)$), implying that we might observe both groups, either group, or no group lobby the legislator, depending on the realization of the acquisition strategies. The intuition here is that the payoffs and costs are such that G_A prefers to lobby alone, while G_B whishes to lobby only if G_A lobbies. Thus the only way in which these incentives can be reconciled involves both groups using mixed acquisition strategies. It is this case that generates the only

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[14] Since G_A will surely tell the truth if it discovers $s=a$ (see Appendix), the probability that G_A successfully misleads L when G_A lobbies alone is given by

$$\Pr[s=b]\cdot\Pr[m_A=a\,|\,s=b]\cdot\Pr[c_L=0\,|\,m_A=a, m_B=\phi]$$

$$=(1-p)\mu_A(b)(-\gamma(a,\phi)) \ .$$

Using Lemma 5 in the Appendix, this probability can be checked (in equilibrium) to be increasing in p and in C_L.

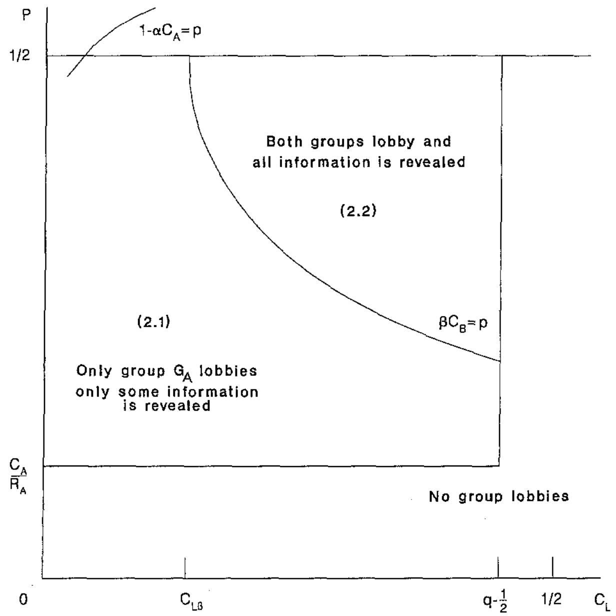

Fig. 3. Equilibria under Regime 2

circumstance under which G_B might be observed to lobby alone. However, it should be emphasized that this does not contradict the last statement of Proposition 1: having acquired information and observed G_A choosing (as a consequence of the realization of G_A's mixed strategy) not to acquire information, G_B would prefer that it too had not acquired the datum. But given that is has the information, it can do no better than lobby the legislator. In other words, G_B's incentive to put positive weight on acquiring information depends entirely on the knowledge that G_A will lobby with positive probability.

Regime 2: $\alpha C_A \leqq \beta C_B$. Figure 3 illustrates the situation for Regime 2.

Given $\alpha C_A \leqq \beta C_B$, no equilibria of the sort described in (2.3) exist. Subject to this one proviso, however, the discussion of possible equilibria under Regime 1 carries through unchanged.

When both groups lobby the legislator, the legislator votes "correctly", i.e. with all the available information on how the district wants her to vote (but recall, $q<1$, so there remains some residual uncertainty). When only G_A lobbies and announces that $s=b$, again the legislator surely votes correctly for B. However, when only G_A lobbies and announces that $s=a$, the legislator either checks the message, learns the truth and votes accordingly, or she does not check the message, believes the message and votes for A. In the latter case, lobbying can result in the legislator being induced to vote for A when she should vote for B. Similarly, when an equilibrium of the (2.3)-sort is being played and only G_B turns out to lobby, the legislator will occasionally vote for B when A is the correct decision. The question is then: "Does lobbying on average improve or worsen the legislator's voting decisions here, relative to not lobbying?"

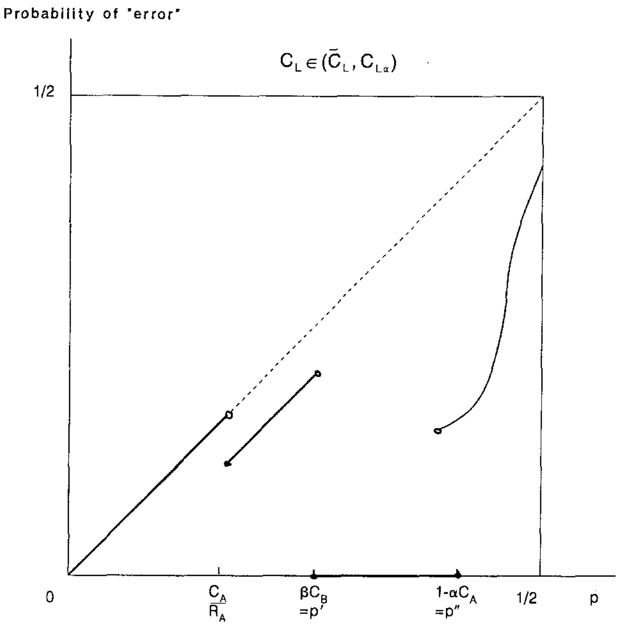

Fig. 4. The Equilibrium Probability of L Casting an "Incorrect" Vote

Proposition 3. *Expectationally, under both Regimes 1 and 2, lobbying induces the legislator to vote correctly more often than in the absence of lobbying.*

Proposition 3 is illustrated in Fig. 4 for the case, $C_L \in (\bar{C}_L, C_{L\alpha})$ in Regime 1. The values p' and p'' in Fig. 4 refer explicitly to those marked on Fig. 2.

Given the assumption that the legislator cannot or does not collect firsthand information on the value of the signal s, the ex ante likelihood that she will cast a vote for B when voting for A is appropriate (i.e. when $s=a$) is given by the prior probability that $s=a$. In Fig. 4, then, this is simply the 45°-line. The discontinuous solid line in Fig. 4 describes the likelihood that L casts an incorrect vote when there is (equilibrium) lobbying. Inspection of Fig. 4 evidently yields Proposition 3 for $C_L \in (\bar{C}_L, C_{L\alpha})$. And the result follows for the remaining values of $C_L \leqq q-(1/2)$ by noting from Fig. 2 that the critical values p' and p'' are functions of C_L, and that: *(i)* $C_L \leqq C_{L\beta}$ implies $p'(C_L) \geqq 1/2$; *(ii)* $C_L \geqq C_{L\alpha}$ implies $p''(C_L) \geqq 1/2$; and *(iii)* $C_L \in (C_{L\beta}, \bar{C}_L]$ implies $p'(C_L) = p''(C_L) < 1/2$. (Regime 2 corresponds to case (ii).)

An important special case of the model is that of symmetric groups: $R_A = R_B = R$, and $C_A = C_B = C$. Symmetric groups fall under Regime 2, above. The next result provides the principal comparative static results, other than that reported in Proposition 3, for Regime 2 in general and the symmetric case in particular.

Proposition 4. *Suppose* $p < 1/2$; *conditions (1.1) and (1.2) both hold; and Regime 2 obtains. Then, ceteris paribus,*

(4.1) An increase [decrease] in f *leads to no change in the set of* (p, C_L)*-pairs for which lobbying exists, but leads to an increase [decrease] in the relative amount of lobbying by both groups together.*

(4.2) An increase [decrease] in R_B leads to no change in the set of (p, C_L)-pairs for which lobbying exists, but leads to an increase [decrease] in the relative amount of lobbying by both groups together. Similarly, variations in C_B only influence the amount of lobbying done by both groups together, and do so in opposing directions to variations in R_B.
(4.3) An increase [decrease] in R_A leads to an expansion [reduction] in the set of (p, C_L)-pairs for which lobbying exists, and leads to a decrease [increase] in the relative amount of lobbying by both groups together. The converse statements hold for variations in C_A.
(4.4) For the symmetric groups case, an increase [decrease] in R leads to an expansion [reduction] in the set of (p, C_L)-pairs for which lobbying exists, and leads to an increase [decrease] in the relative amount of lobbying by both groups together. The converse statements hold for variations in C.

Formally extending Proposition 4 to cover Regime 1 is complicated by the existence of the mixed strategy equilibria of (2.3). Although, as we shall argue momentarily, the comparative static results have a strong intuition and so can be expected to apply equally to Regime 1, we have seen unable to confirm this.

Proposition 4.1 says that as the penalty for being caught dissembling (f) increases, the more often will both groups lobby the legislator. The total amount of lobbying per se, however, is unaffected. The intuition here is that to generate the appropriate incentives for G_A to offer credible messages, the legislator needs to check messages less frequently as f increases. Since the equilibrium probability that G_A dissembles is independent of the penalty, this means that the legislator is voting under complete information less often when only G_A lobbies. And this in turn increases the incentive for G_B to lobby. Ceteris paribus, for sufficiently high penalties the legislator will almost always be lobbied by both groups, conditional on there being any lobbying at all.

Proposition 4.2 asserts that as G_B's stake in having its favored alternative win (R_B) increases, then G_B has a greater incentive to engage in counteractive lobbying (similarly with a decrease in G_B). Because, under Regime 2, G_B's decision on whether to lobby has no effect on G_A's incentives to lobby, this in turn yields an increase in the relative amount of lobbying by both groups together.

On the other hand, Proposition 4.3 claims that although an increase in G_A's stake in having A passed (R_A) leads to an overall increase in the total amount of lobbying by G_A, this is accompanied by a reduction in the relative amount of lobbying by both groups together (similarly with a decrease in C_A). Increasing R_A makes it worthwhile for G_A to lobby at lower values of the prior, p. And, as before, since G_A's incentive to lobby is independent of G_B's decision, this generates an increase in the total amount of lobbying per se. However, G_B's incentive to engage in counteractive lobbying is dependent on the behavior of G_A and the legislator; in particular, the higher is R_A the more frequently will the legislator check on G_A's messages. Consequently, the incentive for G_B to engage in counteractive lobbying is reduced with an increase in R_A. Together, the two effects lead to a fall in the relative amount of lobbying by both groups together. With a decrease in C_A, the reduction in the relative amount of lobbying by both groups together is due entirely to G_A being willing to lobby at lower values of p.

For the symmetric case, changes in the gross payoff for one group imply a corresponding change in the gross payoff for the other group, and similarly with respect to information acquisition costs. The net effect of such simultaneous changes is reported in Proposition 4.4: total lobbying per se increases with an increase in payoffs (reduction in costs) as does the relative amount of lobbying by both groups together.

The discussion above yiels the following corollary:

Corollary. *Under the premises of Proposition 4, an increase in R_B (or, in the symmetric case, R) leads to an increase in the frequency with which L votes correctly. The converse statement is true for an increase in C_B (or, in the symmetric case, C)). Similarly, given G_A lobbies alone, an increase in R_A leads to an increase in the frequency with which L votes correctly.*

Put less prosaically, the corollary states that the more important are the issues for the interest groups, the more likely it is that the legislator will vote under complete information. It is well-understood that the more important is an issue to a legislator's constituents, the more likely is that legislator to vote consistently with their interests. The corollary, however, makes the less-apparent point that the same conclusion follows when the issue is important to the special interest groups, *even though* the legislator is under considerable uncertainty regarding what his or her constituents' preferences happen to be on the issue [15].

In this model it is assumed that the legislator cannot acquire information on the value of s firsthand, but can only check on information reported to her by lobbyists. In many instances this is entirely reasonable. For example, if the response of the district to a vote for A or B is dependent on the technical consequences of implementing either bill (e.g. Does fluoridation of the water supply improve dental health or cause cancer?), then the cost of first-hand information acquisition might be huge. In other circumstances, information acquisition costs can be relatively small. However, in any event there must be such costs or else there is no reason why the legislator should be incompletely informed at the outset. Given this, it is natural to ask at what level of firsthand data acquisition costs would the legislator prefer to receive information through the lobbying process rather than to acquire it directly. Clearly, if both groups lobby together, then the legislator is given complete information at no cost, so she strictly prefers the lobbying process to acquiring the datum directly. But when only one group lobbies, the legislator receives at most partial information and will occasionally be misled. In this instance it is not clear when she would prefer to get firsthand information. Proposition 5 provides a sufficient condition for the legislator to prefer the lobbying process over direct information acquisition under all circumstances.

Proposition 5. *Let k denote the cost to L of acquiring firsthand information on the value of s. Then for all (p, C_L) pairs for which (1.1) and (1.2) obtain, L strictly prefers the lobbying process to collecting firsthand information if:*

(5.1) $k > p(2q-1)C_L/(2q-1-C_L)$ *when* $p < \beta C_B$.
(5.2) $k > 0$ *when* $\beta C_B \leq p \leq 1-\alpha C_A$.
(5.3) $k > \zeta(\eta_A^*, \eta_B^*, p, C_L)(2q-1)/(2q-1-C_L)$ *when* $p > \max\{\beta C_B, 1-\alpha C_A\}$, *and where ζ depends, inter alia, on the equilibrium probabilities of data acquisition, η_j^*.*

[15] We are grateful to a referee for making this point.

Moreover, there invariably exist $k < C_L$ satisfying inequalities (5.1) and (5.2); and for some (p, C_L) such that the (2.3)-type of equilibrium exists, there exist $k < C_L$ satisfying (5.3).

The final statement of this result is the most important: it states that even if the cost to the legislator of acquiring firsthand information is strictly less than the cost of checking on lobbyists' messages, the legislator can still strictly prefer to obtain the information through the lobbying process rather than directly. (By Proposition 3, the legislator prefers the lobbying process to acquiring no information).

To see the intuition behand Proposition 5, suppose Regime 2 applies. Then given lobbying takes place, the legislator receives the least information when only G_A lobbies for sure (i.e. when $p < \beta C_B$). However, the lobbyist's messages in this case are informative, if not perfectly so. And, as discussed earlier, for this to occur requires both that the lobbyist offer truthful information most of the time, and that the legislator not check the messages all of the time. Consequently, while the legislator occasionally expends resources C_L on verifying a message, she often chooses not to incur any costs and to vote simply on the basis of the lobbyist's – typically truthful – speech. Overall, the expected net costs of the lobbying equilibrium to the legislator fall short of the sure payoff from direct information acquisition.

The results discussed above are the central implications of equilibrium behavior in the model. And Proposition 2 also holds when $p = 1/2$ if, in the absence of any further information, the legislator is presumed to vote for B surely (on the basis of the prior information alone, L is indifferent between voting for A and voting for B here). However, there are additional equilibrium possibilities on this boundary and that where $C_L = q - (1/2)$. Here we consider only the situation where $p = 1/2$ [16].

When $p = 1/2$, the legislator is indifferent between voting for A or B. Thus he or she can credibly commit to voting for A with any probability $r \in [0, 1]$. Suppose that the legislator elects to flip a fair coin, and vote for A with probability 1/2. Then each group has a 50% chance of having its favored policy passed without investing in lobbying. On the other hand if a group G_j does acquire information at cost C_j and lobbies the legislator, then there is a 50% (prior) expectation that the information so discovered will not support G_j's position. In which case, G_j either tells the truth and the legislator votes against G_j, or the group lies and risks being monitored leading to the vote going against it plus a penalty f. On balance, it turns out that neither group will choose to lobby here. More generally, we have:

Proposition 6. *Suppose $p = 1/2$; suppose both conditions (1.1) and (1.2) hold; and let $r \in [0, 1]$ be the probability that L votes for A in the absence of lobbying. Then*

(6.1) $r \in ([R_A - 2C_A]/2R_A,\ [R_B + 2C_B]/2R_B)$ *implies no group lobbies L.*
(6.2) $r \leq [R_A - 2C_A]/2R_A$ *implies Proposition 2 holds.*

Thus there exists a set of values for r (including $r = 1/2$) that, should the legislator commit to voting for A with any probability in this set, results in no group choosing to lobby in equilibrium. For sufficiently low values of r, however, at

[16] The additional equilibria on the remaining boundary depend on the knife-edge restriction on C_L and q and are not fundamentally different from those identified in Proposition 2: details can be found in [2].

least group G_A will be induced to acquire information and lobby (evidently, symmetric statements apply for high r). In other words, legislators who are completely indifferent ex ante about how to cast their vote will not, ceteris paribus, be lobbied. A necessary condition for being lobbied (in the current vote-oriented context) is that a legislator has a prior belief or commitment to vote for a given alternative.

Discussion

A prominent theme in the interest group literature, from Bentley [5] to Truman [34] to Dahl [10], is that public policy is the product of bargaining among multiple groups with competing interests. While it is clear that most groups have regular adversaries within specific policy areas ([26]), it is not clear how often these adversaries clash directly over legislators' votes, and how they influence legislators' decisions. Our analysis yields several propositions concerning interest group competition and influence in a legislature.

One main result is that any given legislator is often lobbied by just one of two competing groups. Thus, even though competition among groups is characteristic of much legislative policymaking [7], we conclude that groups do not always compete by clashing directly over a single legislator's vote. There do exist conditions under which two competing groups will lobby a given legislator, but these conditions will not always exist. This result has implications for the amount of information legislators receive through the lobbying process, for the legislator will be perfectly informed through lobbying only when he or she is lobbied by both groups.

We have modelled lobbying as an exercise in strategic information transmission. Whether this is information about district support of information about policy consequences, it turns out that legislators are better informed in the presence of lobbying than in its absence. In fact, we propose that any lobbying at all induces legislators to vote correctly more often than in the absence of lobbying. Lobbying, therefore, performs an important function in representative systems where public opinion is often too inchoate, and the political parties too heterogeneous, for legislators to be fully informed through these mechanisms alone. Given the informational value of lobbying to incumbent representatives, it is understandable that Congress has demonstrated little interest in regulating lobbying activity over the years. Despite the negative publicity often associated with interest group lobbying, representatives clearly prefer to have more, and relatively unrestricted, lobbying than less.

Can interest groups influence legislators' votes? Our analysis suggests that they can, and that they need not resort to threats or promises of electoral punishment and reward. On this score, we disagree with the "pressure group" theories of lobbying a la Bentley [5]. We also disagree, however, with the communications or "access" theories of lobbying a la Milbrath and Bauer et al..

A major difference between the communications approach (e.g., Bauer, et al.) and our approach regards contrasting predictions about whether legislators are typically lobbied only by groups that agree with their policy views. The traditional view is that lobbyists tend to take the "easy path" and lobby only their natural allies. Bauer and his associates ([4], p. 353) argued that "It is so much easier to carry on activities within the circle of those who agree and encourage you than it is to break out and find proselytes, that the day-to-day-routine and pressures of business tend to shun those more painful activities aside." We predict, and agree, that often just one group (or side in a policy debate) lobbies the legislator; but we also predict that the group doing the lobbying is the group that disagrees with the legislator's voting predisposition. The intuition behind our result is that a group has nothing to gain if it is the only group that lobbies a legislator whose inclination, in the absence of lobbying, is to support the group. Such a group has an incentive to lobby only in order to counteract the influence of an opposing group, but it will do so only if the other group lobbies.

Confusion can easily arise empirically over this matter, because when only one group lobbies and is successful, then the policy positions of the group and the legislator will coincide at the end of the process, in equilibrium. If one observed only this equilibrium, it would be impossible to determine whether the positions of the group and legislator agreed or disagreed prior to lobbying. One would observe only the positive association between legislators' positions and groups' positions. Our explanation for this equilibrium, in contrast to the communications perspective, is that groups persuade legislators through lobbying, not that legislators provide access only to those groups that already agree with them.

We emphasize, however, that the preceding remarks apply only to lobbyists attempting to persuade legislators to vote for or against a fixed agenda. But when lobbyists attempt to influence the choice of an agenda, then groups may lobby their "friends". Proposition 1 specifies the circumstances under which a group will not try and persuade a legislator to vote in a particular way on a fixed agenda. In those cases when the group chooses not to lobby, it may still be worthwhile for it to solicit a "friendly" legislator to act on their behalf – that is, to engage in indirect lobbying. "Friendly" legislators are in a position to offer trades (e.g. future logrolls) with key figures on a given issue and so induce "unfriendly" legislators to vote as the group wishes, even though the group could not anticipate influencing the decision directly. The results of the model suggest two conjectures. First, that groups will attempt such indirect lobbying when the prior probability of the "unfriendly" legislator changing his or her mind on informational grounds alone is low; and second, that groups engaged in indirect lobbying will solicit help from legislators whose prior beliefs strongly favor their own position.

Much work remains before competitive lobbying is fully understood. For example, the connection between stragegies of grassroots lobbying and Washington lobbying, or between campaign contributions and lobbying, are clearly important in this regard. That neither issue is considered in the paper should not be taken as a signal that we consider them irrelevant. Rather, our concern here is with developing an informational perspective on interest group behavior within which to build richer strategic models of competitive interest groups and legislative decision making.

Appendix

Let $E\Pi_i(\cdot)$ denote the expected payoffs, $i = A, BL$; let $m = (m_A, m_B, m_L)$ and let $c = (c_A, c_B, c_L)$.

Definition. An *equilibrium* is a list of strategies $(\eta_A^*, \eta_B^*, \mu_A^*, \mu_B^*, \gamma^*, \rho^*)$ and a set of beliefs such that:

(1) $\forall (c, m), \forall \rho$,

$$E\Pi_L(\rho^* \mid c, m) \geqq E\Pi_L(\rho \mid c, m) \ .$$

(2) $\forall (c_A, c_B, \mu), \forall \gamma$,

$$E\Pi_L(\gamma^* \mid c_A, c_B, \mu, \rho^*) \geqq E\Pi_L(\gamma \mid c_A, c_B, \mu, \rho^*) \ .$$

(3) $\forall (c_A, c_B), \forall \mu_j, j, k = A, B$ and $j \neq k$,

$$E\Pi_j(\mu_j^* \mid c_A, c_B, \mu_k^*, \gamma^*, \rho^*) \geqq E\Pi_j(\mu_j \mid c_A, c_B, \mu_k^*, \gamma^*, \rho^*) \ .$$

(4) $\forall \eta_j, j, k = A, B$ and $j \neq k$,

$$E\Pi_j(n_j^* \mid \eta_k^*, \mu^*, \gamma^*, \rho^*) \geqq E\Pi_j(\eta_j \mid \eta_k^*, \mu^*, \gamma^*, \rho^*) \ .$$

(5) Beliefs are consistent with Bayes Rule where defined.
(6) $\mu_A^*(a) > 0$, and $1 - \mu_B^*(b) > 0$.

Conditions (1) to (5) are standard criteria for sequential equilibria. Condition (6) is the innocuous refinement mentioned in the text: it states that, in equilibrium, a group announces the truth with positive probability when the truth is in that group's interest. The motivation for imposing this *plausibility restriction* is that, under some circumstances, there exists an equilibrium in which only G_A acquires information on s and, when the group discovers data favorable to its position ($s = a$), it lies for sure and reports $m_A = b$ to the legislator. Yet if the information is unfavorable to the group ($s = b$), the group sometimes tells the truth and mostly lies. Such behavior is supported by the legislator, on hearing a message that $s = a$, never checking the data and voting for B surely; and when the legislator hears that $s = b$, she always checks the message and votes accordingly. The plausibility restriction on groups' equilibrium message strategies rules out exactly this kind of behavior and it is very weak: for instance, it places no restriction on messages sent by groups discovering unfavorable information, and it says nothing about how large the probability of truth-telling in favorable circumstances must be.

Throughout, starred strategies will refer to equilibrium behavior and, by an abuse of notation, when a group lobbies we will occasionally denote its acquisition strategy by C_j rather than, for instance, "$\eta_j^* > 0$ and $c_j > 0$".

Definition. A message strategy $\mu_A[\mu_B]$ is *influential* if $(\gamma(m_A, t), \rho(m_A, t, \cdot))$ $[(\gamma(t, m_B), \rho(t, m_B, \cdot))]$ is not constant in $m_A[m_B]$.

Lemma 1. *If, in equilibrium,* $c_j > 0$ then μ_j^* *must be influential.*

Proof. If not, $c_j = C_j$ and L's behavior is independent of m_j. But then

$$E\Pi_j(C_j \mid \eta_k^*, \mu_j^*, \mu_k^*, \gamma^*, \rho^*) = E\Pi_j(C_j \mid \eta_k^*, \phi, \mu_k^*, \gamma^*, \rho^*)$$
$$< E\Pi_j(0 \mid \eta_k^*, \phi, \mu_k^*, \gamma^*, \rho^*) \ . \quad \square$$

Any equilibrium in which some message strategy is influential is called an influential equilibrium. Because the only equilibria that are not influential involve no group lobbying, Lemma 1 justifies restricting attention to influential equilibria.

To save on notation, write $\Pr[a|m] \equiv \Pr[s=a|m]$, etc.; and recall that $\Pr[D=A|s=a] = \Pr[D=B|s=b] = q \in (1/2, 1)$.

Lemma 2. *$\rho^*(m) = 1\,(\in [0,1])\,[=0]$ as $\Pr[a|m] > (=)[<]\,1/2$.*

Proof.

$$E\Pi_L(\rho(m)=1\,|\,c,m) = q\Pr[a|m] + (1-q)\Pr[b|m] - c_L$$
$$= q\Pr[a|m] + (1-q)(1-\Pr[a|m]) - c_L \ .$$

Similarly,

$$E\Pi_L(\rho(m)=0\,|\,c,m) = q(1-\Pr[a|m]) + (1-q)\Pr[a|m] - c_L \ .$$

Hence, $E\Pi_L(\rho(m)=1\,|\,c,m) > (=)[<]\,E\Pi_L(\rho(m)=0\,|\,c,m)$ iff $\Pr[a|m] > (=)[<]\,1/2$. □

Lemma 3. *$\gamma^*(m_A, m_B) = 1\,(\in [0,1])\,[=0]$ as*

$$(2q-1)(\rho^*(m_A, m_B, \phi)$$
$$-[2\rho^*(m_A, m_B, \phi) - 1]\Pr[a|m_A, m_B]) > (=)[<]\,C_L \ ,$$

where ρ^* is defined by Lemma 2.

Proof.

$$E\Pi_L(\gamma\,|\,\cdot) = \gamma[q - C_L] + (1-\gamma)E\Pi_L(\rho^*(m_A, m_B, \phi)\,|\,\cdot) \ ,$$

where

$$E\Pi_L(\rho^*\,|\,\cdot) = \rho^*[\Pr[a|m_A, m_B]q + (1-\Pr[a|m_A, m_B])(1-q)]$$
$$+(1-\rho^*)[(1-\Pr[a|m_A, m_B])q + \Pr[a|m_A, m_B](1-q)] \ .$$

Maximizing $E\Pi_L(\gamma\,|\,\cdot)$ with respect to γ pointwise and collecting terms yields the desired result. □

The approach to proving Propositions 1 and 2 is first to derive equilibrium strategies and payoffs conditional *(i)* on G_j lobbying alone, $j = A, B$; and *(ii)* on G_A and G_B lobbying together. Then conditions for the groups to choose to lobby at all (i.e. to invest in data collection) are derived, thus establishing the Propositions.

Begin by assuming $c_A = C_A$ and $c_B \equiv 0$; in which case $\mu_B \equiv \phi$ and $m_B \equiv \phi$. Then G_A's excpected payoff from using the lobbying strategy μ_A is:

$$(A1)\quad E\Pi_A(\mu_A(a)\,|\,C_A, 0, \phi, \gamma^*, \rho^*)$$
$$= \mu_A(a)\{\gamma^*(a,\phi)R_A + (1-\gamma^*(a,\phi))\rho^*(a,\phi,\phi)R_A\}$$
$$+(1-\mu_A(a))\{\gamma^*(b,\phi)[R_A - f]$$
$$+(1-\gamma^*(b,\phi))\rho^*(b,\phi,\phi)R_A\} - C_A$$

when $s = a$, and ρ^* and γ^* are defined by Lemmas 2 and 3, respectively; and

(A2) $E\Pi_A(\mu_A(b) \mid C_A, 0, \phi, \gamma^*, \rho^*)$

$$= \mu_A(b)\{\gamma^*(a,\phi)[-f] + (1-\gamma^*(a,\phi))\rho^*(a,\phi,\phi)R_A\}$$
$$+ (1-\mu_A(b))(1-\gamma^*(b,\phi))\rho^*(b,\phi,\phi)R_A - C_A\ ,$$

when $s = b$.

Lemma 4. *Let* $p < 1/2$, $\eta_A^* = 1$ *and* $\eta_B^* = 0$. *Then* $\mu_A^*(a) = 1 > \mu_A^*(b) > 0$.

Proof. By Lemma 1, $\eta_A^* = 1$ implies μ_A^* is influential in equilibrium so $\mu_A^*(a) \neq \mu_A^*(b)$. There are three cases to consider.

Case I: $\Pr[a \mid m_A = a] = 1/2$.

By Bayes theorem,

$$\Pr[a \mid m_A = a] = p\mu_A^*(a)/[p\mu_A^*(a) + (1-p)\mu_A^*(b)] = 1/2$$
$$\Leftrightarrow p\mu_A^*(a) = (1-p)\mu_A^*(b)$$
$$\Rightarrow \mu_A^*(a) > \mu_A^*(b) > 0, \text{ since } 0 < p < 1/2\ .$$

Hence, $\Pr[a \mid m_A = b] < 1/2$. By Lemma 2, therefore, $\rho^*(b,\phi,\phi) = 0$. Differentiating (A1) and (A2) with respect to $\mu_A(\cdot)$ then yields,

(A3) $\partial E\Pi_A(\mu_A(a) \mid \cdot)/\partial\mu_A(a)$

$$= [\gamma^*(a,\phi) + (1-\gamma(a,\phi))\rho^*(a,\phi,\phi)]R_A + \gamma^*(b,\phi)(f - R_A)\ .$$

(A4) $\partial E\Pi_A(\mu_A(b) \mid \cdot)/\delta\mu_A(b) = (1-\gamma^*(a,\phi))\rho^*(a,\phi,\phi)R_A - \gamma^*(a,\phi)f\ .$

Since $\mu_A^*(a) > \mu_A^*(b) > 0$, $\partial E\Pi_A(\mu_A^*(b) \mid \cdot)/\partial\mu_A(b) = 0$. Hence (A4) implies $\gamma^*(a,\phi) \in (0,1)$. By Lemma 3 and $\Pr[a \mid m_A = a] = 1/2 > \Pr[a \mid m_A = b]$, therefore, $\gamma^*(b,\phi) = 0$. Hence, $\partial E\Pi_A(\mu(a) \mid \cdot)/\partial\mu_A(a) > 0$ so $\mu_A^*(a) = 1$.

Case II: $\Pr[a \mid m_A = a] > 1/2$.

From Case I, Case II can only occur if $\mu_A^*(a) > \mu_A^*(b)$, and so $\Pr[a \mid m_A = b] < 1/2$. By Lemma 2, $\rho^*(a,\phi,\phi) = 1 - \rho^*(b,\phi,\phi) = 1$. Hence (A3) and (A4) apply. In particular, (A3) here yields $\partial E\Pi_A(\mu_A(a) \mid \cdot)/\partial\mu_A(a) > 0$; therefore $\mu_A^*(a) = 1$. Suppose $\mu_A^*(b) = 0$. Then Bayes rule implies $\Pr[a \mid m_A = a] = 1 - \Pr[a \mid m_A = b] = 1$; in which case Lemma 3 gives $\gamma^*(a,\phi) = \gamma^*(b,\phi) = 0$. But then (A4) yields $\partial E\Pi_A(\mu_A(b) \mid \cdot)/\partial\mu_A(b) > 0$, implying $\mu_A^*(b) = 1$: contradiction. Hence, $\mu_A^*(b) \in (0,1)$.

Case III: $\Pr[a \mid m_A = b] \geqq 1/2$.

By Bayes theorem,

$$\Pr[a \mid m_A = b] = p(1-\mu_A^*(a))]/p(1-\mu_A^*(a)) + (1-p)(1-\mu_A^*(b))] \geqq 1/2$$
$$\Leftrightarrow p(1-\mu_A^*(a)) \geqq (1-p)(1-\mu_A^*(b))$$
$$\Rightarrow \mu_A^*(a) < \mu_A^*(b) < 1, \text{ since } 0 < p < 1/2\ .$$

Hence, $\Pr[a \mid m_A = a] < 1/2$. Therefore, Lemma 2 implies $\rho^*(a,\phi,\phi)=0$. Differentiating (A1) and (A2) with respect to $\mu_A(\cdot)$ then yields,

$$(A5)\ \partial E\Pi_A(\mu_A(a)\mid\cdot)/\partial\mu_A(a)$$
$$=\gamma^*(a,\phi)R_A+\gamma^*(b,\phi)(f-R_A)-(1-\gamma^*(b,\phi))\rho^*(b,\phi,\phi)R_A\ .$$

$$(A6)\ \partial E\Pi_A(\mu_A(b)\mid\cdot)/\partial\mu_A(b)$$
$$=-(1-\gamma^*(b,\phi))\rho^*(b,\phi,\phi)R_A-\gamma^*(a,\phi)f\ .$$

By condition (6) of the definition of an equilibrium, $\mu_A^*(a) > 0$.Therefore, since

$$\mu_A^*(a)<\mu_A^*(b)<1, \partial E\Pi_A(\mu_A^*(b)\mid\cdot)/\partial\mu_A(b)=0$$

and

$$\partial E\Pi_A(\mu_A^*(a)\mid\cdot)/\partial\mu_A(a)=0\ .$$

From (A6), the first equality requires $(1-\gamma^*(b,\phi))\rho^*(b,\phi,\phi)=\gamma^*(a,\phi)=0$. And with (A5), this in turn implies $f=R_A$. But then (A1) and (A2) yield:

$$E\Pi_A(\mu_A^*(a)\mid C_A,\cdot)=E\Pi_A(\mu_A^*(b)\mid C_A,\cdot)=-C_A\ .$$

Hence,

$$E\Pi_A(C_A\mid 0,\mu^*,\gamma^*,\rho^*)=pE\Pi_A(\mu_A^*(a)\mid C_A,\cdot)$$
$$+(1-p)E\Pi_A(\mu_A^*(b)\mid C_A,\cdot)=-C_A\ .$$

But by Lemma 2 and $p<1/2$, $E\Pi_A(0\mid 0,\phi,\cdot)=0>-C_A$, in which case μ_A^* cannot be part of an influential equilibrium. Thus Case III cannot occur in any influential equilibrium such that $\eta_A^*=1$ and $\eta_B^*=0$. □

Remark 1. Given $c_A=C_A$ and there is no further cost to making a lobbying speech, Lemma 4 implies that L is rational to infer $s=b$ when $\mu_A^*\equiv\phi$ and $m_A\equiv\phi$. Hence, as claimed in the text, if $c_A>0$ then there is no incentive for G_A not to make a lobbying speech.

Proof of Proposition 1. By Lemma 2 and $p<1/2$, $\eta_A=0$ implies:

$$E\Pi_B(\eta_B=0\mid 0,\cdot)=R_B>E\Pi_B(C_B\mid 0,\phi,\mu_B,\gamma,\rho)\ ,\quad \forall \mu_B,\gamma,\rho\ .$$

Hence, $\eta_A^*=0\Rightarrow\eta_B^*=0$. Given this, to verify (1.1) and (1.2) it is sufficient to establish that they are necessary conditions for G_A to lobby. It is convenient to establish (1.2) first. Let $P(m_A,m_B)=\min.\{\Pr[a\mid m_A,m_B], 1-\Pr[a\mid m_A,m_B]\}$. By Lemmas 2 and 3,

$$\gamma^*(m_A,m_B)=1\,(\in[0,1])[=0]\quad\text{as}\quad(2q-1)P(m_A,m_B)$$
$$>(=)[<]C_L\ .$$

Hence $(2q-1)<2C_L$ implies $\gamma^*(m_A,m_B)=0, \forall(m_A,m_B)$. By Lemmas 2 and 4, $\rho^*(b,\phi,\phi)=0$. With (A1) and (A2), these fact imply $\partial E\Pi_A(\mu_A(s)\mid\cdot)/\partial\mu_A(s)>0$, $\forall s\in\{a,b\}$. But then $\mu_A^*(a)=\mu_A^*(b)=1$, contradicting μ_A^* being influential. Therefore, $(2q-1) \geqq 2C_L$ is a necessary condition for G_A to lobby. Now consider condition (1.1). By Lemma 2 and Lemma 4, (A1) can be written,

$$E\Pi_A(\mu_A^*(a)|\cdot) = [\gamma^*(a,\phi) + (1-\gamma^*(a,\phi))\rho^*(a,\phi,\phi)]R_A - C_A \ .$$

Similarly, (A2) can be written

$$E\Pi_A(\mu_A^*(b)|\cdot) = \mu_A^*(b)[(1-\gamma^*(a,\phi))\rho^*(a,\phi,\phi)R_A - \gamma^*(a,\phi)f] - C_A \ .$$

Because $\mu_A^*(b) \in (0,1)$, (A4) implies,

$$\gamma^*(a,\phi) = \rho^*(a,\phi,\phi)R_A/[\rho^*(a,\phi,\phi)R_A + f] \ .$$

By the argument for Case I of the proof of Lemma 4, $\gamma^*(a,\phi) \in (0,1)$; hence, $\rho^*(a,\phi,\phi) > 0$. By Lemmas 2 and 3, both $\gamma^*(a,\phi) \in (0,1)$ and $\rho^*(a,\phi,\phi) \in (0,1)$ can occur only if $P(m_A, m_B) = 1/2$ and $(2q-1) = 2C_L$. Since this latter condition is not generic, we suppose $(2q-1) \neq 2C_L$ hereafter; in which case, $\rho^*(a,\phi,\phi) = 1$. Substituting yields,

$$E\Pi_A(\mu_A^*(a)|\cdot) = R_A - C_A \ ,$$

$$E\Pi_A(\mu_A^*(b)|\cdot) = -C_A \ .$$

Hence, $E\Pi_A(C_A|0, \mu^*, \gamma^*, \rho^*) = pR_A - C_A$. By Lemma 2, $E\Pi_A(0|0,\cdot) = 0$. Condition (1.1), and Proposition 1, now follow. □

Lemma 5. *Given $c_A = C_A, c_B = 0$ and conditions (1.1) and (1.2) hold, the unique influential equilibrium strategies are given by:*

$$\mu_A^*(a) = 1; \mu_A^*(b) = pC_L/(1-p)(2q-1-C_L) \ ;$$

$$\gamma^*(a,\phi) = R_A/(R_A + f); \gamma^*(b,\phi) = 0 \ ;$$

$$\rho^*(a,\phi,a) = \rho^*(a,\phi,\phi) = 1; \ \rho^*(a,\phi,b) = \rho^*(b,\phi,\phi) = 0 \ .$$

Proof: Save for $\mu_A^*(b)$ and $\gamma(b,\phi)$, all of these expressions have been derived in the course of proving the preceding results. Because $\gamma^*(a,\phi) \in (0,1)$, Lemmas 2 and 3 imply $(2q-1)(1-\Pr[a|m_A = a]) = C_L$. Substituting,

$$(1-p)\mu_A^*(b)/[p + (1-p)\mu_A^*(b)] = C_L/(2q-1)$$

$$\Rightarrow \mu_A^*(b) = pC_L/(1-p)(2q-1-C_L) \ ,$$

as required. And since $\mu_A^*(b) < \mu_A^*(a), \Pr[a|m_A = b] < 1/2$. Hence, Lemma 3 and (1.2) imply $\gamma^*(b,\phi) = 0$. □

Now suppose only G_B lobbies L: $c_B = C_B$ and $c_A = 0$. Then entirely similar reasoning yields an anologous result to Lemma 5, which we state without proof.

Lemma 6. *Given $c_A = 0$, $c_B = C_B$ and conditions (1.1) and (1.2) hold, the unique influential equilibrium strategies are given by:*

$$\mu_B^*(b) = 0; \mu_B^*(a) = [(2q-1)p - C_L]/p(2q-1-C_L) \ ;$$

$$\gamma^*(\phi,b) = R_B/(R_B + f); \gamma^*(\phi,a) = 0 \ ;$$

$$\rho^*(\phi,b,a) = \rho^*(\phi,a,\phi) = 1; \ \rho^*(\phi,b,b) = \rho^*(\phi,b,\phi) = 0 \ .$$

Remark 2. By Proposition 1, a necessary condition for G_B to lobby is for G_A to lobby. Hence, G_B could only find itself lobbying L alone in equilibrium if G_A uses a mixed information acquisition strategy. Therefore, by condition (1.2) of Proposition 1, if $c_B > 0$ and $\mu_B(a) = \mu_B(b)$ then it is a best response for L to check G_B's message surely. So while G_B would prefer to offer no information to L should G_B find itself lobbying L alone, such behavior cannot constitute equilibrium behavior.

Lemma 7. *Given $c_j = C_j$, $j = A$, B, and conditions (1.1) and (1.2) hold, the unique influential equilibrium strategies are given by:*

$$\mu_j^*(a) = [1 - \mu_j^*(b)] = 1, \text{ each } j = A, B \ ;$$

$$\gamma^*(m_A, m_B) = 0\,[1] \text{ if } m_A = [\neq]\, m_B \ ;$$

$$\rho^*(a, a, \phi) = [1 - \rho^*(b, b, \phi)] = 1; \rho^*(\cdot, \cdot, m_L) = 1\,[0] \text{ as } m_L = a\,[b] \ .$$

Proof. (Equilibrium) It is easy to check that these strategies constitute mutual best responses along the specified equilibrium path. It remains to confirm that L's off-the-equilibrium-path strategy, $\gamma^*(m_A, m_B) = 1$ if $m_A \neq m_B$, is credible. Because $m_A \neq m_B$ is a probability-zero event, Bayes rule does not apply and L is free to make any conjecture about the value of s. Suppose L conjectures $\Pr[a \mid m_A \neq m_B] = \lambda$. Then by Lemmas 2 and 3, $\gamma^*(m_A, m_B) = 1$ is a best response if $\lambda \in [C_L/(2q-1), (2q-1-C_L)/(2q-1)]$. By condition (1.2), this interval is nonempty and a proper subset of $[0, 1]$. Hence, for λ in the interval, L's out-of-equilibrium behavior is credible, as required.

(Uniqueness) We show that the specified equilibrium is unique in several steps. For each step, the qualification "In any influential equilibrium with $c_j = C_j$, $j = A, B, \ldots$" is left implicit.

Step 1: $\mu_A^*(a) = [1 - \mu_B^*(b)] = 1$.

μ_B arbitrarily and consider μ_A^*. By condition (6) of the definition of an equilibrium, $\mu_A^*(a) > 0$. Let (m_A, m_B) be the messages sent to L. Either L checks on the value of s or not. If L checks on s when $s = a$ then, by Lemma 2, $\forall m_B$ G_A's payoff is R_A if $m_A = a$ and $R_A - f$ if $m_A = b$; and if L does not check on s here, G_A's payoff is $\rho^*(m_A, m_B, \phi) R_A$. Hence, by (A1), $\mu_A^*(a) < 1$ implies $\rho^*(a, m_B, \phi) < \rho^*(b, m_B, \phi)$. Moreover, $\rho^*(m_A, m_B, \phi) \in (0, 1)$ only if $\Pr[a \mid m_A, m_B] = 1/2$, by Lemma 2; and this, by Lemma 3 and (1.2), implies $\gamma^*(m_A, m_B) = 1$. But then for some $j \in \{A, B\}, \mu_j^*(s) = s$ all s, implying $\Pr[a \mid m_A, m_B] \neq 1/2$ by Bayes consistency. Therefore, $\rho^*(m_A, m_B, \phi) \in \{0, 1\}$; in which case we must have $\rho^*(a, m_B, \phi) = 0 < \rho^*(b, m_B, \phi) = 1$. Hence, by (A2), $\mu_A^*(b) = 0$. To see this, note that either L checks on s or not. If L checks when $s = b$ then, $\forall m_B$, G_A's payoff is 0 if $m_A = b$ and $-f$ if $m_A = a$; and if L does not check on s here, G_A's payoff is R_A if $m_A = b$ and 0 if $m_A = a$. So $\mu_A^*(a) \in (0, 1)$ implies $\mu_A^*(b) = 0$; in which case Bayes rule implies $\Pr[a \mid a, m_B] = 1$ and, by Lemma 2 therefore, $\rho^*(a, m_B, \phi) = 1$: contradiction. Thus $\mu_A^*(a) = 1$ necessarily. A symmetric argument applies to show $\mu_B^*(b) = 0$ necessarily, and Step 1 is proved.

Step 2: $\mu_A^*(b) \in (0, 1) \Leftrightarrow \mu_B^*(a) \in (0, 1)$.

Since μ_j^* is influential, Step 1 implies $\mu_A^*(b) < 1$ and $\mu_B^*(a) > 0$. Suppose $\mu_A^*(b) = 0$. Then Step 1 and Bayes consistency imply $\gamma^*(m_A, m_B)$ and $\rho^*(m_A, m_B, \phi)$ are constant in m_B for all m_A. But then μ_B^* is not influential. Similarly, $\mu_B^*(a) = 1$ implies μ_A^* is not influential; and Step 2 is proved.

Step 3: $\rho^*(a, a, \phi) = [1 - \rho^*(b, b, \phi)] = 1$, and $\gamma^*(a, a) = \gamma^*(b, b) = 0$.

This step follows immediately from Lemmas 2 and 3, and Step 1.

Step 4: $\mu_A^*(b) \in (0, 1) \Rightarrow (2q - 1) = 2C_L$.

Steps 1 and 3 imply

$$E\Pi_A(\mu_A^*(b) \mid \cdot) = \mu_A^*(b)[(1 - \gamma^*(a, b))\rho^*(a, b, \phi) R_A - \gamma^*(a, b) f] .$$

Hence $\mu_A^*(b) \in (0, 1)$ iff $(1 - \gamma^*(a, b))\rho^*(a, b, \phi) R_A = \gamma^*(a, b) f$. Similarly, Steps 1 and 3 imply,

$$E\Pi_B(\mu_B^*(a) \mid \cdot)$$
$$= [1 - \mu_B^*(a)][(1 - \gamma(a, b))(1 - \rho^*(a, b, \phi)) R_B - \gamma^*(a, b) f] .$$

By Step 2, $\mu_B^*(a) \in (0, 1)$ which implies, $(1 - \gamma^*(a, b))(1 - \rho^*(a, b, \phi)) R_B = \gamma^*(a, b) f$. Solving the two equations in $(\gamma^*(a, b), \rho^*(a, b, \phi))$ simultaneously yields $\gamma^*(a, b) \in (0, 1)$ and $\rho^*(a, b, \phi) \in (0, 1)$. By Lemma 2, therefore, $\Pr[a \mid a, b] = 1/2$; and so by Lemma 3, $(2q - 1) = 2C_L$.

Since (1.2) requires $(2q - 1) > 2C_L$, we have the desired contradiction; i.e. the separating equilibrium specified in the statement of Lemma 7 of is unique. □

Proof of Proposition 2. Substituting for the equilibrium strategies identified in Lemmas 5, 6, and 7, compute:

$$E\Pi_A(C_A \mid c_B, \mu^*, \gamma^*, \rho^*) = pR_A - C_A, \forall c_B \in \{0, C_B\} ;$$

$$E\Pi_A(0 \mid C_B, \mu^*, \gamma^*, \rho^*)$$
$$= R_A\{[(2q - 1)p - C_L\} + [R_B C_L(1 - p)/(R_B + f)]\}/(2q - 1 - C_L) .$$

Similarly

$$E\Pi_B(C_B \mid c_A, \mu^*, \gamma^*, \rho^*) = (1 - p) R_B - C_B, \forall c_A \in \{0, C_A\} ;$$

$$E\Pi_B(0 \mid C_A, \mu^*, \gamma^*, \rho^*) = R_B\{(1 - p) - [f p C_L/(R_A + f)(2q - 1 - C_L)]\} .$$

And from Lemma 2 and $p < 1/2$,

$$E\Pi_A(0 \mid 0, \phi, \cdot) = 0; \text{ and } E\Pi_B(0 \mid 0, \phi, \cdot) = R_B .$$

Define,

$$\alpha \equiv (2q - 1 - C_L)(R_B + f)/R_A f C_L \quad \text{and}$$

$$\beta \equiv (2q - 1 - C_L)(R_A + f)/R_B f C_L .$$

Proof of (2.1): Suppose $\eta_A^* = 1$. Then $\eta_B^* > 0$ only if $E\Pi_B(C_B \mid C_A, \cdot)$

$\geqq E\Pi_B(0 \mid C_A, \cdot)$. Using the expression above and doing the algebra, this inequality holds iff $p \geqq \beta C_B$. So $p < \beta C_B$ implies $\eta_B^* = 0$ is a best response to $\eta_A^* = 1$. Similarly, $\eta_A^* = 1$ is a best response to $\eta_B^* = 0$, given $pR_A - C_A \geqq 0$.

Proof of (2.2): If $p \geqq \beta C_B$, then $\eta_B^* = 1$ is a best response to $\eta_A^* = 1$, and is a uniquely best response if the inequality is strict. Suppose $\eta_B^* = 1$. Then $\eta_A^* > 0$ is a best response if $E\Pi_A(C_A \mid C_B, \cdot) \geqq E\Pi_A(0 \mid C_B, \cdot)$. Using the expressions above and doing the algebra, this inequality holds iff $p \leqq 1 - \alpha C_A$. Therefore, $\eta_A^* = \eta_B^* = 1$ are mutually best responses iff $p \in [\beta C_B, 1 - \alpha C_A]$, and are uniquely best responses if p is interior to this interval. Moreover, if $p = \beta C_B$, G_A will wish to lobby irrespective of G_B's decision. Hence, on this boundary, G_B has $\eta_B \in [0, 1]$ as the best response set to $\eta_A^* = 1$. To avoid trivial complications, we assume $\eta_B^* = 1$ here also.

Proof of (2.3): $\eta_A^* = \eta_B^* = 1$ are mutually best responses if $p \in [\beta C_B, 1 - \alpha C_A]$. However, this interval may be empty for $p < 1/2$. In particular, it is possible for $1/2 > p > \max\{1 - \alpha C_A, \beta C_B\}$. In this case,

$$E\Pi_B(C_B \mid C_A, \cdot) > E\Pi_B(0 \mid C_A, \cdot) \text{ and } E\Pi_B(0 \mid 0, \cdot) > E\Pi_B(C_B \mid 0, \cdot) \;;$$

$$E\Pi_A(0 \mid C_B, \cdot) > E\Pi_A(C_A \mid C_B, \cdot) \text{ and } E\Pi_A(C_A \mid 0, \cdot) > E\Pi_A(0 \mid C_B, \cdot) \;.$$

Thus G_B strictly prefers to lobby if G_A does so, but not otherwise; and G_A strictly prefers to lobby if G_B does not do so, but not otherwise. Therefore, there is no equilibrium in pure strategies, η_j. To find the mixed strategy equilibrium, note:

$$\begin{aligned} E\Pi_j(\eta_j \mid \eta_i, \cdot) = {} & \eta_j[\eta_i E\Pi_j(C_j \mid C_i, \cdot) + (1-\eta_i)(E\Pi_j(C_j \mid 0, \cdot)] \\ & + (1-\eta_j)[\eta_i E\Pi_j(0 \mid C_i, \cdot) + (1-\eta_i) E\Pi_j(0 \mid 0, \cdot)] \;. \end{aligned}$$

For $\eta_j \in (0, 1)$, each $j = A, B$, the two sums in square brackets mut be equal. This yields two equations in two unknowns. Substituting from the expressions above and solving yields (after tedious algebra) the unique solution:

(A7) $\eta_A^* = \beta[pR_B + C_B]/p[\beta R_B + 1]$;

(A8) $\eta_B^* = \alpha[pR_A - C_A]/[p(\alpha R_A + 1) - 1)]$. □

Proof of Proposition 3. Given the discussion in the text, it clearly suffices to show the probability-of-error mapping depicted in Fig. 4 is correct. So fix $C_L \in (\bar{C}_L, C_{L\alpha})$, where this interval is shown in Fig. 2. If no lobbying is permitted, L votes with her priors for B (Lemma 2). Hence the ex ante probability of casting an incorrect vote (i.e. voting for A when $s = b$, or voting for B when $s = a$) is given by p. Suppose lobbying is permitted. By Proposition 2.1, only G_A will lobby L when $p \in [C_A/R_A, \beta C_B)$. By Lemma 5, the ex ante probability of casting an incorrect vote is given by:

$$(1-p)\mu_A^*(b)(1-\gamma^*(a,\phi))\,\rho^*(a,\phi,\phi) = p/\beta R_B \;,$$

and by (1.2), $\beta R_B > 1$. Now suppose $p \in [\beta C_B, 1 - \alpha C_A]$. Then by Proposition 2.2 both groups choose to lobby and all information is revealed to L; so the probability of casting an incorrect vote is zero. Finally, suppose

$p \in (1-\alpha C_A, /2)$. Then by Proposition 2.3 the probability of casting an incorrect vote is:

$$\eta_A^* \eta_B^* 0 + \eta_A^*(1-\eta_B^*)p/\beta R_B + (1-\eta_A^*)\eta_B^*(1-p)/\alpha R_A$$
$$+ (1-\eta_A^*)(1-\eta_B^*)p \ ,$$

where the third term follows from Lemma 6. Substituting for η_j^* from (A7) and (A8), differentiating, and doing the algebra shows this expression nonlinear increasing in p and, $\forall p < 1/2$, strictly less than p. □

Proof of Proposition 4. (4.1) From Proposition 2 under Regime 2, varying f affects the locus, $p = \beta C_B$, but leaves the boundary conditions (1.1) and (1.2) unaffected. In particular, $d\beta/df < 0$ and the result follows.
(4.2) Similarly, variations in R_B or C_B affect the locus $p = \beta C_B$ only, with $d\beta/dR_B < 0$ and $d\beta C_B/df > 0$.
(4.3) Variations in R_A or C_A affect both the lower boundary $(d[C_A/R_A]/dR_A < 0; d[C_A/R_A]/dC_A > 0)$ and the locus $p = \beta C_B (d\beta(dR_A > 0; d\beta/dC_A \equiv 0)$. The results follows.
(4.4) Under the symmetric case, $d[C/R]/dR = -C/R^2$ and $d\beta C/dR = -(2q-1-C_L)C/C_L R^2 < 0$. Hence the first statement follows. The relative amount of lobbying by both groups together increases with an increase in R if $(2q-1-C_L)C/C_L R^2 > C/R^2$; and this inequality holds by (1.2). This proves the result. Similarly, the converse results hold for variations in C. □

Proof of Proposition 5. Let k denote the cost of direct data acquisition by L. Then L's expected payoff from directly observing s is simply $q-k$.

Proof of (5.1): By Proposition 2.1, only G_A lobbies here, so L's payoff is $E\Pi_L(C_A, 0 \mid \cdot)$. Substituting for $\mu_A^*(b)$from Lemma 5 and collecting terms gives,

$$E\Pi_L(C_A, 0 \mid \cdot) = q - pC_L(2q-1)/(2q-1-C_L) \ .$$

Comparing this value $q-k$ yields (5.1). That there exist $k < C_L$ satisfying inequality (5.1) strictly follows from (1.2) and $p < 1/2$.

Proof of (5.2): By Proposition 2.2, both groups lobby L and all information is revealed in the messages. Hence, $E\Pi_L(C_A, C_B \mid \cdot) = q$ and (5.2) follows. Because $C_L > 0$, there surely exist $k < C_L$ satisfying (5.2).

Proof of (5.3): By Proposition 2.3, G_j lobbies with probability $\eta_n^* \in (0,1)$, $j = A, B$, with η_j^* being given by (A7) and (A8). Hence,

$$E\Pi_L(\eta^* \mid \cdot) = \eta_A^* \eta_B^* E\Pi_L(C_A, C_B \mid \cdot) + \eta_A^*(1-\eta_B^*) E\Pi_L(C_A, 0 \mid \cdot)$$
$$+ (1-\eta_A^*)\eta_B^* E\Pi_L(0, C_B \mid \cdot)$$
$$+ (1-\eta_A^*)(1-\eta_B^*) E\Pi_L(0, 0 \mid \cdot) \ .$$

Substituting from Lemmas 5, 6 and 7 and collecting terms yields,

$$E\Pi_L(\eta^* \mid \cdot) = q - \zeta(\eta_A^*, \eta_B^*, p, C_L)(2q-1)/(2q-1-C_L) \ ,$$

where $\zeta(\cdot) = p(1-\eta_B^*)[\eta_A^* C_L + (1-\eta_A^*)(2q-1-C_L)] + (1-p)\eta_B^*(1-\eta_A^*)C_L$. (5.3) follows. To show that, for some (p, C_L)-pairs for which the equilibrium of type-(2.3) exists, there are $k < C_L$ satisfying (5.3), note that (A7) and (A8), respectively imply $(1-\eta_A^*) = (p-\beta C_B)/p(\beta R_B+1)$ and $(1-\eta_B^*) = [p-(1-\alpha C_A)]/[p(\alpha R+1)-1]$. So $\eta_A^* \to 1$ and $\eta_B^* \to h \in (0,1)$ as $C_L \to \beta^{-1}(p/C_B)$. Therefore, for $C_L \approx \beta^{-1}(p/C_B)$, $\zeta(\cdot) \approx p(1-h)C_L$. Further, (1.2) and $p < 1/2$ imply $p(2q-1-C_L) < 1$. Hence, $\zeta(\cdot)(2q-1)/(2q-1-C_L) < C_L$ for $p > \max\{\beta C_B, 1-\alpha C_A\}$ and C_L in the neighbor hood of $\beta^{-1}(p/C_B)$. The claim now follows. □

Proof of Proposition 6. When $p = 1/2$, L can, in the absence of any further information, credibly commit to voting for A with any probability $r \in [0,1]$, by Lemma 2. Should R_A choose to lobby alone, similar arguments to those supporting Proposition 1 yield an expected payoff of $pR_A - C_A = R_A/2 - C_A$. In the absence of any lobbying, however, G_A's payoff is rR_A. Hence, a necessary condition for G_A to lobby is, $R_A/2 - C_A \geqq rR_A$. Similarly, a necessary condition for G_B to lobby is, $R_B/2 - C_B \geqq (1-r)R_B$. Combining these inequalities, we have $r \in ([R_A - 2C_A]/2R_A, [R_B + 2C_B]/2R_B)$ implies no group wishes to lobby. Suppose L sets $r \leqq [R_A - 2C_A]/2R_A$; say, without loss of generality, $r = 0$. Then the preceding analysis for $p < 1/2$ applies. □

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