4 Lobbying

In this chapter we begin to examine the activities of organized special interest groups. By an organized group we mean a body that undertakes political actions on behalf of a number of citizens. We shall refer to those who are served by a SIG as its "members," whether or not they are formal, dues-paying members of some organization.

At least since Olson (1965), social scientists have pondered the *logic of collective action*. On the one hand, individuals who have similar policy preferences have much to gain from pooling their resources to pursue common political aims. On the other hand, there is always the temptation to "free ride." This is so because those who share a group's objectives can benefit from its political efforts even if they refuse to help pay the bills. For example, the owners of a textile firm will benefit from a lobby-induced tariff on imported clothing whether or not they bear a portion of the lobbying costs. The fact that free riders cannot be excluded from political benefits raises the question of when collective political action is possible.

Clearly, some interest groups are more adept at overcoming the free-rider problem than others. U.S. dairy farmers are well organized and have long been active in encouraging restrictive quotas on competing imports. But consumers who enjoy imported cheese are poorly organized and have had little influence on the policymaking process. Some groups, like environmentalists, achieve an intermediate degree of success: an active lobby pursues the policy interests of a core of loyal supporters, while others with similar views take a free ride. A complete account of special interest politics surely would begin with a discussion of which groups manage to organize effectively. Unfortunately, theorizing about coalition formation has proved to be very difficult, so we opt for a less ambitious approach. We will take the existence of a set of organized groups as a given, and go from there.

As we noted in Chapter 1, organized SIGs undertake a variety of activities to further their political ends. Many of these activities entail the collection and dissemination of information. It is natural for interest groups to deal in information, for at least two reasons. First, the members of an interest group accumulate knowledge about certain policy issues in the course of performing their everyday activities. Take, for example, the area of health care policy. The design of good policy requires a detailed understanding of the fixed and variable costs of hospital care, the cost sharing between doctors and hospitals, the incentives doctors face in designing treatments, the number and characteristics of uninsured patients, and so on. SIGs that represent the interests of hospitals, insurance companies, and doctors will have much information of this sort from their members' regular involvement in the industry.

Second, interest groups may have an incentive to conduct research on issues of concern to their members. Information has the properties of a public good, inasmuch as the fixed costs of conducting research often far exceed the marginal cost of disseminating results to an additional user. Thus, the same research can inform many individuals for little more than it would cost for one such individual to assemble the information and use it herself. An organized group can take advantage of the economies of scale by researching issues centrally and educating its rank-and-file members. The groups also may use the information they gather to try to win over policymakers and the general public.

This chapter focuses on lobbying activities. We use this term narrowly to refer to meetings between representatives of interest groups and policymakers in which the former try to persuade the latter that their preferred positions would also serve the policymakers' interests and perhaps those of the general public. In other words, lobbying involves the transfer of information by verbal argument. The lobbyists for the AFL-CIO might argue that expanded U.S. trade with China would harm the residents of a legislator's home district and would impede the prospects for democracy in China. Or the lobbyists for the National Abortion Rights Action League might assert that late-term abortions are needed to save the lives of many women. Of course, interest groups on the opposite sides of these issues might well confront the policymakers with conflicting claims.

We assume that lobbying is potentially informative; that is, the interest groups have access to information that in principle could allow the politicians to make better policy decisions. But we also assume that the policymakers cannot easily verify the lobbyists' claims. If policymakers had exactly the same objectives as the lobbyists, then the costliness of verification would pose no problem. But the interests of a SIG and a policymaker rarely are perfectly aligned. For example, SIGs often care about the effects of policy on their own members' incomes, whereas elected representatives are accountable to broader constituencies. Whenever a policymaker has even a slightly different objective than the SIG, she must guard herself against exaggeration and misrepresentation by the lobbyist. The lobbyist, for his part, may choose to stretch the truth somewhat, but he does not wish to make outlandish statements that will simply be ignored. These considerations lead us to ask two important questions. First, what statements and arguments by the lobbyist will be persuasive? Second, what if anything can an interest group do to enhance its credibility?

In this chapter we address the first of these questions, leaving the second for Chapter 5. We analyze persuasiveness by considering the incentives facing a lobbyist. If talk is cheap and allegations are difficult to verify, then a lobbyist's claims will be persuasive only if he has an incentive to report information truthfully when he anticipates that his statements will be accepted and acted upon. We examine in detail the requirements for credibility and investigate how the transfer of information by lobbying affects the policies that result.

4.1 One Lobby

In this section we study a setting in which a single lobby has information relevant to a policymaker's decision. The information may concern the potential effects of different levels of a policy variable or the preferences of a group of voters. We consider a sequence of examples that allow us to develop this intuition. These examples differ in terms of the complexity of the information held by the SIG, but all make use of special forms for the policymaker's ex ante beliefs and the welfare functions of the policymaker and the interest group. A more general formulation of the model is discussed in the appendix to this chapter.

4.1.1 *The Setting*

The welfare of a policymaker depends on the level of a policy variable p and some facts about the world. The underpinnings for the welfare function are not important here; it could reflect, for example, the politician's desire to be reelected or her personal preferences over policy outcomes. The pertinent facts are described by a variable θ. Different facts imply a different ranking of the policy options by the policymaker. For example, θ might indicate the tightness of the labor market, which would affect a policymaker's evaluation of alternative interest rates. Or it might indicate the effectiveness of a scrubber device in reducing pollution, which would affect her view of the desirability of alternative environmental standards. Alternatively, the variable θ may describe something about the subjective preferences of the SIG members themselves. The group's preferences will enter the policymaker's objective function if, for example, the members are residents in the politician's district who will vote in the next election. The policymaker has an objective function $G(p,\theta) = -(p-\theta)^2$. With this objective function, she aims to set the policy level as close as possible to the value of θ.

The welfare of the members of an interest group also depends on the level of the policy instrument and the state of the world. The various group members need not hold the same preferences, although presumably they have somewhat similar aims. We do not consider how the preferences of the SIG members are aggregated. Rather, we simply endow the group's lobbyist with an objective function $U(p,\theta) = -(p-\theta-\delta)^2$ for some positive value of δ. Thus, the group has an ideal policy of $\theta+\delta$ in state of the world θ. Note that the group's ideal policy in any state exceeds the ideal for the policymaker. We refer to the difference, δ, as the "bias" in the group's preferences.

We assume that the interest group has better information about the policy environment than the policymaker. In particular, the lobbyist knows the state of the world, whereas the policymaker does not. If the policymaker were to learn nothing from the lobbyist, she would base her policy decision on some prior beliefs. To describe these beliefs, it is convenient to treat the state of the world as if it were the realization of a random variable, $\tilde{\theta}$. Then the domain of the probability distribution function for $\tilde{\theta}$ gives the values that the policymaker deems to be possible, while the density function gives

the relative likelihood she ascribes to each possibility. The lobbyist knows the actual realization of $\tilde{\theta}$, which we continue to denote by θ.[1]

4.1.2 *Two States of the World*

The simplest case to consider has only two possible values for the variable θ. We denote these values by θ_H and θ_L, where H indicates the need for a "high" level of policy and L the need for a "low" level of policy. The policymaker initially regards the two values as equally likely. The policymaker sets $p = \theta$ when the lobbying reveals the true state of the world, and sets $p = E\tilde{\theta}$ when she remains uncertain about the state. In the latter case, the expectation is formed using her subjective, updated beliefs about the likely values of $\tilde{\theta}$.[2]

The lobbyist for the group knows the true state of the world and thus has no doubt about which policy the group members prefer. Notice that the policymaker and the SIG both prefer a higher level of the policy when $\theta = \theta_H$ than when $\theta = \theta_L$. This common preference creates the potential for informative lobbying. But the objectives of the SIG and the policymaker are never the same. The parameter δ measures the extent of their disagreement.

To investigate the conditions under which lobbying can be informative, we hypothesize that the policymaker takes the lobbyist's claims at face value. We then investigate the incentives facing the lobbyist. Consider figure 4.1, which shows the welfare of the SIG in different states. The curve labeled LL depicts the group's welfare as a function of the policy p when the state is θ_L, while the curve labeled HH depicts the group's welfare as a function of p when the state is θ_H. If the true state is θ_H and the lobbyist reports it as such, then a trusting policymaker enacts a policy of $p = \theta_H$. If the lobbyist instead reports that the state is θ_L, the policymaker sets $p = \theta_L$. Since a truthful report always results in a policy that is closer to the group's ideal than a false report, the lobbyist has no incentive to misrepresent the facts when the state is θ_H.

1. We can also use this formulation to describe the situation in which the SIG and the policymaker are both uncertain about the policy environment, but the policymaker is more so. To do so, we take θ to be a noisy signal of the state of the world rather than the state itself. Then the group's superior information is reflected in its precise observation of the signal, compared to the policymaker's noisy observation of it.

2. Let ζ be the policymaker's ex post subjective probability that $\theta = \theta_H$. The policymaker seeks to maximize her expected welfare, $EG = -\zeta(p-\theta_H)^2 - (1-\zeta)(p-\theta_L)^2$. The first-order condition for this maximization implies $p = \zeta\theta_H + (1-\zeta)\theta_L$; that is, the policymaker sets the policy equal to the expected value of θ.

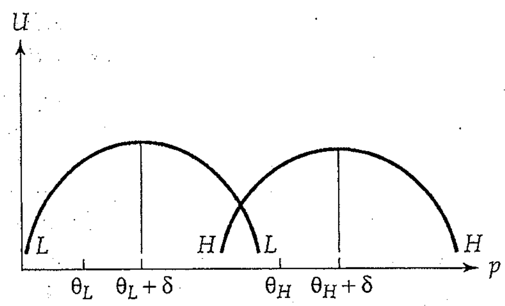

Figure 4.1
Example with Two States

If the state instead is θ_L, a truthful (and trusted) report by the lobbyist induces a policy of $p = \theta_L$. This is smaller than the group's ideal policy of $\theta_L + \delta$ in state θ_L. If the lobbyist instead claims that the state is θ_H, the policy outcome will be $p = \theta_H$. The SIG members may prefer this larger policy, but it also might be too large even for their tastes. The lobbyist will report truthfully in state θ_L if and only if the SIG members prefer $p = \theta_L$ to $p = \theta_H$; that is, if and only if $(\theta_L + \delta) - \theta_L \leq \theta_H - (\theta_L + \delta)$. Notice that this inequality is satisfied for the case depicted in figure 4.1

We can rewrite the inequality as a limitation on the size of the divergence in preferences; that is,

$$\delta \leq \frac{\theta_H - \theta_L}{2}. \qquad (4.1)$$

When (4.1) is satisfied, there exists an equilibrium with informative lobbying.[3] In such an equilibrium, the lobbyist educates the policy-

3. Game theorists have developed the notion of a Bayesian equilibrium to describe outcomes of games with imperfect information, and the notion of a perfect Bayesian equilibrium (PBE) to select among such equilibria. In an equilibrium, beliefs are updated according to Bayes' rule, all strategies must be best responses to the strategies of rivals, and they have to satisfy subgame perfection. The latter means that players correctly anticipate subsequent incentives facing their rivals at every stage of the game. Moreover, a PBE requires that players update their beliefs using Bayes' rule even out of equilibrium, whenever that is possible. See Fudenberg and Tirole (1991, Chapter 6). In the equilibrium with truthful revelation that exists when condition (4.1) is satisfied, the policymaker updates her beliefs based on the report of the SIG. The updating causes the policymaker to attach a probability of one to the event that the state of nature is θ_H when the SIG reports it as such, and similarly for θ_L. This is consistent with Bayes' rule in the indicated equilibrium.

maker about the state of the world. The equilibrium that results is "fully revealing," because the policymaker learns the true state for all possible values of the random variable $\tilde{\theta}$.

If, in contrast, (4.1) is not satisfied, the lobbyist's report lacks credibility. The policymaker would know in such circumstances that the lobbyist had an incentive to announce the state as θ_H no matter what the true state happened to be. For this reason, his report is uninformative, and the policymaker is well justified in ignoring its content. In the event, the policymaker sets the policy $p = (\theta_L + \theta_H)/2$ that matches her prior expectation about the mean value of $\tilde{\theta}$. Evidently, the transmission of information via lobbying requires a sufficient degree of alignment between the interests of the policymaker and the interest group.

Now let us return to the case in which inequality (4.1) is satisfied. We have identified an equilibrium with informative lobbying. But that is not the only possible outcome. Indeed, there is another equilibrium in which the lobbying effort fails. To see that this is so, suppose the policymaker distrusted the lobbyist. Then she would invoke the policy $p = (\theta_L + \theta_H)/2$ no matter what report she heard. Anticipating this behavior, the lobbyist would have no incentive to report truthfully. For any parameter values, there is an equilibrium outcome in which the policymaker remains uninformed. Game theorists refer to this as a "babbling equilibrium," for it is as if the lobbyist babbles when providing his report.

Although the babbling equilibrium always exists, Farrell (1993) has argued that it is not always a reasonable prediction of what may happen in a cheap-talk game. He has proposed a stricter concept of equilibrium that sometimes rules out the uninformative outcome. Farrell's refinement is based on the idea of a supporting argument. That is, he would allow the lobbyist to accompany his report of θ with a short supporting speech. Like the report, the arguments in the speech would not be verifiable by the policymaker. But if they are nonetheless compelling, the policymaker might take them into account. Farrell suggests that a plausible equilibrium should be immune to speeches of the sort he describes.

To pursue this idea for a moment, suppose the lobbyist senses the policymaker's distrust. Let the true state be θ_L, so that the lobbyist anticipates a policy of $p = (\theta_L + \theta_H)/2$ unless he can make his case. Now imagine that he utters the following speech:

"Please believe me that the state is θ_L. You should believe me, because I would have no incentive to make this speech and have you believe me were the true state to be θ_H."

As figure 4.1 shows, θ_L is farther from $\theta_H + \delta$ than is $(\theta_L + \theta_H)/2$. So the lobbyist's claim that he would not wish to make the speech in state θ_H indeed is compelling. Now we must ask whether the lobbyist would be inclined to make the speech in state θ_L. If he did so and succeeded in convincing the policymaker, the policy outcome would be $p = \theta_L$. The SIG prefers this outcome to $p = (\theta_L + \theta_H)/2$ if and only if $\delta < (\theta_H - \theta_L)/4$. Thus, Farrell would argue that the babbling equilibrium is implausible for small values of δ, that is, for $\delta < (\theta_H - \theta_L)/4$.[4]

Farrell offers an interesting refinement of the equilibrium concept for cheap-talk games. But his proposal and others like it remain controversial.[5] Indeed, there are no equilibrium refinements that command universal support. Since it is not our aim to make strong predictions about policy outcomes, we do not take a position on which refinements are most plausible, nor do we devote much space to them in what follows.

4.1.3 *Three States of the World*

Now suppose there are three possible states of the policy environment. The possible values of $\tilde{\theta}$ are θ_L, θ_M, and θ_H, with $\theta_L < \theta_M < \theta_H$. Again, let the policymaker perceive the three states as equally likely. We ask: When can the lobbyist advise the policymaker of the true state?

Again, we begin by hypothesizing that the lobbyist's report will be taken at face value. Then, a report of θ_L induces a policy of θ_L, a report of θ_M induces a policy of θ_M, and a report of θ_H induces a policy of θ_H. Consider first the incentives for false reporting in state θ_L. The lobbyist has two possible false reports. He could exaggerate his claim modestly and report the state as θ_M. Or he could exaggerate it dramatically and report the state as θ_H. The lobbyist prefers to report truthfully in state θ_L than to claim the state is θ_M if and only if the group's ideal point, $\theta_L + \delta$, is no closer to θ_M than it is to θ_L; that is, if and only if

$$\delta \leq \frac{\theta_M - \theta_L}{2}. \tag{4.2}$$

As for a false report of θ_H in state θ_L, this will be unattractive to the lobbyist anytime it is unattractive to report the state as θ_M. When (4.2) is satisfied, the SIG regards a policy level of θ_M as too high. Then, since $\theta_H > \theta_M$, it must consider a policy level of θ_H to be excessive as well.

Now consider the incentives for false reporting in state θ_M. The lobbyist has no incentive to report the state as θ_L when actually it is θ_M. After all, the SIG prefers a policy larger than θ_M, and the false report would induce the policymaker to choose one that is smaller than $p = \theta_M$, which is what she would choose upon hearing a truthful report. But the lobbyist might be tempted to exaggerate, because by alleging the state to be θ_H when actually it is θ_M, he induces a higher level of the policy variable than otherwise. The lobbyist is willing to eschew this temptation and report truthfully in state θ_M if and only if

$$\delta \leq \frac{\theta_H - \theta_M}{2}. \tag{4.3}$$

This inequality constitutes a second requirement for the existence of an equilibrium with full revelation.

Finally, consider the incentives for false reporting in state θ_H. In this state, the lobbyist has no incentive to report either that the state is θ_L or that it is θ_M. Each of these false reports would result in a policy level that is lower than $p = \theta_H$. And the group regards even this policy level to be less than what it desires. Thus, there is no additional restriction needed for truthful reporting in state θ_H.

The inequalities (4.2) and (4.3) constitute necessary and sufficient conditions for an equilibrium with truthful reporting. Notice that, by introducing a third possible value of $\tilde{\theta}$, we have added another restriction on the extent of disagreement between the policymaker and the interest group that is consistent with fully informative lobbying.

4. Note that if $\delta < (\theta_H - \theta_L)/4$, it is always in the group's interest, and always credible, for the lobbyist to make the analogous speech about state θ_H. If $\theta = \theta_H$, the SIG prefers the outcome $p = \theta_H$ to $p = (\theta_L + \theta_H)/2$, whereas if $\theta = \theta_L$, the SIG prefers $p = (\theta_L + \theta_H)/2$ to $p = \theta_H$.

5. Farrell's proposed refinement has been criticized for its implicit assumption that the listener draws no inference from the lobbyist's failure to provide a supporting argument. See Farrell and Rabin (1996) for further discussion of equilibrium refinements in cheap-talk games.

Now suppose that one of the conditions (4.2) or (4.3) is violated. Is the lobbyist bound to babble? Or might he be able to communicate some more-limited information to the policymaker? In fact, limited communication may still be possible, as Crawford and Sobel (1982) have emphasized in their seminal article on strategic information transmission.

Take, for example, the case in which inequality (4.3) is violated. The temptation to exaggerate in state θ_M precludes the lobbyist from revealing whether the state is "medium" or "high." But the lobbyist may nonetheless be able to distinguish this pair of states from one that requires a low level of the policy instrument. Suppose the lobbyist were to issue one of two possible reports, with the aim of making this lesser distinction. Specifically, let a report of "low" indicate that the state is θ_L and a report of "not low" indicate that the state is either θ_M or θ_H. Then a policymaker who takes the lobbyist's claims at face value sets $p = \theta_L$ when she hears that the state is "low" and $p = (\theta_M + \theta_H)/2$ when she hears otherwise. The latter policy level matches her expectation of the state of the world in situations in which she can rule out the possibility that $\theta = \theta_L$ but remains otherwise uninformed. We now must ask again whether the lobbyist has an incentive to report falsely in any of the three states.

Clearly, the lobbyist has no incentive to do so when the true state is θ_H. A false claim of "low" would induce a policy of $p = \theta_L$. This outcome is less desirable to the group than the policy $p = (\theta_M + \theta_H)/2$ that results from a truthful report of "not low." When the state is θ_M, the lobbyist also confronts a choice between the outcomes $p = (\theta_M + \theta_H)/2$ and $p = \theta_L$. A truthful report of "not low" yields the former level of policy, whereas a false report yields the latter. The lobbyist will not report falsely if and only if the former policy is at least as close to the group's ideal of $\theta_M + \delta$ than the latter, that is, if and only if $(\theta_M + \delta) - \theta_L \geq (\theta_M + \theta_H)/2 - (\theta_M + \delta)$ or

$$\delta \geq \frac{\theta_H - \theta_M}{4} - \frac{\theta_M - \theta_L}{2}. \tag{4.4}$$

Notice that condition (4.4) must be satisfied when (4.3) is violated. So, truthful reporting in state θ_M is not an issue in situations in which the lobbyist cannot credibly distinguish between θ_M and θ_H.

Finally, we must check that the lobbyist has no incentive to report falsely when the state is θ_L. In this state, a truthful report results in a policy of $p = \theta_L$, whereas a false report leads to $p = (\theta_M + \theta_H)/2$. The group prefers the former outcome if and only if $(\theta_L + \delta) - \theta_L \leq (\theta_M + \theta_H)/2 - (\theta_L + \delta)$, or

$$\delta \leq \frac{\theta_H - \theta_M}{4} + \frac{\theta_M - \theta_L}{2}. \tag{4.5}$$

When conditions (4.4) and (4.5) are satisfied, there exists an equilibrium with partial transmission of the interest group's knowledge. It is easy to check that (4.4) and (4.5) can be satisfied when one of (4.2) and (4.3) is violated. Suppose, for example, that $\theta_L = 0$, $\theta_M = 4$, and $\theta_H = 6$. Then (4.3) requires $\delta \leq 1$, whereas (4.5) requires only that $\delta \leq 5/2$. For $1 < \delta \leq 5/2$, the lobbyist can credibly distinguish between a low state and others, but cannot advise the policymaker whether the state is "medium" or "high."

Suppose now that conditions (4.2) and (4.3) are satisfied, and that (4.4) and (4.5) are satisfied as well.[6] In such circumstances, there exists an equilibrium in which the lobbyist reports the precise state of the world and another equilibrium in which he (sometimes) issues a coarser report. Moreover, a third equilibrium exists in which the lobbyist babbles. Each of these reporting strategies can be justified by consistent beliefs of the policymaker. But note that the policymaker fares best in the fully revealing equilibrium.[7] So too does the SIG, at least in an ex ante sense.[8] The lobbyist and the policymaker might coordinate on this equilibrium, if each expects the other to use the language that affords both the highest ex ante welfare.

4.1.4 *Continuous Information*

As the number of possible states grows, full revelation becomes ever more difficult to achieve. For a lobbyist to be able to distinguish among all possible states, δ must be smaller than one-half of the dis-

6. When $\theta_L = 0$, $\theta_M = 4$ and $\theta_H = 6$, for example, (4.2), (4.3), (4.4), and (4.5) are satisfied for all $\delta \leq 1$.

7. Expected welfare for the policymaker is $-\frac{2}{9}[(\theta_H - \theta_M)^2 + (\theta_M - \theta_L)(\theta_H - \theta_L)]$ in the babbling equilibrium, $-\frac{1}{6}(\theta_H - \theta_M)^2$ in the equilibrium with partial revelation, and 0 in the equilibrium with full revelation. Thus, the policymaker's expected welfare increases with the level of detail in the lobbyist's report.

8. By ex ante welfare, we mean the expected welfare of the group as viewed from a time before it learns the state of the world. Ex ante welfare is calculated using the prior distribution for $\tilde{\theta}$. We find that $EU = -\delta^2 - \frac{2}{9}[(\theta_H - \theta_M)^2 + (\theta_M - \theta_L)(\theta_H - \theta_L)]$ in the babbling equilibrium, $EU = -\delta^2 - \frac{1}{6}(\theta_H - \theta_M)^2$ in the equilibrium with partial revelation, and $EU = -\delta^2$ in the equilibrium with full revelation. So the group's ex ante ordering of the equilibria is the same as that of the policymaker.

tance between any two of them. But as the number of states tends to infinity—as it must, for example, when θ represents a continuous variable—this requirement becomes impossible to fulfill. An interest group that has information about a continuous variable can never communicate to the policymaker the fine details of its knowledge.

The reason for this should be clear by now. Consider two possible values of a policy-relevant variable that are close to one another. For example, the cost of building a school might be either \$100 per square foot or \$101 per square foot. A lobbyist for the teachers' union realizes that the policymaker will opt for a larger school if she learns that costs are lower. If the union members value space in the school more highly than the policymaker, the lobbyist will always be tempted to report the \$100 figure when the actual figure is \$101. A slight understatement of costs would push the policymaker toward a slightly larger school, but would never result in one being built that exceeds the teachers' preferred size. The policymaker cannot trust a claim that "costs are \$100," even if the SIG has precise information of this sort.

Although the lobbyist cannot credibly distinguish between cost figures that are close to one another, it may be possible for him to advise the policymaker about ranges of costs. Suppose the lobbyist is expected to report "low" whenever costs fall between \$70 and \$90 per square foot and to report "high" when they fall between \$90 and \$110 per square foot. If the policymaker trusts such reports, she will build a school commensurate with the average cost in the indicated range. But then the lobbyist may have reason to report the range truthfully, because a misrepresentation when costs are high could lead to a bill that even the union members would regard as excessive.

What statements by the lobbyist would be credible in this situation? To answer this question, we assume that the policymaker's prior beliefs are that $\tilde{\theta}$ is uniformly distributed on the interval between $\theta_{\min}$ and $\theta_{\max}$. The lobbyist knows θ, the realized value of $\tilde{\theta}$, but he does not report a precise figure, because such a report would not be credible. Instead, he indicates a range that contains the true value of θ. If the lobbyist reports that "θ is in range 1," the policymaker interprets this to mean that $\theta_{\min} \leq \theta \leq \theta_1$ for some value of θ_1. If he reports that "θ is in range 2," the interpretation is that $\theta_1 \leq \theta \leq \theta_2$. Let there be n ranges in total, so that the statement "θ is in range n" means that $\theta_{n-1} \leq \theta \leq \theta_n$. We denote the ranges by

$R_1, R_2, \ldots, R_n$. Our task is to find values of $\theta_1, \theta_2, \ldots, \theta_n$ such that, if the policymaker takes the lobbyist's assertions at face value, the lobbyist has no incentive to lie.

Consider first the statement "θ is in R_1." If the policymaker treats this claim as truthful, she updates her beliefs using Bayes' rule. Then her expected value of $\tilde{\theta}$ is $(\theta_{\min} + \theta_1)/2$, and she sets the policy at this level. We must now check that the SIG prefers the outcome $p = (\theta_{\min} + \theta_1)/2$ for all values of θ that are actually in R_1 to the policy levels that would result from false claims of "θ is in R_2," "θ is in R_3," and so on. If it does not, then the policymaker should not trust the lobbyist's report.

Among values of θ in R_1, the lobbyist's greatest temptation to lie occurs when θ actually is close to θ_1. These highest values of θ are the ones for which the group's preferred policy is the largest. If the lobbyist does not wish to exaggerate his claim when θ is very close to θ_1, he will not wish to do so for smaller values of θ. Moreover, if the lobbyist has no incentive to make the false statement "θ is in R_2" when $\theta \leq \theta_1$, it is because that claim would generate a policy that exceeds the group's preferred policy given the true value of θ. Then, further exaggeration (such as "θ is in R_3") would generate even greater overshooting of the group's desired outcome. It follows that the only false statement we need investigate is the claim "θ is in R_2" when actually θ is at the upper end of R_1.

We now ask, for what values of θ_1, θ_2, and δ does the SIG prefer to tell the truth in this situation? A false claim of "θ is in R_2" causes the policymaker to update her beliefs so that $E\tilde{\theta} = (\theta_1 + \theta_2)/2$. Thus, the false claim yields a policy level of $p = (\theta_1 + \theta_2)/2$. If the lobbyist is not tempted to make this false claim when θ is a bit less than θ_1, it means that this policy level exceeds the group's ideal of almost $\theta_1 + \delta$ by at least as much as the policy that results from truthful reporting falls short of this ideal. In symbols, credibility requires $(\theta_1 + \theta_2)/2 - (\theta_1 + \delta) \geq (\theta_1 + \delta) - (\theta_{\min} + \theta_1)/2$, or

$$\theta_2 \geq 2\theta_1 + 4\delta - \theta_{\min}. \tag{4.6}$$

Now suppose that θ actually is in R_2. There are two things to check here. First, the lobbyist must not wish to understate the truth (by claiming that θ is in R_1) when θ is at the lower end of the range. Second, he must not wish to overstate the truth (by claiming that θ is in R_3 or beyond) when θ is at the upper end of the range. For values of θ in R_2, truthful reporting generates a policy of $p = (\theta_1 + \theta_2)/2$. A false report that θ is in R_1 would induce a policy of $p = (\theta_{\min} + \theta_1)/2$. The SIG prefers the former outcome to the latter when θ is near θ_1 if and only if $(\theta_1 + \delta) - (\theta_{\min} + \theta_1)/2 \geq (\theta_1 + \theta_2)/2 - (\theta_1 + \delta)$, or

$$\theta_2 \leq 2\theta_1 + 4\delta - \theta_{\min}.$$

Notice that this inequality is the opposite of (4.6). Therefore, both can be satisfied if and only if

$$\theta_2 = 2\theta_1 + 4\delta - \theta_{\min}. \tag{4.7}$$

At the upper end of R_2, the temptation is to exaggerate by claiming that "θ is in R_3." By arguments analogous to those above, truthful reporting when the actual value of θ is near θ_2 requires

$$\theta_3 \geq 2\theta_2 + 4\delta - \theta_1.$$

But truthful reporting for values of θ at the lower end of R_3 requires a similar inequality running in the opposite direction. So, we need $\theta_3 = 2\theta_2 + 4\delta - \theta_1$. More generally, a series of requirements for credibility are that

$$\theta_j = 2\theta_{j-1} + 4\delta - \theta_{j-2} \tag{4.8}$$

for all values of j from 2 through n, where $\theta_0 = \theta_{\min}$ is the initial condition.

Finally, consider values of θ in R_n. Here there is no possibility for the lobbyist to claim an even higher range for θ, because the policymaker knows the maximum value in the distribution of $\tilde{\theta}$. But then the topmost value of θ in R_n must coincide with the greatest possible value of $\tilde{\theta}$, or

$$\theta_n = \theta_{\max}. \tag{4.9}$$

If values of $\theta_1, \ldots, \theta_n$ can be found that satisfy (4.7), (4.8), and (4.9) and that have $\theta_{\min} < \theta_1 < \theta_2 < \cdots < \theta_n$, then these values describe the credible messages in a lobbying equilibrium. Notice that, if $\theta_1 > \theta_{\min}$ and (4.7) is satisfied, this implies $\theta_2 > \theta_1$. This inequality and (4.8) ensures $\theta_3 > \theta_2$. Then $\theta_4 > \theta_3$, and so on. Therefore, the procedure for finding an equilibrium is to solve the n linear equations in (4.8) and (4.9), and then verify that $\theta_1 > \theta_{\min}$.

It will not be possible to have an arbitrarily large number of ranges in a lobbying equilibrium, because information transmission is limited by the degree of similarity in the interests of the policymaker

and the SIG. There must be a largest possible number of ranges that depends on δ and the other parameters. To see how this works, consider an example with $\theta_{\min} = 0$ and $\theta_{\max} = 24$. Then, if $\delta > 6$, the only equilibrium has $n = 1$. In this equilibrium, the lobbyist reports that "θ is between $\theta_{\min}$ and $\theta_{\max}$" and the policymaker sets $p = 12$. Of course, the policymaker learns nothing from such a report, so the unique outcome is none other than the babbling equilibrium. To see that informative lobbying is not possible with $\delta > 6$, note that equations (4.8) and (4.9) require, for $n = 2$, that $\theta_1 = 12 - 2\delta$ and $\theta_2 = 24$. But then $\delta > 6$ implies $\theta_1 < 0$, which is impossible because θ_1 must be at least as large as $\theta_{\min}$. With a large divergence in interests between the policymaker and the lobbyist, the lobbyist is unable to share any of his knowledge.

Now suppose instead that $\delta = 4$. Then the lobbyist can credibly claim that "θ is in the range from 0 to 4" or "θ is in the range from 4 to 24." In this case, when θ actually is a bit less than 4, a truthful report induces a policy of $p = 2$, which falls short of the group's ideal by a bit less than 6. A false report induces $p = 14$, which exceeds the group's ideal by a bit more than 6. So, the lobbyist has no incentive to claim that "θ is in R_2" when actually it is in R_1. And when the actual value of θ is a bit more than 4, the lobbyist similarly has no incentive to claim that "θ is in R_1." In this case, a lobbying equilibrium exists with two alternative reports. We shall refer to this as a 2-partition equilibrium.

It is possible to derive an explicit solution for θ_j from (4.8) and (4.9).[9] It will be useful to have this solution for some of our later discussions. We note that (4.8) and (4.9) are satisfied when

$$\theta_j = \left(\frac{j}{n}\right)\theta_{\max} + \left(\frac{n-j}{n}\right)\theta_{\min} - 2j(n-j)\delta \tag{4.10}$$

for all values of j between 1 and n. An equilibrium further requires that $\theta_1 > \theta_{\min}$. By applying the formula in (4.10) with $j = 1$, we see that $\theta_1 > \theta_{\min}$ if and only if

$$2n(n-1)\delta < \theta_{\max} - \theta_{\min}. \tag{4.11}$$

Inequality (4.11) is a necessary and sufficient condition for the existence of a lobbying equilibrium with n different reports. By

9. Equation (4.8) constitutes a second-order, linear difference equation for θ_j, which must be solved subject to the initial condition, $\theta_0 = \theta_{\min}$, and the terminal condition, $\theta_n = \theta_{\max}$.

inspecting this inequality, we can draw the following conclusions. First, an equilibrium with $n = 1$ always exists; this is the babbling equilibrium. Second, if an equilibrium with n reports exists, then an equilibrium with k reports also exists, for all $k < n$. This follows from the fact that the left-hand side of the inequality increases with n, so that if the inequality is satisfied for some integer n, it will also be satisfied for all smaller integers. Finally, the smaller is δ, the larger is the maximum number of feasible partitions. This confirms our intuition that the prospects for information transmission improve when the preferences of the SIG and the policymaker become more similar.

4.1.5 *Ex Ante Welfare*

We have seen by now that more than one equilibrium may exist in the lobbying game. For example, there always exists a babbling equilibrium, and if $\delta < (\theta_{\max} - \theta_{\min})/4$, there also exists an informative equilibrium in which the lobbyist issues one of two possible reports. Furthermore, if $\delta < (\theta_{\max} - \theta_{\min})/12$, then a 3-partition equilibrium also exists. Repeated application of equation (4.10) with $n = 4, 5, \ldots$ gives the conditions for the existence of equilibria with larger numbers of alternative reports.

When several different partition equilibria exist for a given set of parameter values, it is impossible to say definitively which one will emerge. All of the equilibria are self-sustaining, in the sense that if the policymaker expects the lobbyist to issue one of k reports, then the lobbyist can do no better than to behave as expected. And there is little to pin down the policymaker's beliefs. Thus, we are left with an inevitable ambiguity in the model's prediction.

In some circumstances, however, the policymaker and the lobbyist might be able to coordinate on a particular equilibrium. This is most likely to be true if the two sides agree on their rankings of the alternative equilibria. We consider the rankings from an ex ante perspective; that is, before the play of the game. For the policymaker, an ex ante perspective means that she evaluates her expected welfare using her prior beliefs about the distribution of $\tilde{\theta}$. As for the interest group, we have assumed of course that it knows or learns the true value of θ. But we still may be able to evaluate the group's ex ante welfare if we can imagine a time before the group gains that knowledge. At such a time, the SIG, like the policymaker, may regard all values of θ between $\theta_{\min}$ and $\theta_{\max}$ as equally likely.

To see if the policymaker and the SIG concur in their ex ante rankings, we first calculate the expected welfare of the policymaker. Recall that the policymaker has the objective function $G = -(p - \theta)^2$. She expects to learn which of the n ranges contains the actual value of θ, and to set the policy $p = (\theta_{j-1} + \theta_j)/2$ when she learns that θ is in R_j. Taking all possible realizations of $\tilde{\theta}$ into account, her expected welfare in an n-partition equilibrium is[10]

$$EG^n = -\frac{1}{12(\theta_{\max} - \theta_{\min})} \sum_{j=1}^{n} (\theta_j - \theta_{j-1})^3. \tag{4.12}$$

Now we calculate the expected welfare of the interest group. Again, the expectation is taken with respect to the group's prior beliefs about the likelihood of the different possible values of θ. We assume that the group has uniform prior beliefs. Its ex ante expected welfare in an n-partition equilibrium is calculated using $U = -(p - \theta - \delta)^2$ and the policies it anticipates being implemented after each possible realization of $\tilde{\theta}$, and is given by

$$EU^n = -\frac{1}{12(\theta_{\max} - \theta_{\min})} \sum_{j=1}^{n} (\theta_j - \theta_{j-1})^3 - \delta^2. \tag{4.13}$$

Comparing (4.12) and (4.13), we see that the policymaker and the SIG do agree on their ranking of the possible equilibria. In fact, the ex ante welfare of the policymaker and the interest group always differ by the constant amount δ^2.

We can use (4.12) and (4.13) to identify the ex ante favorite equilibrium of both sides. Using (4.10), we calculate

$$-\frac{\sum_{j=1}^{n} (\theta_j - \theta_{j-1})^3}{\theta_{\max} - \theta_{\min}} = -\frac{(\theta_{\max} - \theta_{\min})^2}{n^2} - 4\delta^2(n^2 - 1). \tag{4.14}$$

Since the right-hand side of (4.14) is an increasing function of n for all values of n that satisfy (4.11), it follows that the ex ante welfare of the

10. We calculate expected utility from

$$EG^n = -\frac{1}{\theta_{\max} - \theta_{\min}} \sum_{j=1}^{n} \int_{\theta_{j-1}}^{\theta_j} \left(\frac{\theta_j + \theta_{j-1}}{2} - \theta \right)^2 d\theta.$$

Here $1/(\theta_{\max} - \theta_{\min})$ is the probability density of $\tilde{\theta}$ and $-[(\theta_j + \theta_{j-1})/2 - \theta]^2$ is the policymaker's utility for a given realization of $\tilde{\theta}$ in the range R_j. The formula sums the utilities for all values of $\tilde{\theta}$ in each range, sums over all ranges, and adjusts for the likelihood of each possible value of $\tilde{\theta}$.

policymaker and the interest group both increase with n.[11] Thus, both sides would agree, ex ante, that the equilibrium using the greatest number of different reports is the best among all equilibrium outcomes.[12]

4.2 Two Lobbies

So far we have considered a setting in which a single interest group lobbies the policymaker. But often policymakers are lobbied by more than one party. Several groups may have information about the policy environment, and each may try to persuade the policymaker to take decisions that it considers best. In such circumstances, the policymaker must weigh the credibility of the various groups and decide what advice to heed and what to dismiss.

But the problem of information transmission with multiple lobbies is more subtle than that. The lobbying game between an interest group and a policymaker is altered by the presence of other lobbies. A policymaker may be able to play off one information source against another by asking an informed group to confirm or contradict the reports she has already heard. The lobbyists must consider more than just their own direct relationship with the policymaker. Each must realize that the reports of others will affect how their own messages are interpreted, and that their own reports may alter the incentives that other groups have when it comes time for them to advise the policymaker.[13]

In this section we study a lobbying game with two informed interest groups. Our discussion draws heavily on Krishna and Morgan

11. Consider the difference between the right-hand side of (4.14) evaluated at $n = m$ and evaluated at $n = m - 1$. It equals

$$(2m-1)\left[\frac{(\theta_{\max}-\theta_{\min})^2}{m^2(m-1)^2}-4\delta^2\right].$$

With (4.11) being satisfied for $n = m$, this expression must be positive.

12. It may seem obvious, at first glance, that more reports are better, because information sharing improves the quality of policy decisions. But the result is not trivial, because when adding more reports, the lobbyist does not simply subdivide some of the ranges he would have used in an equilibrium with fewer reports. Rather, the ranges in the two different equilibria typically overlap.

13. Interest groups may be able to *prove* that they are telling the truth, or the policymaker may be able to detect utterly untruthful messages, as in Milgrom and Roberts (1986). Moreover, the policymaker may be able to use one interest group to confirm or disprove messages from another group, as in Lipman and Seppi (1995). We abstract from these interesting variants of the problem.

(2001). We follow them in distinguishing two different situations. In one, which they call the case of "like bias," the preferences of the two groups are biased in the same direction relative to those of the policymaker. That is, for each state of the world, either both groups prefer a policy p that is larger than what the policymaker would choose if she knew the true state, or both groups prefer a policy that is smaller than the policymaker's ideal choice. The groups may differ in the extent of their bias, with one group perhaps being more extreme than the other. The issue here is whether the two lobbyists jointly can communicate more information to the policymaker than either could convey on his own.

The second case is one of "opposite bias." In this setting, the groups' ideal points for a given state of the world lie on opposite sides of the policymaker's ideal. One group prefers a higher policy level than the politician, while the other prefers a smaller level. This pits the lobby groups against one another, to the potential advantage of the policymaker. Again we investigate what the policymaker can learn and ask whether the lobbyists can guard themselves against contradictory reports by their political adversaries.

4.2.1 *Like Bias*

We begin with the case of like bias. As before, the policymaker must take a decision p with consequences that depend on the state of the world, θ. The policymaker's objective is to maximize $G(p,\theta) = -(p-\theta)^2$. She has two potential sources of information about θ. These sources are two lobbyists, each of whom is fully informed about the policy environment. The lobbyist for SIG 1 seeks to maximize $U_1(p,\theta) = -(p-\theta-\delta_1)^2$, while that for SIG 2 seeks to maximize $U_2(p,\theta) = -(p-\theta-\delta_2)^2$. The case of like bias arises when the value of p that maximizes $G(p,\theta)$ is smaller (or larger) than the value that maximizes $U_1(p,\theta)$ and the one that maximizes $U_2(p,\theta)$, for every value of θ. When, as here, the welfare functions are quadratic, this case arises when δ_1 and δ_2 have the same sign. For concreteness, we suppose $0 < \delta_1 \leq \delta_2$, so that SIG 1 is (if anything) the more moderate interest group while SIG 2 is more extreme.

The outcome of the lobbying game may depend on the order in which the lobbyists meet with the policymaker and on what each knows about the advice given by the other. We can imagine at least three different scenarios. First, the meetings between the lobbyists and the policymaker might be a *secret*, so that each informant is ignorant of the fact that the policymaker has an alternative information source. Second, the meetings between lobbyist and policymaker might be *private*, in which case a lobbyist will know that another has offered advice (or will offer advice) but not the content of the discussion. Finally, a lobbyist's recommendation to the policymaker may become *public*, in which case subsequent advisers can condition their reports on the information that the policymaker already has. We will concentrate our discussion on public messages, but first say a few words about the other two scenarios.[14]

Secret Messages

When the lobbyists meet secretly with the policymaker, there can be no strategic interaction between them.[15] Neither lobbyist realizes that another meeting might take place, and so neither anticipates that the policymaker has another informant. We cannot really speak of an equilibrium in this situation, because a lobbyist's perception of how the policymaker will respond to his message will not be consistent with how the policymaker actually responds. Each lobbyist will behave as if he were the sole provider of information, and so act according to the prescriptions of one of the equilibria we studied before. The policymaker, however, will take an action based on the combined advice of the two lobbyists.

We bring this case up only to point out how the policymaker might try to combine the information contained in two distinct reports. Suppose the first lobbyist sends either a message m_1, which the policymaker interprets to mean $\theta \leq \theta_1$, or a message m_2, which the policymaker interprets to mean $\theta \geq \theta_1$. The second lobbyist, not knowing of the existence of the first, sends either $\hat{m}_1$, which means $\theta \leq \hat{\theta}_1$, or $\hat{m}_2$, which means $\theta \geq \hat{\theta}_1$. Finally, suppose for concreteness that $\theta_1 < \hat{\theta}_1$. Then, if the policymaker hears the reports m_1 and $\hat{m}_1$, she infers $\theta_{\min} \leq \theta \leq \theta_1$; these are the only values of $\tilde{\theta}$ that are consistent with her prior understanding of the distribution of the random variable and the pair of reports she has received. Similarly, if the policymaker hears m_2 and $\hat{m}_2$, she infers $\hat{\theta}_1 \leq \theta \leq \theta_{\max}$. Finally, if she hears m_2 and $\hat{m}_1$, she infers $\theta_1 \leq \theta \leq \hat{\theta}_1$.[16] Notice that the pair of messages convey more information about the true state of the world than does either message alone. The policymaker can combine the information contained in two messages to refine her beliefs about the policy environment

But the very fact that the meaning of a message changes when combined with another implies that the lobbyists' incentives change once each becomes aware of the other's existence. Consider, for example, a setting in which the policymaker initially believes that θ lies between 0 and 24, and that all values are equally likely. Suppose that $\delta_1 = 1$ and $\delta_2 = 2$. If only the lobbyist for SIG 1 lobbies the policymaker, there is a 2-partition equilibrium with $\theta_1 = 10$. In this case, when the state is $\theta = 10$, the lobby is indifferent between the policy $p = 5$ that would result from a report of m_1 and the policy $p = 17$ that would result from one of m_2. Each of these policies differs by 6 from the group's preferred policy of 11. Similarly, there is a unique 2-partition equilibrium when the representative of SIG 2 alone lobbies the policymaker. In this equilibrium, the lobbyist reports $\hat{m}_1$ if $\theta \leq 8$ and $\hat{m}_2$ if $\theta \geq 8$.

This pair of partitions does not, however, constitute an equilibrium when each lobby is aware that the other will also be providing information to the policymaker. If the lobbyist for SIG 1 suspects that a counterpart will report $\hat{m}_1$ when $\theta \leq 8$ and $\hat{m}_2$ when $\theta \geq 8$, then his own report of m_1 when θ slightly exceeds 10 would lead the policymaker to believe that θ lies between 8 and 10. In the event, the policymaker would set the policy $p = 9$. SIG 1 prefers this outcome to the policy $p = 17$ that would result from a truthful report of m_2. The messages m_1 and m_2 no longer are credible.

Private Messages

If the lobbyists realize that the policymaker has an alternative information source but have no way of observing the other report, then many different outcomes are possible in the lobbying game. Among

14. It is also possible to imagine situations in which, after receiving messages from a lobbyist, the policymaker issues statements that reveal some of the information contained in these messages. We will not examine such possibilities here.

15. This statement is true when the lobbyists do not even conceive of the possibility that the policymaker has another source of information. Alternatively, the lobbyists may suspect that other secret meetings might take place, in which case they will form expectations of the likelihood of such meetings and adjust their reports accordingly. The situation then is similar to that of private messages, which we discuss below.

16. The policymaker might also hear m_1 and $\hat{m}_2$. However, this pair of messages cannot arise if both lobbyists report truthfully. Since the pair of messages occurs with zero probability "along an equilibrium path" (where the lobbyists have an incentive to report truthfully), Bayes' rule places no restriction on the policymaker's updated beliefs.

these equilibria is one in which the policymaker gains full information. To see that this is so, suppose the policymaker believes that each group will report the state of the world precisely and truthfully. She interprets a report of m from the lobbyist for SIG 1 to signify that $\theta = m$. Similarly, she interprets a report $\hat{m}$ from the lobbyist for SIG 2 to mean that $\theta = \hat{m}$. Then among her optimal strategies is one in which she sets $p = \min\{m, \hat{m}\}$. This is not the only strategy that maximizes the policymaker's expected welfare, but as long as each side reports truthfully (as it must in an equilibrium), the strategy provides the policymaker with her ideal policy in each state of the world.[17]

Now consider the incentives facing the lobbyists when they anticipate that the policymaker will follow the indicated strategy. If SIG 1 believes that its counterpart will report truthfully, this group may as well report truthfully too. For example, if the true state is $\theta = 5$, and SIG 1 expects $\hat{m} = 5$, then it expects $p = 5$ for any report it might make of a state greater than or equal to $\theta = 5$. If SIG 1 were instead to report some $m < 5$, the policymaker would take its false report at face value and the policy would be even further from the group's ideal. A truthful report by SIG 1 is a best response in this situation. The same is true for SIG 2. By using each lobbyist's report to discipline the other's, the policymaker gains full information and achieves her desired outcome in every state.

However, the equilibrium with full revelation seems fragile in these circumstances. The lobbyist for SIG 1 might believe that there is a small probability that his counterpart will announce a state larger than 5 when the true state is $\theta = 5$. This belief might reflect the possibility that the other lobbyist will make an error, or the lobbyist for SIG 1 might simply be unsure of his counterpart's intentions. If the lobbyist for SIG 2 does happen to report something larger than 5, then the lobbyist for SIG 1 would wish he had done so as well. Moreover, if the lobbyist for SIG 2 does not report a state larger than 5, there is no harm to SIG 1 if its lobbyist exaggerates his own report.

17. As we noted in footnote 16, Bayes' rule does not restrict what the policymaker may believe after hearing messages that would not be sent in an equilibrium play of the game. The optimal strategy we have described arises when the policymaker believes, upon hearing two conflicting reports, that the group reporting the smaller value of θ has reported honestly. With these beliefs, it is optimal for her to set $p = \min\{m, \hat{m}\}$.

Given the anticipated behavior of the policymaker, it is a weakly dominant strategy for each lobbyist to report his own group's ideal point in every state. If both lobbies recognize this, neither will report the true state.

Moreover, if the SIGs anticipate an equilibrium with full revelation of the state of the world, they may try to air their reports publicly. Whereas the policymaker achieves her first-best outcome in an equilibrium with private messages and full revelation, the interest groups with like biases may not be so happy with the situation. Each group would like the other to exaggerate the state slightly, and then it would gladly follow suit. The lobbyist for group 1 might attempt to publicize a report of, say, $m = 5.1$ when the true state is $\theta = 5$, hoping that the other lobbyist would back up his false claim.

It might be interesting to consider a game in which each lobbyist has a *choice* of whether or not to make his report public. In such a game, the policymaker would be able to draw inferences about the state of the world not only from the content of the messages, but also from the manner in which they were communicated. Moreover, the policymaker herself might have an incentive to make public what advice she has been given in some situations. But such a game is rather complicated. Instead, we turn our attention to situations in which the lobbyists are free to offer their advice publicly and have no opportunity to do otherwise.

Public Messages

When the lobbies report their information sequentially and the second lobbyist can learn what the first has said, full revelation cannot occur in any equilibrium. To see this, suppose to the contrary that there is an equilibrium in which the policymaker learns the precise state of the world from the combined reports of the two lobbyists. Then the policymaker's best response would be to set $p = \theta$ when she learns that the state is θ. But the interest groups both prefer policies greater than θ in state θ. Therefore, the first-reporting lobbyist could misrepresent the state in such a way that, if his counterpart follows suit, the policymaker will believe the state to be some $\theta' > \theta$. It would then be in the interest of the second lobbyist to corroborate the first lobbyist's (false) report.

Krishna and Morgan (2001) prove that, as in the lobbying game with a single lobby, every equilibrium with two lobbies can be rep-

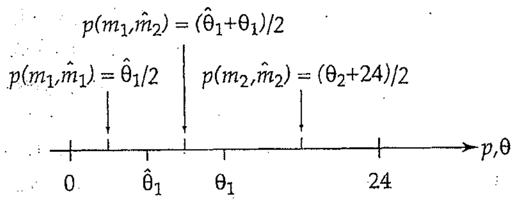

Figure 4.2
Partitions and Policies with Two Reports

resented as a partition equilibrium.[18] In a partition equilibrium, as before, the policymaker learns that θ lies in one of a finite number of nonoverlapping ranges. With two lobbies, the policymaker's information comes from the combined evidence in the two reports. For example, a three-partition equilibrium arises when each lobbyist divides the set of possible values of θ into two (nonidentical) subsets.

To show how partition equilibria can be constructed in a lobbying game with two SIGs, we analyze further the numerical example described above. In the example, the policymaker initially believes that θ lies between 0 and 24. She sees each such value as equally likely. Both interest groups have biases toward higher levels of policy than the policymaker; specifically, $\delta_1 = 1$ and $\delta_2 = 2$.

Suppose that the lobbyist representing SIG 1 reports first, and that his strategy is to issue one of two messages. If he sends message m_1, the policymaker understands it to mean that $\theta \leq \theta_1$ (for some value of θ_1 yet to be determined). If he sends the message m_2, the policymaker infers $\theta \geq \theta_1$. We hypothesize that θ_1 is reasonably large, so that the second lobbyist will wish to distinguish further between states that are "very low" (those that lie between $\theta_{\min}$ and some $\hat{\theta}_1$) and those that are only "reasonably low" (lie between $\hat{\theta}_1$ and θ_1). The second lobbyist can make this distinction by choosing among two messages. The policymaker interprets the message $\hat{m}_1$ to mean $\theta \leq \hat{\theta}_1$ and the message $\hat{m}_2$ to mean $\theta \geq \hat{\theta}_1$. The resulting partition is depicted in figure 4.2.

First we consider the optimal response by the policymaker to the reports she may hear. If she hears m_1 and $\hat{m}_1$, she infers that θ lies

18. Actually, they show that all *monotonic* equilibria are partition equilibria. A monotonic equilibrium is one in which the policy outcome in a higher state is always at least as large as the outcome in a lower state. This property is guaranteed for the lobbying game with one informed party, but it is not guaranteed when there is more than one informed party. Krishna and Morgan restrict their attention to monotonic equilibria, as

between 0 and $\hat{\theta}_1$. By Bayes' rule, all values in this range remain equally likely. Therefore, she sets p equal to the expected value of $\tilde{\theta}$ in this range, that is, $p(m_1, \hat{m}_1) = \hat{\theta}_1/2$. This policy is shown in figure 4.2. By similar reasoning, the pair of messages m_1 and $\hat{m}_2$ induces $p(m_1, \hat{m}_2) = (\hat{\theta}_1 + \theta_1)/2$, and the pair of messages m_2 and $\hat{m}_2$ induces $p(m_2, \hat{m}_2) = (\theta_1 + 24)/2$. These policies, too, are shown in the figure.

Next we consider the incentives facing the lobbyist for SIG 2. By the time he must select a message, he will have heard his counterpart report either m_1 or m_2. If the first lobbyist has reported m_2, this signifies to the policymaker that $\theta \geq \theta_1 > \hat{\theta}_1$. Then, if the lobbyist for SIG 2 delivers the message $\hat{m}_2$, this provides no new information to the policymaker. If the lobbyist instead delivers the message $\hat{m}_1$, the policymaker will know that at least one of the reports must be false. But false reports are not part of any equilibrium. So it must be that the lobbyist for SIG 2 does not wish to send the message $\hat{m}_1$ after hearing his counterpart report m_2.[19]

In contrast, when the report by the lobbyist for SIG 1 has been m_1, the subsequent report by the second lobbyist does provide additional information to the policymaker. If the second lobbyist delivers the message $\hat{m}_1$, the policymaker infers that $\theta \leq \hat{\theta}_1$, and sets the policy $p(m_1, \hat{m}_1) = \hat{\theta}_1/2$. If he instead reports $\hat{m}_2$, the policymaker infers that $\hat{\theta}_1 \leq \theta \leq \theta_1$, and sets the policy $p(m_1, \hat{m}_2) = (\hat{\theta}_1 + \theta_1)/2$. The lobbyist for SIG 2 must have no incentive to report falsely for any value of θ, and in particular for those values slightly below and slightly above $\hat{\theta}_1$. As before, this requires the lobbyist to be indifferent between reporting $\hat{m}_1$ and $\hat{m}_2$ when the state actually is $\hat{\theta}_1$. Such indifference arises when $(\hat{\theta}_1 + \delta_2) - p(m_1, \hat{m}_1) = p(m_1, \hat{m}_2) - (\hat{\theta}_1 + \delta_2)$, or, with $\delta_2 = 2$,

$$(\hat{\theta}_1 + 2) - \frac{\hat{\theta}_1}{2} = \frac{\hat{\theta}_1 + \theta_1}{2} - (\hat{\theta}_1 + 2).$$

Rearranging terms, this gives

$$\hat{\theta}_1 = \frac{\theta_1}{2} - 4. \tag{4.15}$$

19. The incentives facing the second lobbyist when his counterpart has already reported m_2 depend on what inference the policymaker would draw upon hearing contradictory reports. Bayes' rule does not apply and therefore does not restrict the policymaker's beliefs in such an event. Without going into the details, we note that there are legitimate beliefs for the policymaker that make it undesirable for the lobbyist for SIG 2 to report $\hat{m}_1$ when $\theta \geq \theta_1$ and the other lobby has reported m_2. These beliefs support the equilibrium with truthful reporting by both lobbyists.

Finally, we consider the incentives facing the lobbyist for SIG 1. He must anticipate not only how his message will be interpreted by the policymaker, but also how it will affect the report of the other lobby. The lobbyist for SIG 1 must not have an incentive to report falsely in any state. This requires that, when the state is θ_1, his group is indifferent between the outcome that would ensue from a report of m_1 and the one that would result from a report of m_2. From what we have seen, a report of m_1 in state θ_1 leads the lobbyist for SIG 2 to report $\hat{m}_2$. A report of m_2 in state θ_1 also leads to a report of $\hat{m}_2$. Thus, in equilibrium, the lobbyist for SIG 1 anticipates a report of $\hat{m}_2$ by his counterpart, no matter which message he himself delivers. When the lobbyist for SIG 1 looks beyond the second lobbying report to the policy-setting stage, he anticipates a choice of $p = (\theta_1 + \hat{\theta}_1)/2$ in response to a report of m_1 and $p = (\theta_1 + 24)/2$ in response to a report of m_2. SIG 1 is indifferent between these outcomes in state θ_1 if and only if $(\theta_1 + \delta_1) - (\theta_1 + \hat{\theta}_1)/2 = (\theta_1 + 24)/2 - (\theta_1 + \delta_1)$, or (with $\delta_1 = 1$, and after some rearranging of terms),

$$\theta_1 = 10 + \frac{\hat{\theta}_1}{2}. \tag{4.16}$$

Equations (4.15) and (4.16) are two linear equations that relate θ_1 and $\hat{\theta}_1$. If both of these equations are satisfied, the lobbyists' messages will be credible at every stage. The equations have a unique solution with $\theta_1 = 32/3$ and $\hat{\theta}_1 = 4/3$, which is shown in panel a of figure 4.3. Evidently there is a 3-partition equilibrium in which the lobbyist for SIG 1 first reports whether θ is above or below 32/3 and then the lobbyist for SIG 2 reports whether θ is above or below 4/3. The policymaker sets the policy at either $p = 2/3$, $p = 18/3$, or $p = 52/3$, depending on what combination of reports she hears.

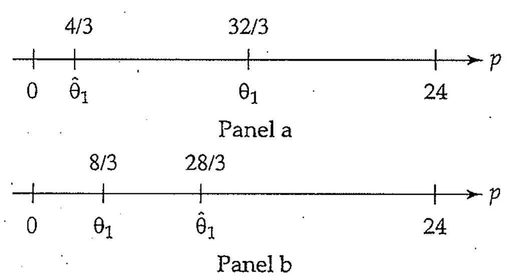

Figure 4.3
Equilibrium Partitions When SIG 1 Reports First

However, this is not the only 3-partition equilibrium that can arise when SIG 1 reports first. In constructing the equilibrium, we have assumed that $\theta_1 > \hat{\theta}_1$, so that the first lobbyist distinguishes "very low" values of θ from values that are "not so low," and the second further distinguishes "very large" values of θ from those that are only "moderately large." It is also possible to construct an equilibrium with $\hat{\theta}_1 > \theta_1$. Then the roles of the two lobbyists are reversed. The procedure for constructing the equilibrium is much the same. First, we find a state $\hat{\theta}_1$ in which the lobbyist for SIG 2 is indifferent between reporting $\hat{m}_1$ and $\hat{m}_2$, given that his counterpart has already reported m_2 (i.e., that $\theta > \theta_1$). Then we find a state θ_1 in which the lobbyist for SIG 1 is indifferent between reporting m_1 and m_2, in the light of the equilibrium responses he anticipates. The equations that are analogous to (4.15) and (4.16) are $\hat{\theta}_1 = \theta_1/2 + 8$ and $\theta_1 = \hat{\theta}_1/2 - 2$. They imply $\theta_1 = 8/3$ and $\hat{\theta}_1 = 28/3$. These partitions are depicted in panel b of figure 4.3.

So far we have assumed that the lobbyist for SIG 1 delivers his message first. We can also consider the game that arises when the order of reporting is reversed. Also in this game, there are two possible 3-partition equilibria, one with $\theta_1 > \hat{\theta}_1$ and the other with $\hat{\theta}_1 > \theta_1$. The procedure for constructing them is the same as before. It turns out that the equilibrium values for θ_1 and $\hat{\theta}_1$ are the same as when SIG 1 reports first; namely, $\theta_1 = 32/3$ and $\hat{\theta}_1 = 4/3$, or $\theta_1 = 8/3$ and $\hat{\theta}_1 = 28/3$. The possible policy outcomes also are the same.

Now let us turn our attention from the specific example with $\delta_1 = 1$, $\delta_2 = 2$, and $\theta_{\max} - \theta_{\min} = 24$ to the more general case of like bias. Krishna and Morgan (2001) have shown that, generally, it does not matter which lobby group reports first. The sets of possible equilibria are the same with either sequence of lobbying. Moreover, for any given set of parameter values, there is a maximum number of subsets in an equilibrium partition. This number rises (or remains the same) as either δ_1 or δ_2 approaches zero. In other words, the more similar are the interests of the interest groups and the policymaker, the more detailed can be the information they convey.

Krishna and Morgan also compare the equilibria that can arise when two groups lobby the policymaker to those that are possible when there is only a single lobbyist. They ask whether the addition of a second lobby improves the prospect for transfer of knowledge. Their answer is that it does not. In particular, they prove that the maximum number of subsets in an equilibrium partition with two lobbies of like bias cannot exceed the maximum number of subsets in an equilibrium partition when only the more moderate of the two lobbies the policymaker. Moreover, the ex ante welfare of the policymaker and of each of the two SIGs is higher in an n-partition equilibrium with reports by only the more moderate of the two lobbies than in any n-partition equilibrium in which both lobbies offer their advice. Therefore, all parties would agree ahead of time (i.e., before θ is known to the SIGs) to have only the more moderate interest group advise the policymaker rather than to have both groups file reports. The more moderate group has greater credibility than the other, and thus is better able to communicate with the policymaker.

4.2.2 *Opposite Bias*

When interest groups share the same direction of policy bias relative to a policymaker, it is difficult for the policymaker to use one group to discipline the statements of others. If one lobbyist misrepresents the policy environment slightly, the others are happy to corroborate his report. A policymaker then must rely on keeping her conversations private in order to elicit truthful confirmation or contradiction of the reports she hears. But such privacy may be difficult to maintain, because the groups have good reasons to publicize their claims.

A policymaker can, however, use competing information sources to her advantage when lobbies have conflicting policy aims. In such a setting, if one lobbyist attempts to exaggerate his claims, another may have an incentive to bring the falsehood to light. Still, as Krishna and Morgan (2001) have shown, a policymaker can never become fully informed, even if the lobbyists do represent opposing interests.

To see why, we examine a situation in which $\delta_1 < 0, \delta_2 > 0$ and the lobbyist for SIG 1 reports first. We define $\theta_2^* \equiv \theta_{\max} - \delta_2$; that is, θ_2^* is the state of the world in which the ideal policy for SIG 2 is equal to $\theta_{\max}$. Our argument shall be that no equilibrium of the lobbying game can reveal the precise state of the world for values of $\theta > \theta_2^*$.

Suppose, to the contrary, that the policymaker does learn the true state for such values of θ. Consider two states, θ' and θ'', such that $\theta' > \theta'' > \theta_2^*$. When the lobbying reveals the state to be θ', the policymaker sets the policy $p = \theta'$. When it reveals the state to be θ'', she sets $p = \theta''$. We take θ' and θ'' to be sufficiently close together, so that SIG 1 prefers the policy $p = \theta''$ in state θ' to the policy $p = \theta'$. This requires $\theta' - \theta'' < -\delta_1$.

Let m' denote the message that the lobbyist for SIG 1 delivers in state θ' and m'' denote the message he delivers in state θ''. Also, let $\hat{m}(m|\theta)$ denote the optimal response by the lobbyist for SIG 2 to a message m sent by his counterpart, when the true state is θ. Then, in the hypothesized equilibrium, the lobbyist for SIG 2 reports $\hat{m}' = \hat{m}(m'|\theta')$ in state θ' and $\hat{m}'' = \hat{m}(m''|\theta'')$ in state θ'', and the policymaker responds with $p(m', \hat{m}') = \theta'$ and $p(m'', \hat{m}'') = \theta''$ in these states.

We now proceed to establish that these cannot be optimal strategies for both lobbyists. To begin, suppose that the lobbyist for SIG 1 were to report m'' in state θ', instead of m'. Then the response by the second lobbyist would be $\hat{m}(m''|\theta')$. It must be that $p[m'', \hat{m}(m''|\theta')] \geq \theta''$, because the lobbyist for SIG 2 could have responded with $\hat{m}''$, in which case the policymaker would have delivered the policy θ''. So the optimal response must leave SIG 2 at least as well off as this. Furthermore, it cannot be that $p[m''; \hat{m}(m''|\theta')] = \theta''$, for if it were, SIG 1 would benefit from the proposed deviation. It follows that $p[m'', \hat{m}(m''|\theta')] > \theta''$. However, this implies that it is not optimal for the lobbyist for SIG 2 to report $\hat{m}''$ in state θ''. He could instead report $\hat{m}(m''|\theta')$ and thereby induce a policy that his group prefers to the outcome $p = \theta''$, which results when he follows the allegedly optimal strategy. Thus, the assumption of full revelation for states $\theta > \theta_2^*$ leads to a contradiction.

Although the policymaker cannot gain a complete understanding of the policy environment from two opposing lobbies, she can learn more from the two together than from either one alone. To see this, we pursue another numerical example, this time with $\delta_1 = -3$ and $\delta_2 = 3$. We again take θ to lie between 0 and 24. Then, were only SIG 1 to lobby the policymaker, the outcome would either be a babbling equilibrium or a 2-partition equilibrium. In the latter equilibrium, the lobbyist for the group sends one message if $\theta \leq 18$ and another if $\theta \geq 18$. And if only SIG 2 were to lobby, again the outcome would either be a babbling equilibrium or a 2-partition equilibrium. The lobbyist's messages would distinguish between states with $\theta \leq 6$ and those with $\theta \geq 6$. The reader may confirm that no 3-partition equilibrium is possible in either of these cases. We now proceed to show that a 3-partition equilibrium can arise when both groups lobby the policymaker.

Suppose the lobbyist for SIG 1 reports first, and that he delivers either message m_1 that indicates $\theta \leq \theta_1$ or m_2 that indicates $\theta \geq \theta_1$. The lobbyist renders his advice with the understanding that an opposing group will report subsequently. When it is time for the lobbyist for SIG 2 to meet with the policymaker, he delivers the message $\hat{m}_1$ that indicates $\theta \leq \hat{\theta}_1$ or the message $\hat{m}_2$ that means $\theta \geq \hat{\theta}_1$. Our job is to find values of θ_1 and $\hat{\theta}_1$ such that both reports are credible when each lobbyist correctly forecasts the ensuing events.

Once the lobbyist for SIG 1 has delivered his message m_1, the report by the representative of SIG 2 gives additional information to the policymaker. Suppose, for example, that $\theta_1 \geq \hat{\theta}_1$. Then a message $\hat{m}_1$ suggests to the policymaker that θ lies between 0 and $\hat{\theta}_1$, while the message $\hat{m}_2$ suggests that θ lies between $\hat{\theta}_1$ and θ_1. With the former message, the policymaker sets the policy $p = \hat{\theta}_1/2$; with the latter message, she sets $p = (\hat{\theta}_1 + \theta_1)/2$. SIG 2 must be indifferent between these two outcomes when $\theta = \hat{\theta}_1$, which requires $(\hat{\theta}_1 + 3) - \hat{\theta}_1/2 = (\theta_1 + \hat{\theta}_1)/2 - (\hat{\theta}_1 + 3)$, or

$$\hat{\theta}_1 = \frac{\theta_1}{2} - 6. \tag{4.17}$$

Also, the lobbyist for SIG 1 must be indifferent between reporting m_1 and reporting m_2 when the state is θ_1. Since this lobbyist reports first, he must forecast the response by his counterpart. A report of m_1, coupled with the best response by SIG 2, induces a policy of $p = (\hat{\theta}_1 + \theta_1)/2$. A report of m_2 and the best response of SIG 2 yields a policy of $p = (\theta_1 + 24)/2$. SIG 1 is indifferent between these two outcomes in state θ_1 if and only if $(\theta_1 - 3) - (\theta_1 + \hat{\theta}_1)/2 = (\theta_1 + 24)/2 - (\theta_1 - 3)$, or

$$\theta_1 = \frac{\hat{\theta}_1}{2} + 18. \tag{4.18}$$

Equations (4.17) and (4.18) are the only two requirements for a 3-partition equilibrium. They are both satisfied when $\theta_1 = 20$ and $\hat{\theta}_1 = 4$. Thus, we have identified a 3-partition equilibrium in which the lobbyist for the group that prefers a relatively low level of the policy variable first reports whether θ is greater or less than 20, and the lobbyist for the group that prefers a relatively high level of the policy subsequently reports whether θ is greater than or less than 4. If the policymaker hears the pair of messages m_1 and $\hat{m}_1$, she sets $p = 2$; if she hears m_1 and $\hat{m}_2$, she sets $p = 12$; and if she hears m_2 and $\hat{m}_2$, she sets $p = 22$. These responses validate the lobbyists' reporting strategies.

When we compare the expected welfare of the policymaker in the 3-partition equilibrium to what she can achieve when she has only a

single source of information, we find that having advisers on opposite sides of the issue works to the policymaker's benefit. What is more surprising, perhaps, is that the groups themselves gain from this, at least in an ex ante sense. Viewed from a time before the groups learn the value of θ, each has higher expected welfare in the 3-partition equilibrium that exists when both lobby than in the best equilibrium that can arise when only one group engages in lobbying. The explanation for this is simple. When a group provides information without any foil, the policymaker will be wary of its report. This wariness causes the policy outcome to differ greatly from what is warranted in some states of the world. But when a group's report must be confirmed by the report of another group that has an opposing bias, the report enjoys greater credibility. Both groups benefit from the ability to communicate information about the policy environment.

We have constructed a 3-partition equilibrium for our numerical example. But this is not the best that can be achieved. In fact, our example admits equilibria in which the policymaker becomes fully informed about the policy environment for a range of values of θ. Only for extreme values of the state variable is the policymaker forced to rely on coarse information.

Krishna and Morgan (2001) show that the properties of our numerical example are rather general. For the case of opposite bias, they establish the existence of an equilibrium with "partial revelation" whenever both lobby groups are "nonextreme." By partial revelation, we mean that lobbying enables the policymaker to infer the state of the world for a continuous range of values of θ. A group is nonextreme if it does not wish to have the policymaker believe that the state is $\theta_{\min}$ (or $\theta_{\max}$) in all states of the world. When a partial-revelation equilibrium does exist, it yields higher ex ante welfare to the policymaker and to both SIGs than does any equilibrium with lobbying by only a single group. When a partial-revelation equilibrium does not exist, then the groups' extreme preferences deprive their lobbyists of any credibility. The only equilibrium in such circumstances is a babbling equilibrium.

4.2.3 *Multidimensional Information*

Our discussion in this chapter has been confined to unidimensional policy issues and unidimensional uncertainty about the policy environment. Although much of the literature focuses on this case, that focus may be limiting. Indeed, a recent paper by Battaglini (2000) has shown that increasing the dimensionality of the policy problem may improve the prospects for information transmission. That is, lobby groups may be more effective in communicating information when there are many dimensions to policy than when the policy choice concerns the height of a single policy instrument.

We consider now a setting with two interest groups, two dimensions of policy, and two dimensions of policy uncertainty. The two policy dimensions might reflect different aspects of a single instrument (e.g., the tax rate on long-term capital gains and the minimum holding period for a gain to be considered "long term"), or two entirely different instruments (e.g., the tax rate on gasoline sales and the maximum allowable pollution emission). We represent the policy by a two-dimensional vector $\mathbf{p} = (p_1, p_2)$ and the state of the world by a two-dimensional vector $\boldsymbol{\theta} = (\theta_1, \theta_2)$.[20] The welfare function of the policymaker is $G(\mathbf{p}, \boldsymbol{\theta}) = -\sum_{j=1}^{2}(p_j - \theta_j)^2$, while that of SIG i is $U_i(\mathbf{p}, \boldsymbol{\theta}) = -\sum_{j=1}^{2}(p_j - \theta_j - \delta_{ij})^2$, for $i = 1, 2$. Thus, $\mathbf{p} = \boldsymbol{\theta}$ is the policymaker's ideal policy vector in state of the world $\boldsymbol{\theta}$, whereas $\mathbf{p} = \boldsymbol{\theta} + \boldsymbol{\delta}_i$ is the favorite of SIG i in that state. The vector $\boldsymbol{\delta}_i = (\delta_{i1}, \delta_{i2})$ denotes the bias in the preferences of SIG i relative to those of the policymaker. A group may prefer larger (or smaller) values of p_1 and p_2 than the policymaker in every state of the world, or it may prefer a larger value on one dimension and a smaller value on the other.

We assume that both groups know the values of both bits of information; that is, each knows the realization of the (two-dimensional) random variable $\tilde{\boldsymbol{\theta}}$. Lobbyists for the two groups meet with the policymaker privately to deliver their assessment of the policy environment.[21] The policymaker uses the advice to update her beliefs about

20. We alert the reader to a temporary change of notation. Whereas until now we have used θ_1 to denote the highest value of θ for which the lobbyist for SIG 1 sends the message m_1, we now use it to denote the first element of the vector $\boldsymbol{\theta}$. We will revert to the previous usage in the next chapter.

21. Recall from Section 4.2.1 that, with like bias and private reporting, there always exists an equilibrium with full revelation. This equilibrium arises when each lobbyist reports a state of the world and the policymaker sets the policy equal to the minimum of the two reports. However, we noted at the time the fragility of this equilibrium. It relies on each lobbyist being fully confident that the other will reveal the true state, so that each is indifferent between doing so himself or not. With even the slightest possibility that a lobby may observe the state of the world with error, the equilibrium with full revelation disappears. In contrast, the equilibrium with full revelation that we shall describe for the case of multiple policy dimensions is immune to this critique, as we shall discuss further below. Battaglini (2000) has shown that full revelation typically is not possible with sequential public reporting about multiple dimensions of policy uncertainty unless a special condition relating the groups' preferences is satisfied.

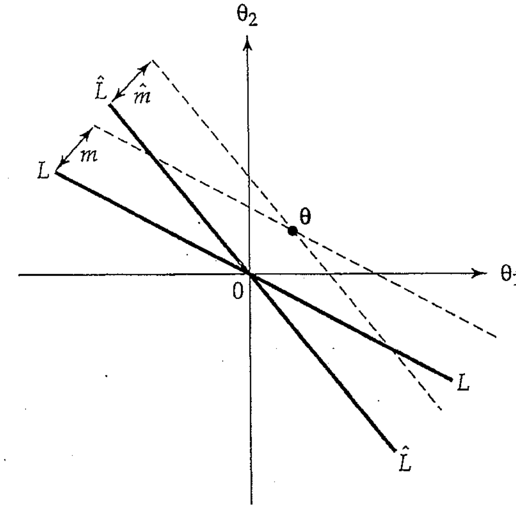

Figure 4.4
Messages with Two Policy Dimensions

$\tilde{\boldsymbol{\theta}}$. Then she chooses the policy vector $\mathbf{p}$ that maximizes her expected utility.

We consider the lobbying game that arises when $\boldsymbol{\delta}_1$ is not proportional to $\boldsymbol{\delta}_2$. If $\boldsymbol{\delta}_1$ were proportional to $\boldsymbol{\delta}_2$, that would mean that the bias of SIG 1 relative to that of SIG 2 is the same in every dimension. With a lack of proportionality, each group is relatively more biased along one policy dimension.

When the groups differ in their relative biases, there exists an equilibrium with full revelation of $\boldsymbol{\theta}$. In this equilibrium, the lobbyist for SIG 1 reports the value of $m = \delta_{21}\theta_1 + \delta_{22}\theta_2$. This report informs the policymaker of the distance of $\boldsymbol{\theta}$ from the line LL defined by $\delta_{21}\theta_1 + \delta_{22}\theta_2 = 0$. Meanwhile, the lobbyist for SIG 2 delivers the message $\hat{m} = \delta_{11}\theta_1 + \delta_{12}\theta_2$. This message informs the policymaker of the distance of $\boldsymbol{\theta}$ from the line $\hat{L}\hat{L}$ defined by $\delta_{11}\theta_1 + \delta_{12}\theta_2 = 0$. Figure 4.4 depicts the lines LL and $\hat{L}\hat{L}$, as well as the messages m and $\hat{m}$, for a particular realization of $\boldsymbol{\theta}$. When the policymaker hears the messages m and $\hat{m}$, she can construct the two dotted lines shown in the figure. Then she can find the value of $\boldsymbol{\theta}$ at the point where they intersect. Thus, the messages allow the policymaker to identify the state of the world. It remains to check only that the lobbyists have incentives to report them truthfully.

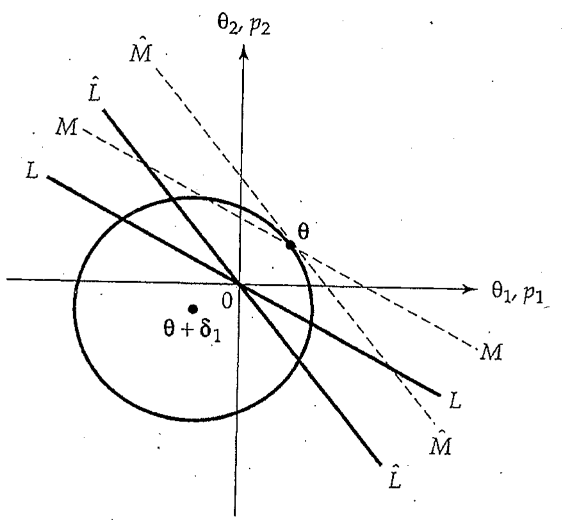

Figure 4.5
Best Response by SIG 1

Suppose the lobbyist for SIG 1 expects his counterpart to report $\hat{m} = \delta_{11}\theta_1 + \delta_{12}\theta_2$. Now consider figure 4.5, which reproduces the essential features of figure 4.4. In this figure we have added the indifference curve for SIG 1 that goes through the point $\boldsymbol{\theta}$. In general, SIG 1 is indifferent among policies that are equidistant from its ideal point of $\boldsymbol{\theta} + \boldsymbol{\delta}_1$; these are points on circles centered at $\boldsymbol{\theta} + \boldsymbol{\delta}_1$. So SIG 1 is indifferent between the policy $\mathbf{p} = \boldsymbol{\theta}$ and those that lie on the circle that we have drawn, when the state of the world is $\boldsymbol{\theta}$. It prefers all such policies to those that are farther from its ideal point, that is, those that lie outside the indicated indifference curve.

If the lobbyist for SIG 2 reports truthfully, the policymaker will suspect $\boldsymbol{\theta}$ to lie somewhere along the dotted line labeled $\hat{M}\hat{M}$. The report from the lobbyist for SIG 1 allows her to form beliefs about the location of $\boldsymbol{\theta}$ on this line. Since the policymaker sets the policy vector equal to what she believes to be the state, a truthful report results in the policy $\mathbf{p} = \boldsymbol{\theta}$. A false report can be used by the lobbyist to achieve any point along $\hat{M}\hat{M}$. But notice that SIG 1 prefers the policy $\mathbf{p} = \boldsymbol{\theta}$ to any other policy on $\hat{M}\hat{M}$. It follows that the lobbyist for SIG 1 will report truthfully if he expects his counterpart to do so. The same argument applies to the lobbyist for SIG 2.

Unlike the equilibrium with full revelation that exists when the lobbyists report privately about a single item of policy-relevant information, the equilibrium here survives the introduction of small reporting mistakes by the lobbyists. Battaglini (2000) considers a game in which group i observes the correct value of $\boldsymbol{\theta}$ with probability $1 - \varepsilon_i$ and observes a random, incorrect value of $\boldsymbol{\theta}$ with probability ε_i. He supposes that the probabilities of error are independent for the two groups and that the groups themselves do not know if their research has been faulty or not. If the probability of a mistake is small for each group, there exists an equilibrium with (nearly) full revelation of $\boldsymbol{\theta}$ when the policy environment has two dimensions of uncertainty, but not when there is only one. In the equilibrium with nearly full revelation, the policymaker learns the true value of $\boldsymbol{\theta}$ except in those rare instances when one of the groups observes the state with error.

What allows for full revelation in situations with multiple policy dimensions is the ability of the policymaker to find a "direction" of policy in which her own interests align with those of each interest group. In state $\boldsymbol{\theta}$, the policymaker and SIG 1 agree that $\mathbf{p} = \boldsymbol{\theta}$ is the best policy among those on $\hat{M}\hat{M}$. Thus, the policymaker can trust the lobbyist for SIG 1 to report truthfully about the distance of MM from LL. And the policymaker and SIG 2 agree that $\mathbf{p} = \boldsymbol{\theta}$ is the best policy among those on MM. So, the lobbyist for SIG 2 can report credibly about the distance of $\hat{M}\hat{M}$ from $\hat{L}\hat{L}$. The prospect for finding coincident interests would be obvious, perhaps, if each SIG had unbiased preferences relative to the policymaker's along one dimension of policy, and if these dimensions of agreement were different for the two groups. Then the policymaker could rely on the lobbyist for SIG 1 to provide information about, say, θ_2, and the lobbyist for SIG 2 to provide information about θ_1. But we have seen that the same outcome can be achieved even when the groups' preferences are biased along both policy dimensions, provided that each group is comparatively more biased along a different dimension.

Battaglini's arguments can be generalized to other utility functions besides the quadratic. However, it does rely on the alignment of the different policy dimensions with the different dimensions of policy uncertainty. Suppose, for example, that the policymaker has the welfare function $G(\mathbf{p}, \boldsymbol{\theta}) = -[p_1 - (\theta_1 + \theta_2)]^2 - (p_2)^2$, while the welfare function for SIG i is $U_i(\mathbf{p}, \theta) = -[p_1 - (\theta_1 + \theta_2) - \delta_{i1}]^2 - (p_2 - \delta_{i2})^2$. Here, both bits of information bear on the policymaker's choice of p_1. Since both groups are biased in their preferences along this dimension, the problem is like the unidimensional case. Each lobbyist has an incentive to misrepresent θ_1 or θ_2 if he sees the slightest chance that his counterpart will report one of these parameters with error. Further research is needed to clarify the generality of Battaglini's results and, more important, to characterize the equilibria that can arise when there are several interest groups and several dimensions of policy, and each group is relatively better informed about certain aspects of the policy environment.

We have seen in this chapter how SIGs can use their knowledge of the policy issues to influence policy choices. We have modeled lobbying as cheap talk; that is, as a game in which messages are costless to deliver but difficult to verify. Such lobbying typically reduces the uncertainty facing a policymaker, but cannot eliminate it entirely. Importantly, in most cases, the sharing of information is beneficial to both the policymaker and the interest group. Even when two groups with disparate preferences lobby a policymaker, each group gains relative to the outcome that would result from an uninformed policy choice. Indeed, the gains from lobbying often are greatest when the groups wish to pull the policymaker in opposite directions, because then each group can serve as a credibility check on the other. The dimensionality of the policy problem can also affect the groups' ability to communicate information credibly. Policymakers may be able to learn more when lobbyists convey information about several dimensions of policy than they can when the policy advice concerns a single policy parameter.

4.3 Appendix: A More General Lobbying Game

In this appendix we provide a more general treatment of the lobbying game of Section 4.1. We describe a setting in which the probability distribution for $\tilde{\theta}$ is an arbitrary one, and the policymaker and interest group have objective functions that may represent a broad class of preferences. We begin by describing the setting and then proceed to report results that generalize our earlier findings.

4.3.1 *The General Setting*

We now take $G(p, \theta)$ and $U(p, \theta)$ to be general functions, not necessarily quadratic as in Section 4.1. We assume only that these functions are differentiable, strictly concave in the policy variable p, and that the cross-partial derivatives $G_{p\theta}$ and $U_{p\theta}$ are positive. The last of these assumptions means that increases in the level of the policy variable are more valuable to the policymaker and the SIG the higher is the level of θ.

The random variable $\tilde{\theta}$ now has a cumulative distribution function $F_\theta(\theta)$, with density function $f_\theta(\theta) = F'_\theta(\theta)$. We take $f_\theta(\theta)$ to be strictly positive for all values of θ between $\theta_{\min}$ and $\theta_{\max}$ and equal to zero for all values of θ outside this range. We further assume that the group's ideal policy is greater than that of the policymaker in every state of the world. Namely,

$$\arg\max_p U(p, \theta) > \arg\max_p G(p, \theta) \quad \text{for all } \theta \in [\theta_{\min}, \theta_{\max}].$$

The lobbyist learns the value of θ before the game begins. In the first stage, he communicates a "message" to the policymaker. The message is one of a finite or infinite set of possible statements, M. The lobbyist's strategy can be described by a function $\sigma(\theta)$ such that when the lobbyist observes θ, he communicates the message $m = \sigma(\theta)$ for some $m \in M$.[22]

The policymaker interprets any message according to her beliefs about the lobbyist's strategy. Let $\hat{\sigma}(\theta)$ be the strategy that the policymaker suspects the lobbyist of using. Then the policymaker interprets the message m to mean that the state is one of those for which $m = \hat{\sigma}(\theta)$. Upon hearing a message, she updates her beliefs about the distribution of $\tilde{\theta}$ by applying Bayes' rule. We define $\hat{F}_\theta(\cdot|m, \hat{\sigma})$ to be the policymaker's posterior distribution for $\tilde{\theta}$ when she hears the message m and believes the lobbyist's strategy to be $\hat{\sigma}$.[23]

The policymaker chooses p in the second stage to maximize her expected welfare, given her posterior beliefs about the policy envi-

22. We could allow for richer strategies. For example, the lobbyist might draw his message from a probability distribution, so that the same value of θ might give rise to one of several different messages. But we focus on pure strategies, whenever possible, to keep matters simple.

23. Bayes' rule applies for every message m that the policymaker expects to hear with positive probability. If the policymaker does not expect to hear some message m' in any state of the world, then $\hat{F}_\theta(\theta|m', \hat{\sigma})$ is not restricted.

ronment. The policy choice depends on the message she has heard and on her beliefs about the lobbyist's strategy. We denote this dependence by $p^G(m|\hat{\sigma})$. Using the posterior distribution induced by the message m given the beliefs $\hat{\sigma}$, we have

$$p^G(m|\hat{\sigma}) = \arg\max_p \int G(p,\theta)\, d\hat{F}_\theta(\theta|m,\hat{\sigma}).$$

What is an optimal strategy for the lobbyist under these conditions? We assume that the lobbyist knows how the policymaker will interpret his messages and knows the policymaker's preferences. Therefore, he can forecast the outcome $p^G(m|\hat{\sigma})$ that will result for any message. The optimal lobbying strategy, $\sigma(\theta)$, is constructed by finding, for each value of θ, the message $m \in M$ that maximizes $U[p^G(m|\hat{\sigma}),\theta]$.

In an equilibrium, the policymaker's beliefs must be consistent with the incentives faced by the lobbyist. But we have seen that the beliefs $\hat{\sigma}(\theta)$ give the lobbyist an incentive to follow the strategy $\sigma(\theta)$. Consistency thus requires that $\hat{\sigma}(\theta) = \sigma(\theta)$.[24]

4.3.2 *Properties of an Equilibrium*

It is easy to see that no equilibrium can be characterized by full revelation. Suppose to the contrary that the policymaker expects to learn the precise value of θ from the lobbyist's report. Then she must expect to hear a different message in each state of the world. For convenience, we let θ denote the message that the policymaker interprets as an indication that the state is θ. That is, we take $\hat{\sigma}(\theta) = \theta$. For example, the message θ might be the literal statement, "the state is θ." Upon hearing the message θ, the policymaker updates her beliefs to place a probability one on the event that the state is θ, and a probability zero on the possibility that the state is different from θ. She then implements the policy that maximizes her welfare in state θ.

We now show that it is not optimal under these circumstances for the lobbyist to use the strategy $\sigma(\theta) = \theta$. In state θ, the ideal policy for the interest group is larger than the ideal policy for the politician. If the lobbyist were to misrepresent the state to be something greater

24. We also need to specify beliefs "off the equilibrium path"—that is, beliefs that apply when the policymaker observes a message that is not part of the equilibrium play. We omit this part of the discussion because it has no important bearing on the main thrust of our arguments.

than θ, the policymaker would respond, given her beliefs, by setting a policy more to the group's liking. Since the beliefs $\hat{\sigma}(\theta) = \theta$ can never give rise to behavior that fulfills those beliefs, the policymaker cannot expect full revelation in any equilibrium.

It is also easy to see that a babbling equilibrium always exists. In a babbling equilibrium, the policymaker interprets all messages as providing no new information. In other words, she treats all literal statements as if they were the same message, say m^*. The policymaker's beliefs about the lobbyist's strategy can be described by $\hat{\sigma}(\theta) = m^*$ for all θ. When the policymaker forms her post-message beliefs about $\tilde{\theta}$, the posterior distribution coincides with the prior distribution.[25] Therefore, she sets the policy that maximizes her expected welfare under the distribution $F_\theta(\cdot)$. Here the policy outcome is invariant to the message. So the strategy $\sigma(\theta) = m^*$ is as good for the lobbyist as any other. In short, the beliefs $\hat{\sigma}(\theta) = m^*$ can give rise to the behavior $\sigma(\theta) = m^*$ as an optimal response. This validates the equilibrium.

Crawford and Sobel (1982) have characterized all of the possible equilibria in games such as this one. The properties they have established are generalizations of the ones that we highlighted in Section 4.1.4. They showed, first, that every equilibrium can be represented as a *partition equilibrium*. In a partition equilibrium, the lobbyist chooses one of a finite number n of messages, say $m \in \{m_1, m_2, \ldots, m_n\}$. The policymaker interprets the message m_i to mean that $\theta_{i-1} \le \theta \le \theta_i$ for some set of numbers $\{\theta_0, \theta_1, \ldots, \theta_n\}$ such that $\theta_0 = \theta_{\min}$ and $\theta_n = \theta_{\max}$. In other words, the lobbyist partitions the space of possible values of the state variable into a finite number of subsets, and advises the policymaker which subset includes the true value of θ. When the policymaker hears the message m_i, she updates her beliefs to exclude the possibility that θ lies outside the range from θ_{i-1} to θ_i. Then, by Bayes' rule, $\hat{f}_\theta(\theta|m_i) = f_\theta(\theta)/[F(\theta_i) - F(\theta_{i-1})]$ for all $\theta \in [\theta_{i-1}, \theta_i]$ and $\hat{f}_\theta(\theta|m_i) = 0$ for all $\theta \notin [\theta_{i-1}, \theta_i]$. The policymaker chooses the policy $p(m_i)$, where

$$p(m_i) = \arg\max_p \int_{\theta_{i-1}}^{\theta_i} G(p,\theta)\hat{f}_\theta(\theta|m_i)\, d\theta.$$

25. If the policymaker hears a message other than m^*, she cannot apply Bayes' rule to update her beliefs. In a perfect Bayesian equilibrium, the policymaker can attach any meaning at all to this sort of message. In the babbling equilibrium, her posterior distribution for $\tilde{\theta}$ is the same as her prior distribution, even if she hears a message different from m^*.

This policy maximizes the policymaker's expected welfare, conditional on her belief that $\tilde{\theta}$ must lie between θ_{i-1} and θ_i.

The lobbyist's optimal strategy must coincide with the policymaker's beliefs. This requirement pins down the boundaries of each partition. Near each boundary point, the lobbyist must have no incentive to lie when the true value of θ is just above the boundary and when it is just below it. Thus, when $\theta = \theta_i$, the lobbyist must be indifferent between the policy that results when he sends the message m_i and the policy that results when he sends the message m_{i+1}. This requires

$$U[p(m_i), \theta_i] = U[p(m_{i+1}), \theta_i]. \tag{4.19}$$

For any welfare functions $G(p, \theta)$ and $U(p, \theta)$ and any distribution $F_\theta(\theta)$, there exists a maximum number of messages that can be used in the lobbying equilibrium. This maximum number, say $n_{\max}$, depends on the degree of alignment in the interests of the SIG and the policymaker. The more similar are the welfare functions of the interest group and the policymaker, the larger is $n_{\max}$.

Crawford and Sobel prove that, if an equilibrium with n different messages exists, then an equilibrium with $n-1$ messages also exists. Moreover, under some conditions, they can establish the uniqueness of the equilibrium with a given number of messages.[26] If these conditions hold, the lobbying game has exactly $n_{\max}$ different equilibria. These $n_{\max}$ equilibria can be ranked in terms of ex ante welfare. In particular, both the SIG and the interest group achieve higher ex ante welfare (evaluated in terms of the prior distribution for $\tilde{\theta}$, namely F_θ) in the equilibrium with n different messages than in the one with k different messages, for all $k < n$. The coincidence of ex ante preferences may be useful in selecting among equilibria, if the two sides have an opportunity to discuss the interpretation of messages before the SIG learns the state of the world.

26. A sufficient condition for the uniqueness of an equilibrium with a given number of messages is as follows. Consider the sets of values of θ, $\{\theta_0, \theta_1, \ldots,\}$, that satisfy $U[p(m_i), \theta_i] = U[p(m_{i+1}), \theta_i]$ for $i \geq 1$. Let $\{\hat{\theta}_0, \hat{\theta}_1, \ldots,\}$ and $\{\theta_0^*, \theta_1^*, \ldots,\}$ be two such sets with $\hat{\theta}_0 = \theta_0^*$ and $\hat{\theta}_1 > \theta_1^*$. Then uniqueness is assured if $\hat{\theta}_i > \theta_i^*$ for all $i \geq 2$. Crawford and Sobel provide, in their Theorem 2, conditions on the utility function $U(\cdot)$ and the distribution of states $F_\theta(\cdot)$ that guarantee that the above sufficient condition will be satisfied.

5 Costly Lobbying

In the last chapter we abstracted from the costs that interest groups must incur to collect and disseminate information. In reality, lobbying often entails significant costs. Interest groups hire lawyers and policy experts, engage in advertising and mailings, and sometimes pay fairly large sums to entertain policymakers in an effort to gain their sympathies. Many of these costs can be avoided by a group that elects not to participate in the lobbying game. In this chapter we examine the incentives that interest groups have to invest in lobbying and the effect that these costs have on their ability to educate policymakers.

It is useful to divide lobbying costs into three categories. Some costs are relatively fixed and outside the control of the interest group. Other costs may be varied at a group's discretion. Still other costs are imposed by the policymakers themselves. We examine each of these categories of expenses in successive sections of this chapter.

Lobbying costs that are outside a group's control are the subject of Section 5.1. We refer to these as *exogenous costs*. They may include, for example, the salaries of the technical experts who are needed to prepare policy briefs and of the lawyers who are needed to present the briefs to the policymakers. An important characteristic of exogenous costs is that they do not vary with the content of a group's message. For example, it may be that a SIG must pay roughly the same amount to hire a lawyer to argue that the policy environment warrants a moderate policy level as it would to hire a lawyer who claims that the situation is more extreme. When lobbying costs are independent of content, the policymaker cannot infer much about the policy environment from the size of these expenses. But she may be able to glean some useful information from the fact that the group was willing to bear these costs. If a group benefits differently from a given policy action in different states of the world, the fact that the group is willing to incur the cost of lobbying gives some indication about what the true state might be.[1]

Once we recognize that the mere act of lobbying can convey information, we understand why a group might be willing to incur expenses beyond those that are strictly necessary. A group might choose to run a costly advertising campaign rather than a more modest one, or to hire a stable of high-priced lawyers rather than a few articulate spokespersons. By opting for greater expense when less would suffice, the group might be able to signal the strength of its convictions or to indicate something about the nature of the policy environment. In Section 5.2 we examine *endogenous lobbying costs*—those expenses that groups bear beyond the minimum necessary to convey their messages.

A final category of costs includes those that are imposed by policymakers. Some policymakers may insist that an interest group contribute to their campaigns before they are willing to schedule a meeting to discuss the group's concerns. More often a contribution is not a strict prerequisite for a conference, but groups see their contributions as a means to increase the likelihood of being granted a meeting. Groups often secure such access long before they know what issues will appear on the policy agenda. Accordingly, it makes sense to think of the access costs as being incurred before a group learns the state of the world. A first question to ask is, Why does the policymaker impose these costs? After all, the information she stands to obtain from the lobbyist will be valuable to her in deciding her policy actions. One possible answer is that politicians need resources to finance their campaigns. They may be willing to sacrifice some useful information in order to raise the needed funds. Another possibility is that policymakers use the price of admission as a screen to distinguish groups that are more likely to provide valuable information from those whose reports will be less valuable. We will consider both of these explanations for *access costs* in Section 5.3.

1. The costs that we consider here can be avoided if an interest group decides to refrain from lobbying. They are to be distinguished from other fixed costs that a SIG must bear in order to become and remain an organized entity. Organizational costs are important for determining which interests will be active in the lobbying game, but they do not affect a group's decision of whether to lobby on a particular issue, nor do they figure in the policymaker's interpretation of a group's claims. The analysis of Chapter 4 applies to situations in which an organization bears (only) unavoidable fixed costs.

5.1 Exogenous Lobbying Costs

We begin with lobbying costs that are exogenously fixed and that are invariant to the content of a group's message. As we suggested earlier, these costs may include payments to experts and lawyers who are needed to prepare the policy briefs and to argue the group's case. We examine first the case of a single interest group that has information about a dichotomous variable. Then we proceed to situations with a continuous policy variable, and finally to situations with multiple lobbies.

5.1.1 *Single Lobby, Dichotomous Information*

Our discussion in this section builds on Potters and van Winden (1992). There is a single interest group, whose preferences are represented by the function $U = -(p - \theta - \delta)^2 - l$, where p is a policy variable and θ describes the state of the world. The new variable is l, which represents the cost of lobbying. In this section we take l to equal zero when the SIG chooses not to lobby and $l = l_f > 0$ when it elects to present its case. The SIG knows the state of the world, which may be either θ_H or θ_L, with $\theta_H > \theta_L$. The group's ideal policy in state θ is $\theta + \delta$, for some value of $\delta > 0$.

The policymaker has an objective function $G = -(p - \theta)^2$. Thus, the policymaker has a target policy of θ when the state is θ, but she does not know the prevailing state. She begins with the prior belief that each of the two states is equally likely. Then she updates her beliefs based on what she observes and hears. After learning what she can, she chooses p to maximize her expected utility.

As in Chapter 4, we have introduced some degree of congruence in the interests of the SIG and the policymaker, but also some conflict. Both the group and the policymaker prefer a larger value for p when the state is θ_H than when it is θ_L. This shared preference for a policy that is appropriate to the state introduces the possibility of mutually beneficial communication. However, in any given state of the world, the SIG prefers a higher value of p than the policymaker does. Thus, the policymaker must be wary of strategic manipulation. As before, the parameter δ measures the bias in the group's preferences relative to those of the policymaker—that is, the extent of the conflict in their relationship.

The lobbying game proceeds as follows. First, the interest group learns the true value of θ; then it decides whether to bear the cost l_f

of preparing a case and presenting it to the policymaker. If the SIG chooses to lobby, the policymaker updates her beliefs about θ based on the observation that a report has been made and on the content of that report. If the SIG opts not to prepare a case, the policymaker still might update her beliefs in recognition of the fact that the group opted not to appear. After updating her beliefs, the policymaker chooses the policy level to maximize her expected utility.

When $l_f = 0$, the situation is very much akin to that described in Section 4.1.2. The interest group may lobby the policymaker in all states, but only reports that are persuasive will be taken at face value. This means that the interest group must have an incentive to report truthfully in each state of the world, if any communication is to occur. When the state is θ_H, there is no risk of false reporting, since the group would never wish to report a value for θ smaller than the actual one. But when the state is θ_L, the group may be tempted to misrepresent its case. If the SIG reports "high" in state θ_L and the policymaker accepts the report as true, the resulting policy of $p = \theta_H$ may be more to the group's liking than the smaller value of $p = \theta_L$ that would result from an honest report. Recall that truthful reporting in state θ_L requires $\delta \leq (\theta_H - \theta_L)/2$; that is, the bias in the group's preferences relative to those of the policymaker must be small relative to the difference in policies indicated by the alternative states (see (4.1)). Otherwise the group's report will not be credible, and the policymaker will set $p = (\theta_H + \theta_L)/2$ no matter what report she hears.

Paradoxically, the SIG might fare better when lobbying is costly than when it is not. A positive lobbying cost can benefit the group, because it affords the group an added means to gain credibility. Consider a situation with $l_f > 0$. If the group chooses to bear this expense, its incentives for truthful reporting will be the same as those described above. Namely, the lobbyist will inevitably report truthfully when the state is θ_H, but he might be tempted to claim θ_H even when the state is θ_L. In some cases, however, the potential benefit from false reporting would not be enough to justify the lobbying cost. In such circumstances the SIG would choose to keep its lobbyist at home when the state is θ_L. But then the mere fact of the group's appearance would indicate to the policymaker that the true state must be θ_H. The content of the policy brief is no longer important, since the information has been conveyed by the group's willingness to prepare it.

We attempt now to construct an equilibrium in which the policymaker infers the value of θ from the lobbying behavior of the interest group. In such an equilibrium the policymaker takes a group's willingness to lobby to imply that $\theta = \theta_H$ and a failure to lobby to mean that $\theta = \theta_L$. To support such beliefs, the group must be willing to bear the expense of lobbying when the state is θ_H. In this state the group faces a choice between paying the cost of l_f and achieving a policy of $p = \theta_H$, or saving itself the expense and accepting $p = \theta_L$. The SIG is willing to pay the lobbying cost in state θ_H if and only if $-\delta^2 - l_f \geq -(\theta_L - \theta_H - \delta)^2$, or

$$l_f \leq (\theta_H - \theta_L)(2\delta + \theta_H - \theta_L) \equiv k_1. \tag{5.1}$$

The group must also prefer to refrain from lobbying when the state is θ_L. By failing to lobby, it accepts a policy of θ_L, but saves l_f. If it were to opt instead to deliver a (false) report, it could induce a policy of $p = \theta_H$ at a cost of l_f. The SIG prefers to refrain from lobbying in state θ_L if and only if $-\delta^2 \geq -(\theta_H - \theta_L - \delta)^2 - l_f$, or

$$l_f \geq (\theta_H - \theta_L)[2\delta - (\theta_H - \theta_L)] \equiv k_2. \tag{5.2}$$

Since $k_1 > k_2$, there is a range of lobbying costs for which both (5.1) and (5.2) are satisfied. For these values of l_f, there exists an equilibrium in which the SIG engages in lobbying if and only if the state warrants a high level of the policy, and the mere act of lobbying signals the state of the world. Notice that $k_2 > 0$ if and only if $\delta > (\theta_H - \theta_L)/2$. This makes sense, for it says that a positive lobbying cost is required for credibility if and only if the SIG has an incentive to report falsely when $\theta = \theta_L$.

It is interesting to compare how the policymaker and the interest group each fare in an equilibrium with costly lobbying to how they would fare in the same environment were lobbying to be costless. We know that, if $\delta > (\theta_H - \theta_L)/2$, communication would be impossible in the absence of lobbying costs. Then the policymaker would set $p = (\theta_H + \theta_L)/2$, which is not her ideal policy in either state of the world. But when l_f falls between k_1 and k_2, the costly lobbying (or its absence) allows the policymaker to infer the true value of θ. Then she achieves her ideal policy in both states of the world. Clearly, the policymaker prefers the outcome with costly lobbying and full revelation to the outcome with costless lobbying that proves to be uninformative.

As for the interest group, we calculate its expected welfare at a time before it learns the realization of $\tilde{\theta}$. When lobbying is costly, the group achieves a welfare level of $-\delta^2 - l_f$ in state θ_H and a welfare level of $-\delta^2$ in state θ_L. Its expected welfare is $-\delta^2 - l_f/2$, considering that the two states are equally likely. It is easy to verify that the SIG prefers a situation in which lobbying is costly to one in which it is costless but futile if and only if $l_f < (\theta_H - \theta_L)^2/2$. It follows that both the policymaker and the interest group may benefit from having lobbying not be free.[2]

However, the opportunity to engage in costly lobbying is not always a blessing to the interest group. When $l_f > (\theta_H - \theta_L)^2/2$, the group fares worse in an equilibrium with effective lobbying than it would if lobbying were not a possibility at all. This may seem surprising, inasmuch as the SIG always has the choice not to pay the lobbying cost. But the group can suffer from an inability to tie its own hands. If the policymaker expects the SIG to lobby whenever the state is θ_H, she will interpret a failure to appear as an indication that the state is θ_L. Then, if $l_f < k_1$, the group will indeed prefer to pay the cost when the state is θ_H. But when $l_f > (\theta_H - \theta_L)^2/2$, its expected welfare with full revelation and an expected lobbying bill of $l_f/2$ still is lower than what it would be if the policy were always $p = (\theta_H + \theta_L)/2$ and the expected lobbying expense were zero. The group would lose from having the opportunity to lobby, unless it could somehow commit itself ahead of time (before learning the realization of $\tilde{\theta}$) never to come pleading for a high level of the policy.[3]

When (5.2) is violated, it is impossible for the policymaker to infer the state of the world from the lobbyist's actions and words. Still, as Potters and van Winden (1992) have shown, there may be an equilibrium in which the group's lobbying behavior conveys some limited information to the policymaker. Specifically, they construct an equilibrium in which the interest group pursues a mixed strategy. If the state is θ_H, the SIG lobbies the policymaker with probability one. But

2. See Banerjee and Somanathan (2001) for another example of a communication game in which both players may prefer a situation in which communication costs are positive to one in which they are zero.

3. We should note that when $\delta > (\theta_H - \theta_L)/2$, there also exists an equilibrium without any lobbying. If the policymaker expects no lobbying to occur, and if she assumes that any lobbying that does take place reflects a mistake that is equally likely to happen in either state, she will set $p = (\theta_H + \theta_L)/2$ no matter whether she is lobbied or not. Then the SIG will have no reason to bear the cost of lobbying, since it can have no effect on the policy outcome.

if the state is θ_L, it randomizes its choice, so that it sometimes lobbies and sometimes refrains. Since lobbying might occur in either state, the policymaker cannot infer from lobbying that the state must be θ_H. But she can update her beliefs based on what she sees. She will certainly put more weight on the possibility that $\theta = \theta_H$ when she observes lobbying than when she does not.

We proceed now to construct such a mixed-strategy equilibrium and to derive the limits on l_f for which it exists. Let the policymaker anticipate that lobbying will surely take place when the state is θ_H and that it will occur with a probability $\zeta < 1$ when the state is θ_L. The policymaker applies Bayes' rule to update her beliefs. If the lobbyist appears to argue his case for a high level of policy, she concludes that with probability $1/(1+\zeta)$ the true state is θ_H and with probability $\zeta/(1+\zeta)$ the true state is θ_L.[4] She responds to a lobbying campaign by setting a policy equal to her updated expectation of $\tilde{\theta}$, which implies that $p_{lobby} = (\theta_H + \zeta\theta_L)/(1+\zeta)$. If no lobbyist appears, the policymaker infers the state can only be θ_L. In the event, she sets $p_{no\ lobby} = \theta_L$.

We have hypothesized that the group sometimes lobbies and sometimes does not, when the true state is θ_L. For the group to behave in this manner, it must attain the same level of welfare in state θ_L regardless of its behavior; otherwise the group would simply take its preferred action. It follows that the probability of lobbying in state θ_L must be such that the induced policy response leaves the interest group indifferent between lobbying and not. The group is indifferent in state θ_L if and only if $-(p_{lobby} - \theta_L - \delta)^2 - l_f = -\delta^2$, or

$$\zeta = (\theta_H - \theta_L)\left(\frac{\delta \pm \sqrt{\delta^2 - l_f}}{l_f}\right) - 1. \tag{5.3}$$

This equation gives two possible values of ζ that might apply in a mixed-strategy equilibrium.

Of course, the probability of lobbying must fall between zero and one. This requirement limits the combinations of lobbying costs and

4. Bayes' theorem states that

$$\Pr\{\theta = \theta_H \mid I = 1\} = \frac{\Pr\{I = 1 \mid \theta = \theta_H\}\Pr\{\theta = \theta_H\}}{\Pr\{I = 1 \mid \theta = \theta_H\}\Pr\{\theta = \theta_H\} + \Pr\{I = 1 \mid \theta = \theta_L\}\Pr\{\theta = \theta_L\}},$$

where I is an indicator variable, with $I = 1$ when the SIG lobbies and $I = 0$ otherwise. Since $\Pr\{\theta = \theta_H\} = \Pr\{\theta = \theta_L\} = 1/2$, we have $\Pr\{\theta = \theta_H \mid I = 1\} = 1/(1+\zeta)$ when $\Pr\{I = 1 \mid \theta = \theta_H\} = 1$ and $\Pr\{I = 1 \mid \theta = \theta_L\} = \zeta$.

preferences that admit an equilibrium with randomization by the interest group. In particular, the fixed costs l_f cannot be too large (e.g., if $l_f > \delta^2$, ζ is not a real number), nor can they be too small (if l_f is close to zero, $\zeta > 1$). Nonetheless, it is easy to find parameter values for which a mixed-strategy equilibrium exists. Suppose, for example, that $\theta_L = 0$, $\theta_H = 1$, $\delta = 0.9$, and $l_f = 0.72$. Then, according to (5.3), there exists an equilibrium with $\zeta = 2/3$. In this equilibrium, the group lobbies with probability 2/3 when the state is θ_L and always does so when the state is θ_H. When the policymaker observes that lobbying has occurred, she updates her belief by placing a probability of 0.6 on the event that the state is θ_H. Therefore, $p_{lobby} = 0.6$. When no lobbying occurs, she believes $\theta = \theta_L$ with probability one. Thus, $p_{no\ lobby} = 0$. The SIG is indifferent between lobbying in state θ_L and not, as is required for an equilibrium with randomization in this state.[5] When the state is θ_H, it prefers to lobby. Notice that $l_f < k_2 = 0.8$ in this example, so that whereas an equilibrium with partial learning exists, there is no equilibrium in which the policymaker learns the state of the world for sure.

5.1.2 *Single Lobby, Continuous Information*

Now we take the random variable $\tilde{\theta}$ to be continuous. Whereas the interest group knows the precise value of θ, the policymaker initially perceives that all values of θ between $\theta_{\min}$ and $\theta_{\max}$ are possible and equally likely. This situation is identical to the one we studied in Section 4.1.4, except that now we include a cost of lobbying.

Recall from Chapter 4 the outcome when lobbying is costless. A moderately biased interest group can convey some useful information to the policymaker, but the group can never communicate the exact value of θ. Any attempts by the lobbyist to make fine distinctions between similar states of the world are spoiled by the temptation to exaggerate. So the lobbyist must resort to coarse statements that identify ranges of possibilities. We referred to such outcomes as "partition equilibria," because the interest group uses its messages to partition the parameter space into a set of regions.

Now, when an interest group must pay to prepare a report, the mere act of lobbying sends a signal to the policymaker. For some

5. In state θ_L the SIG has an ideal policy of 0.9. By lobbying, it achieves a net welfare level of $-(0.6-0.9)^2 - 0.72 = -0.81$, which is the same as what it achieves by refraining.

values of θ, the SIG may be willing to bear the lobbying cost, while for other values it will prefer to save its money. In this situation the policymaker is able to partition the parameter space into two regions even before the lobbyist utters a sound. If the lobbyist appears, the policymaker realizes that θ belongs to one set of possible values, whereas if he fails to appear a different set is indicated. Thus, lobbying may provide information even when the words cannot be trusted.

Consider, for example, a situation in which no partition equilibrium exists, except for the ubiquitous babbling equilibrium. As we noted in Section 4.1.4, this situation arises, for example, when $\theta_{\min} = 0$, $\theta_{\max} = 24$, and $\delta > 6$. Any 2-partition equilibrium would require the existence of a value of θ, say θ_1, at which the SIG is indifferent between the outcomes that would result from the alternative reports of "high" and "low." If such a value were to exist, the policymaker would set $p = 12 + \theta_1/2$ on hearing a report of "high" and $p = \theta_1/2$ on hearing a report of "low." But with $\delta > 6$, the SIG would always have an incentive to report "high," no matter what the value of θ_1. Therefore, there is no partition of the states that gives the group an incentive to report honestly for all values of θ. Credible communication is impossible with these parameter values when lobbying is costless.

This pessimistic conclusion need not apply when lobbying is costly. The prospective cost l_f may be large enough to discourage lobbying for a range of low values of θ when the group's desired outcome is reasonably low anyway. But if the realized value of $\tilde{\theta}$ were higher, the incentive to lobby would be greater. The group might be willing to bear the requisite cost for a range of high values of θ. A 2-partition equilibrium will exist if, for some value of θ_1 between $\theta_{\min} = 0$ and $\theta_{\max} = 24$, the SIG is indifferent between paying the cost l_f and attaining the policy outcome $p = (24 + \theta_1)/2$, and accepting the less desirable policy $p = \theta_1/2$ at zero cost. We now seek to identify a value of θ_1 that engenders such indifference.

We suppose that lobbying leads the policymaker to infer that $\theta \geq \theta_1$ and that an absence of lobbying leads her to infer that $\theta \leq \theta_1$. Then, her response to lobbying would be to set $p_{lobby} = 12 + \theta_1/2$, while her response to silence would be to set $p_{no\ lobby} = \theta_1/2$. If the group pays the cost l_f, it achieves welfare of $U = -(12 - \theta_1/2 - \delta)^2 - l_f$ in state θ_1. If it saves its resources, it achieves $U = -(-\theta_1/2 - \delta)^2$. Indifference requires these two welfare levels to be equal, or that

$$\theta_1 = 12 - 2\delta + \frac{l_f}{12}.$$

Finally, we must check that this value of θ_1 falls in the feasible range between 0 and 24. For $\delta > 6$ and $l_f = 0$, clearly it does not. But if, for example, $l_f = 24$, then a 2-partition equilibrium exists for $\delta < 7$. And if $l_f = 48$, such an equilibrium exists for $\delta < 8$. A group with a relatively large bias may nonetheless lobby effectively, because costly actions speak louder (or at least more credibly) than costless words.

The same intuition extends to settings where the lobbyist can in fact make some credible distinctions using only his words. Suppose, for example, that $\theta_{\min} = 0$ and $\theta_{\max} = 24$, and that $2 < \delta < 6$. If lobbying were costless, there would exist a 2-partition equilibrium in which the lobbyist advises the policymaker whether θ exceeds $12 - 2\delta$. But no 3-partition equilibrium is possible. When lobbying is costly, a 3-partition equilibrium may exist. In such an equilibrium the lobbyist would appear before the policymaker whenever $\theta \geq \theta_1$ and would not appear whenever $\theta \leq \theta_1$. Thus, the act of lobbying or not partitions the parameter space into two regions. Then, when the lobbyist appears, he informs the policymaker whether θ exceeds some critical value θ_2 or not. An equilibrium with these features exists, for example, when $l_f = 12$ and $\delta = 3$. In general, better information can be conveyed when lobbying is somewhat costly than when it is free.[6]

Lobbying costs that are independent of content cannot, however, fully resolve the SIG's credibility problem. By showing itself willing to bear the fixed cost of lobbying, the group can at best distinguish one set of states from another. For any further distinction between the states, the group must rely on its words. When a lobbyist confronts a wary policymaker, he will be forced as before to resort to coarse statements about the policy environment. So the outcome still must be a partition equilibrium, albeit one in which the act of lobbying serves as a particularly persuasive statement.

5.1.3 *Two Lobbies*

We return now to the case of dichotomous information, but imagine that there are two interest groups with different policy objectives. SIG 1 has a welfare function $U_1(p, \theta, l_1) = -(p - \theta - \delta_1)^2 - l_1$, where $l_1 = l_f$ when SIG 1 engages in lobbying and $l_1 = 0$ when it does not. Similarly, SIG 2 has a welfare function $U_2(p, \theta, l_2) = -(p - \theta - \delta_2)^2 - l_2$ with $l_2 = l_f$ when SIG 2 undertakes lobbying and $l_2 = 0$ when it does not. We suppose that both groups know the precise value of θ.

Like Biases

Consider first the case of like biases, that is, $\delta_2 > \delta_1 > 0$. If SIG 1 has a moderate bias relative to the policymaker and lobbying is not too expensive, then this group alone could serve as a credible informant. In particular, if

$$l_f \leq (\theta_H - \theta_L)(2\delta_1 + \theta_H - \theta_L) \tag{5.4}$$

and

$$l_f \geq (\theta_H - \theta_L)(2\delta_1 - \theta_H + \theta_L), \tag{5.5}$$

then there exists an equilibrium in which SIG 1 lobbies whenever the state is θ_H but not when it is θ_L, and SIG 2 never lobbies.[7] The policymaker looks to SIG 1 for information, and sets $p = \theta_H$ if and only if she is lobbied by this group. With this anticipated behavior by the policymaker, SIG 1 will elect to lobby in state θ_H but not in state θ_L, by the same reasoning as was described in Section 5.1.1. And given that SIG 1 is providing the policymaker with the relevant information, SIG 2 is happy to save its resources.

Of course, for some values of δ_2, the roles of the interest groups could be reversed. If the bias of SIG 2 were such that

$$l_f \leq (\theta_H - \theta_L)(2\delta_2 + \theta_H - \theta_L) \tag{5.6}$$

and

$$l_f \geq (\theta_H - \theta_L)(2\delta_2 - \theta_H + \theta_L), \tag{5.7}$$

then SIG 2 could play the role of the informant while SIG 1 free rides. In this alternative equilibrium, the policymaker turns to SIG 2 for information and ignores any lobbying by the other group. SIG 1 has no incentive to bear the lobbying cost under these circumstances.

But if the bias of SIG 2 is sufficiently large, then condition (5.7) will be violated, and SIG 2 cannot serve as a reliable informant. The policymaker would recognize the group's incentive to report "high"

6. Of course, if lobbying is very costly, the SIG may not consider it worthwhile to educate the policymaker, even if the lobbyist's words would be credible.

7. Note that (5.4) is analogous to (5.1) and (5.5) is analogous to (5.2).

even when the state is θ_L, and thus would be well justified in disregarding any report from this highly biased group. Anticipating this reaction by the policymaker, SIG 1 cannot rely on its counterpart to provide the relevant policy advice. This group would find it worthwhile to lobby itself in state θ_H, assuming that the policymaker would be responsive to its actions.

We have identified equilibria with lobbying (in some states) by only one interest group. Might there also be situations in which both groups are "forced" to lobby when the state is θ_H, for fear that the policymaker would not be convinced by a single report? The answer to this question is a qualified "yes." Suppose that for some reason, the policymaker requires lobbying by both groups before she becomes convinced that the state is θ_H. If one group or none appears, she concludes that the state must be θ_L. With these beliefs, the policymaker sets $p = \theta_H$ when both groups lobby and $p = \theta_L$ when one group or neither group does so. Then, if (5.4) and (5.5) are satisfied, SIG 1 will deem it worthwhile to lobby in state θ_H but not in state θ_L. Similarly, if (5.6) and (5.7) are satisfied, SIG 2 will lobby in state θ_H but not in state θ_L. Since the policymaker never observes lobbying by only one group, her suspicion that such an occurrence would signal $\theta = \theta_L$ never is contradicted. Therefore, her beliefs about this event do not violate the requirements of a Bayesian equilibrium.

One might argue that such skepticism on the part of the policymaker is unjustified. Imagine that SIG 2 were to deviate from its equilibrium strategy by refraining from lobbying. This would force the policymaker to confront a situation with lobbying by only one group. In the event, she should ask herself whether it is more likely that the state is θ_L and SIG 1 chose to pay the lobbying cost, or that the state is θ_H and SIG 2 opted not to come. The first possibility could arise only if SIG 1 made an error, because it is not worthwhile for this group to lobby in state θ_L even if the action convinces the policymaker that the state is θ_H.[8] In contrast, the second possibility can be rationalized as an intentional decision by SIG 2. If this group believes that the policymaker will anyway draw the "correct" conclusion about the policy environment, it prefers to stay home and save the lobbying cost. Since the event of no lobbying by SIG 2 in state θ_H can be rationalized as a reasoned choice, but the same is not true of lobbying by SIG 1 in state θ_L, it might be more reasonable to assume

8. Technically, lobbying by SIG 1 is a dominated strategy in state θ_L.

that the policymaker believes that $\theta = \theta_H$ in case she observes lobbying by only one group. But, if she would draw this inference, then SIG 2 indeed will opt to save the lobbying cost, as long as it expects SIG 1 to bear it. By imposing restrictions on the policymaker's out-of-equilibrium beliefs, we call into question the plausibility of an equilibrium in which each of two similarly biased groups engages in lobbying.[9]

Opposite Biases

Now suppose the groups have opposite biases, that is, $\delta_1 > 0 > \delta_2$. In such circumstances, SIG 1 has an incentive to overstate the value of θ, whereas SIG 2 is tempted to understate it. We argue first that, despite the conflict of interests, there might exist an equilibrium in which only one of the groups engages in costly lobbying, while the other free rides.

Suppose that conditions (5.4) and (5.5) are satisfied. Then, if the policymaker expects the lobbying behavior of SIG 1 to reveal the state of the world, this group indeed prefers to lobby when the state is θ_H and to refrain when the state is θ_L. The policymaker can ignore the lobbying of SIG 2 and rely on SIG 1 for information. In the event, SIG 2 has no reason to lobby in state θ_L, because the outcome anyway is the one the group prefers. And it has no reason to lobby in state θ_H, because the policymaker would pay no heed to any (false) claim that $\theta = \theta_L$.

However, this asymmetric equilibrium is not the only possible outcome under these conditions. A more symmetric equilibrium exists in which each group lobbies the policymaker in one state of the world. In state θ_H, SIG 1 has a keen interest in having the policymaker understand that a high level of policy is indicated, because underestimation of θ by the policymaker would be especially costly to the group in this state. Similarly, in state θ_L, SIG 2 wants the policymaker to be well advised that a low level of policy is needed, because this group suffers most from a high policy level in this state. The policymaker might expect that SIG 1 will come to plead its case in state θ_H and that SIG 2 will appear in state θ_L. If both groups lobby or neither does so, the policymaker might see no basis for updating her beliefs. We might suppose that, in such circumstances, she would set

9. Technically, the outcome with lobbying by both interest groups meets the requirements of a perfect Bayesian equilibrium, but it does not survive when a refinement is made to the equilibrium concept.

the policy based on her prior understanding that each state is equally likely. With these beliefs, the policymaker's optimal strategy is to set $p = \theta_H$ when only SIG 1 lobbies, $p = \theta_L$ when only SIG 2 lobbies, and $p = (\theta_H + \theta_L)/2$ when both groups lobby or neither does.

We must check whether the groups' chosen actions are consistent with the policymaker's beliefs. The policymaker expects SIG 1 to lobby in state θ_H, but not in state θ_L. If the group were in fact to lobby in state θ_L, it could induce a policy of $p = (\theta_H + \theta_L)/2$ in place of $p = \theta_L$, at a cost of l_f. If it were to refrain in state θ_H, it would accept a policy of $p = (\theta_H + \theta_L)/2$ in place of $p = \theta_H$, while saving l_f. The organization prefers to lobby in state θ_H and refrain in θ_L when l_f falls in an intermediate range, namely, when

$$(\theta_H - \theta_L)\left(\delta_1 - \frac{\theta_H - \theta_L}{4}\right) < l_f < (\theta_H - \theta_L)\left(\delta_1 + \frac{\theta_H - \theta_L}{4}\right).$$

The policymaker expects SIG 2 to lobby in state θ_L but not in θ_H. By analogy to the arguments for SIG 1, the organization will behave in this manner if and only if

$$(\theta_H - \theta_L)\left(-\delta_2 - \frac{\theta_H - \theta_L}{4}\right) < l_f < (\theta_H - \theta_L)\left(-\delta_2 + \frac{\theta_H - \theta_L}{4}\right).$$

When these inequalities are satisfied, there exists an equilibrium in which each group advocates its cause in the state in which it feels most strongly. The conditions are satisfied, for example, when $\theta_H = 24$, $\theta_L = 0$, $\delta_1 = 5$, $\delta_2 = -4$, and $l_f = 100$.

Unknown Biases

Lohmann (1993) has suggested a different sort of equilibrium that can arise when the policymaker is unsure of the degrees to which the interest groups are biased. We can illustrate her points in a variant of our simple model.

Lohmann observes that extremist groups may be willing to undertake costly political actions regardless of the underlying policy conditions, whereas moderately biased groups may restrict their activity to times when circumstances most warrant it. If the policymaker does not know which groups are moderate and which are extreme, then the prevalence of political activity may serve as a signal of what the state is likely to be. When lobbying is confined to a few groups, the policymaker may suspect that only the extremists are active, and thus take an action that is appropriate in a moderate state of the world. When lobbying is more widespread, she may conclude that even the moderates are active, and then she will realize that conditions call for a more extreme policy response.

To illustrate this idea, we consider again a setting with two like-biased interest groups, where SIG 2 has a greater bias relative to the policymaker than SIG 1. Suppose that the policymaker is aware that there are two groups with positive preference parameters δ_1 and δ_2, but she does not know which group is the moderate one and which is extreme. To begin, let us assume as before that both groups know the policy state, which is either θ_H or θ_L. Then, if conditions (5.4) and (5.5) are satisfied but (5.7) is violated, there can be no equilibrium in which a single lobbying report leads the policymaker to conclude that the state is θ_H. If the policymaker were to draw such a conclusion from one report, the more biased SIG 2 would have an incentive to misreport the state whenever $\theta = \theta_L$. An equilibrium does, however, exist in which both groups lobby when the state is θ_H and neither does so when the state is θ_L. The policymaker relies on confirmation from both groups to assure herself that the reliable informant is among those who are paying to send a signal. Note that it does not pay for the more biased SIG to lobby in state θ_L, because the group recognizes that its counterpart has no incentive to lobby and that its own report by itself will not be convincing.

An even more striking outcome is possible when the interest groups are unsure about the state of the world. Then the more biased group may opt to lobby the policymaker no matter what it believes about the policy environment. That is, SIG 2 may behave as a pure advocate, always alleging that the state is θ_H. The less biased SIG 1, in contrast, will engage in lobbying if and only if it believes that the state is more likely to be θ_H than θ_L. Then the policymaker can use the level of political activity as an imperfect signal of the policy state. In the equilibrium we shall describe, the policymaker chooses a relatively high level of policy when both SIGs come to argue for such, and a lower level of policy when only one group appears to plead its case.

To capture the groups' uncertainty about the policy environment, we assume that each one observes an imperfect indicator or "signal" of the true state. If SIG 1 observes the signal σ_H, then, with probability $\zeta > 1/2$, the true state is θ_H. But with probability $1 - \zeta$, the facts observed by SIG 1 are misleading, and the true state instead is θ_L. Similarly, if SIG 1 observes the signal σ_L, then, with probability ζ, the true state is θ_L. With probability $1-\zeta$, the state is θ_H. Meanwhile, SIG 2 observes an independent signal about the state of the world. Its signal corresponds to the true state with probability ζ, but suggests a misleading conclusion about the environment with probability $1-\zeta$. Both groups know the accuracy of their observations, and they know that the other group also may be misled about the policy conditions.

Consider first what the policymaker thinks when two lobby groups appear to argue for a high level of the policy. She knows that one or the other of the groups has a large bias and presumes that this group would engage in lobbying no matter what it had observed. She also knows that the other group is more moderate, and suspects that its willingness to bear the lobbying cost means that it has observed the signal σ_H. The policymaker updates her beliefs about the distribution of $\tilde{\theta}$ using Bayes' rule. This leads her to conclude that with probability ζ the state is θ_H and with probability $1-\zeta$ it is θ_L. Using these updated beliefs, the policymaker sets the policy level to maximize her expected welfare, which implies that $p(2) = \zeta\theta_H + (1-\zeta)\theta_L$. Here, $p(j)$ denotes the policy that is implemented when j groups appear before the policymaker to argue for a high level of policy.

Now consider the policymaker's reasoning when only one lobbyist appears. In equilibrium, this event suggests to the policymaker that the more moderate group chose not to bear the lobbying cost. Since the more moderate group refrains from lobbying if and only if it observes σ_L, the policymaker concludes that with probability ζ the true state is θ_L and with probability $1-\zeta$ it is θ_H. Accordingly, she sets $p(1) = (1-\zeta)\theta_H + \zeta\theta_L$ when only one group lobbies.

What happens if neither group chooses to lobby? A complete absence of lobbying is inconsistent with the hypothesized strategy of SIG 2. Accordingly, Bayes' rule does not restrict what the policymaker would make of such an event. We assume that the policymaker interprets an absence of lobbying as an indication that the more moderate lobby observed σ_L and that the extreme lobby erred in failing to report. Moreover, the policymaker does not see the mistake by the more extreme group as revealing anything about what signal the group might have observed. With this interpretation of the events that would lead neither group to lobby, the policymaker concludes that with probability ζ the true state is θ_L and with probability

$1-\zeta$ it is θ_H. These are the same beliefs as when one group lobbies, so $p(0) = p(1) = (1-\zeta)\theta_H + \zeta\theta_L$.[10]

Now let us investigate the incentives facing the interest groups, who anticipate the policymaker's responses to the various lobbying outcomes. We begin with the more moderate group, which is SIG 1 in our example. This group expects its counterpart to lobby no matter what signal it observes. Accordingly, it expects its own lobbying behavior to make the difference between two active lobbying campaigns and one. If SIG 1 chooses to lobby, the resulting policy will be $p(2)$. If it refrains, the policy will be $p(1)$. When the group observes σ_H, it believes that with probability ζ the true state is θ_H and with probability $1-\zeta$ it is θ_L. By lobbying, the group achieves an expected welfare level of $-\zeta[p(2)-\theta_H-\delta_1]^2 - (1-\zeta)[p(2)-\theta_L-\delta_1]^2 - l_f$. By refraining, it achieves $-\zeta[p(1)-\theta_H-\delta_1]^2 - (1-\zeta)[p(1)-\theta_L-\delta_1]^2$. We have supposed that the group prefers to lobby when it observes σ_H, which requires that

$$l_f \le (\theta_H-\theta_L)(2\zeta-1)[2\delta_1 + (\theta_H-\theta_L)(2\zeta-1)].$$

Similarly, when the group observes σ_L, it believes that with probability ζ the true state is θ_L and with probability $1-\zeta$ it is θ_H. Lobbying yields the group expected welfare of $-\zeta[p(2)-\theta_L-\delta_2]^2 - (1-\zeta)[p(2)-\theta_H-\delta_2]^2 - l_f$, whereas refraining yields welfare of $-\zeta[p(1)-\theta_L-\delta_2]^2 - (1-\zeta)[p(1)-\theta_H-\delta_2]^2$. The group prefers to conserve its resources if and only if

$$l_f \ge (\theta_H-\theta_L)(2\zeta-1)[2\delta_1 - (\theta_H-\theta_L)(2\zeta-1)].$$

Now we turn our attention to the more extreme SIG 2. The lobbying behavior of this group will make a difference in two situations. First, if the true state is θ_H and SIG 1 has observed the (accurate) signal σ_H, then by lobbying the group induces a policy of $p(2)$ in place of $p(1)$. Second, if the true state is θ_L but SIG 2 has observed the (misleading) signal σ_H, then by lobbying the group again induces the policymaker to set $p = p(2)$ instead of $p = p(1)$. Since the bias of SIG 2 is large, it may prefer the higher policy $p(2)$ even when the true

10. Alternatively, we might assume that the policymaker interprets a failure to lobby by the more extreme group as indicating that the group more likely observed σ_L, the pattern that makes a high policy level less imperative. With this interpretation, the policymaker sees a failure to lobby by either group as a stronger indication that $\theta = \theta_L$, in which case $p(0) < p(1)$. Such an assumption would expand the range of parameters for which the hypothesized strategies constitute equilibrium behavior.

state is θ_L. Moreover, the group may be willing to bear the lobbying expense on the chance that its counterpart has (rightly or wrongly) observed the signal σ_H, so that its own lobbying behavior will make the difference to the outcome. By lobbying when it observes σ_L, SIG 2 achieves expected welfare of[11]

$$-\zeta^2[p(1)-\theta_L-\delta_2]^2-\zeta(1-\zeta)[p(2)-\theta_L-\delta_2]^2$$
$$-(1-\zeta)\zeta[p(2)-\theta_H-\delta_2]^2-(1-\zeta)^2[p(1)-\theta_H-\delta_2]^2-l_f.$$

By refraining, the SIG ensures that the policy will be $p(1)$, in which case its expected welfare is $-\zeta[p(1)-\theta_L-\delta_2]^2-(1-\zeta)[p(1)-\theta_H-\delta_2]^2$. Lobbying yields higher expected welfare for SIG 2 than not lobbying if and only if

$$l_f \le 4\delta_2(\theta_H-\theta_L)\zeta(1-\zeta)(2\zeta-1). \tag{5.8}$$

When condition (5.8) is satisfied, SIG 2 prefers to lobby even when it finds evidence that the state is more likely to be θ_L. It has an even greater incentive to lobby when it sees indications that the state is θ_H. Thus, the more biased group lobbies indiscriminately. This group pays the cost of advocacy with the hope that its counterpart will observe σ_H, in which case its own message will confirm the other's report. Of course, the policymaker anticipates the more biased group's behavior and discounts its actions appropriately.

We have identified conditions for an equilibrium with pure advocacy by one interest group and informative lobbying by another. First, the policymaker must be unsure which one is the extreme group. Otherwise she would simply ignore its lobbying, and then there would be no point for the group to incur the cost. Second, the advocate must have a sufficiently large bias, so that condition (5.8) is satisfied. When SIG 2 has a large bias, it is willing to pay l_f on the off chance that its actions will make the difference to the policy outcome. This difference comes when the state is θ_H, but also when it is θ_L and yet the more moderate lobby has observed the misleading signal, σ_H. In this latter situation, the group can advocate a high level of policy (which it always prefers) and the other lobby will support its arguments. Third, condition (5.8) requires that ζ not be too close to 1. The more accurate the information available to the interest groups, the less likely it is that the moderate group will observe an incorrect signal. The extreme group needs the existence of such inaccurate signals to give reason to its lobbying campaign.

11. The first term in this expression is the probability that both the true state is θ_L and SIG 1 has observed σ_L, multiplied by the utility in state θ_L from a policy of $p(1)$. The second term is the probability that the true state is θ_L but SIG 1 has observed the misleading signal, σ_H, multiplied by the utility for SIG 2 in state θ_L from a policy of $p(2)$. The remaining terms have similar interpretations.

5.2 Endogenous Lobbying Costs

We have seen that lobbying can serve to signal an interest group's unverifiable information. If the lobbying costs fall in a certain range, then the policymaker can learn something about the policy environment by observing whether a group is willing to pay them. However, the value of this signal is limited. If the costs are too high, the groups will rarely if ever be willing to bear them. If the costs are too low, then the willingness to pay reveals little or nothing. And, at best, a fixed lobbying cost can be used by a group to distinguish one set of policy states from another.

But lobbying costs need not be fixed. Interest groups have discretion over the size and scope of their lobbying efforts. Indeed, we often see SIGs waging lavish campaigns when it would seem that the information could be communicated more frugally. Why would an interest group pay more than is necessary to educate a policymaker? One answer might be that the group is trying to lend credibility to its words in situations where the facts are favorable to its cause. In this section we allow an interest group to choose what it wishes to spend on its lobbying campaign. We ask whether the group might spend more than is necessary, and whether the ability to overpay facilitates communication.

5.2.1 *Dichotomous Information*

Our model is the same as that in Section 5.1.1 in all respects but one. An interest group knows the precise value of a policy-relevant variable θ, which may be either θ_L or θ_H. The policymaker believes initially that the alternative values of θ are equally likely. The SIG has an objective to maximize $U(p,\theta,l)=-(p-\theta-\delta)^2-l$, while the policymaker seeks to maximize $G=-(p-\theta)^2$. All of this is the same as before. But now we allow the interest group to choose the scale of its lobbying campaign; it can make the lobbying cost l large by sending a large team of lawyers and experts to the policymaker or by running a lavish advertising campaign. Or it can keep costs down by hiring a single lobbyist to argue its case.

We will show that the freedom to choose the scale of lobbying can make the difference in a group's effort to communicate dichotomous information. In particular, when lobbying costs are fixed, there exists an equilibrium with full revelation only for certain values of l_f. But when they are variable, an equilibrium with full revelation always exists. In this equilibrium, the interest group spends nothing on lobbying if the policy environment indicates a low level of the policy. If conditions indicate a high level of the policy, the group spends enough to convince the policymaker that the reality could not be otherwise.

To make this point, we need to construct an equilibrium in which the policymaker discerns the state of the world by observing the group's actions. To this end, let l_L be the amount that the SIG spends on lobbying in state θ_L and let l_H be the amount it spends in θ_H. We know that if the policymaker concludes that the state is θ_H, she will set a policy of $p = \theta_H$. And if she concludes the state is θ_L, she will set a policy of $p = \theta_L$. Our task is to find a lobbying strategy for the interest group that validates this behavior by the policymaker.

We argue first that, in an equilibrium with full revelation, $l_L = 0$. With full revelation, the policymaker infers the state of the world from the lobbying behavior of the SIG. In state θ_L, the policy outcome is $p = \theta_L$, which is worse for the interest group than the alternative of $p = \theta_H$.[12] There is no reason for the SIG to bear a cost to achieve its less desired outcome when by spending nothing on lobbying, it would suffer the same fate.

This leaves us to determine only l_H. On the one hand, the spending on lobbying in state θ_H must be large enough to be convincing. That is, it must be sufficiently large that the SIG would not wish to make the outlay in state θ_L and thereby deceive the policymaker. On the other, l_H must not be so large that the SIG would be unwilling to pay it in state θ_H. The SIG will not wish to pay the lobbying cost in state θ_L to signal falsely that the state is θ_H if and only if $-\delta^2 \geq -(\theta_H - \theta_L - \delta)^2 - l_H$, or

12. We are assuming here that $\delta > (\theta_H - \theta_L)/2$, or that purely verbal arguments would not be credible in state θ_L. Otherwise there is an equilibrium with full revelation with $l_L = l_H = 0$. The SIG could spend nothing on its lobbying campaign and simply report the state of the world to the policymaker.

$$l_H \geq (\theta_H - \theta_L)[2\delta - (\theta_H - \theta_L)] \equiv k_2.$$

This is the same condition as (5.2), except that now the SIG can choose l_H to ensure that it is met. The SIG is willing to pay the lobbying cost in state θ_H if and only if $-\delta^2 - l_H \geq -(\theta_L - \theta_H - \delta)^2$, or

$$l_H \leq (\theta_H - \theta_L)[2\delta + (\theta_H - \theta_L)] \equiv k_1.$$

Again, the condition is the same as (5.1). It follows that a credible lobbying campaign requires a lobbying cost between k_1 and k_2, just as before. But since $k_1 > k_2$ and the scale of lobbying is variable, it is always possible to find a value of l_H that falls in the required range.

We have established the existence of "separating equilibria." In these equilibria, the policymaker infers that the state must be θ_H when the interest group spends l_H or more on lobbying. If the group spends less than l_H, she concludes that the state must be θ_L. The lobbyist's cost l_H can be any number between k_1 and k_2. When the policymaker holds these beliefs, it is optimal for the SIG to spend l_H on lobbying if the state is θ_H and to spend nothing if the state is θ_L. The group's optimal behavior is consistent with the policymaker's beliefs.[13]

To reiterate, when an interest group can vary the scale of its lobbying effort, it can always find a way to communicate its policy-relevant information to the policymaker. This ability to communicate need not be a blessing, however. As we noted earlier, the SIG's welfare may be lower from an ex ante perspective when the policymaker expects the group to lobby in certain policy environments than it would be if the opportunity for lobbying were nonexistent. Suppose, for example, that the policymaker expects the group to pay k_2 when the state is θ_H, which is the smallest amount that ensures credibility. If the policymaker has these expectations, the group will do so to avoid an outcome with $p = \theta_L$. In the equilibrium with signaling, expected welfare for the group (before it learns the true value

13. Among the separating equilibria, many would consider the one with $l_H = k_2$ to be the most compelling. When $l_H = k_2$, the cost of lobbying is the smallest it can be while remaining potentially credible. If the policymaker were to remain skeptical when she observed a campaign of size k_2, the SIG might choose to pay k_2 and offer a compelling verbal argument. The argument would be that, were the true state to be θ_L, the group would not have been willing to pay even k_2. So the group's willingness to pay k_2 ought to confer credibility on its claim that the state is θ_H. Formally, the equilibrium with $l_H = k_2$ is the only one that satisfies the "intuitive criterion" proposed by Cho and Kreps (1987) as a refinement of the equilibrium concept for signaling games.

of θ) is $EU = -\delta^2 - k_2/2$. In comparison, if there were no possibility of lobbying, then the policymaker would always set $p = (\theta_L + \theta_H)/2$, and the expected welfare of the group would be $-\delta^2 - (\theta_H - \theta_L)^2/4$. Thus, the SIG might actually be better off if there were no possibility of lobbying, as is the case when $\delta > 3(\theta_H - \theta_L)/4$.

5.2.2 *Many States of Nature*

The same logic applies when the policy environment has more than two possible states. The interest group might refrain from lobbying when conditions indicate the lowest possible level of policy, and it might undertake lobbying of some sort whenever conditions indicate a higher level of policy. Moreover, the policymaker might expect the scale of the lobbying effort to vary with the underlying conditions, so that the SIG devotes more resources to lobbying the greater is the value of θ. Then the policymaker would respond to more costly lobbying campaigns with ever greater levels of policy. We illustrate this logic first for the case of three states of nature and then for the case of a continuous random variable $\tilde{\theta}$.

First, let there be three possible values of θ, θ_H, θ_M, and θ_L, with $\theta_H > \theta_M > \theta_L$. Suppose the policymaker expects the group's lobbying behavior to be revealing about the policy environment. In particular, she expects the group to spend nothing on lobbying when the state is θ_L, to spend at least $l_M > 0$ when the state is θ_M, and to spend at least $l_H > l_M$ when the state is θ_H. Then she responds by setting $p = \theta_L$ when the SIG fails to lobby, $p = \theta_M$ when the lobbying expense is at least l_M but less than l_H, and $p = \theta_H$ when the lobbying expense is l_H or more.

To justify beliefs of this sort, we need to find values of l_M and l_H that give the SIG the appropriate incentives. We seek the smallest such values that do the trick. Note first that the incentives facing the SIG in state θ_L are similar to those in a two-state environment. The group can pay nothing for lobbying and accept a policy of $p = \theta_L$, or it can conduct a moderate lobbying campaign and induce an outcome of $p = \theta_M$. The smallest lobbying cost l_M that leaves the group with no incentive to lobby in state θ_L is

$$l_M = (\theta_M - \theta_L)[2\delta - (\theta_M - \theta_L)].$$

The group also has the option to conduct a vigorous lobbying campaign in state θ_L so as to fool the policymaker into setting $p = \theta_H$.

However, this option will never be attractive to the SIG in circumstances in which it has no incentive to engage in large-scale lobbying even when the true state is θ_M.

We consider next the group's incentives in state θ_M. With $l_M = (\theta_M - \theta_L)[2\delta - (\theta_M - \theta_L)]$, the group always prefers to lobby in state θ_M than to accept a low level of policy. The group might, however, be tempted to intensify its lobbying effort and thereby induce a higher level of policy. For the group not to engage in such misleading behavior, we need the *extra* cost of the larger lobbying campaign to offset the benefit from having a high level of policy in state θ_M instead of an intermediate level of policy. Thus, $l_H - l_M = (\theta_H - \theta_M)[2\delta - (\theta_H - \theta_M)]$, which (with the equation for l_M) implies

$$l_H = 2\delta(\theta_H - \theta_L) - (\theta_H - \theta_M)^2 - (\theta_M - \theta_L)^2.$$

The final thing we need to verify is that the SIG is willing to bear the high cost of lobbying when the state actually is θ_H. But we know by construction that the group is indifferent between conducting a modest campaign and an elaborate one when the true state is θ_M. The group places an even greater value on a high level of policy when the state is θ_H than when it is θ_M. It follows that the group must be willing to spend l_H when the state is θ_H to avoid an outcome with $p = \theta_M$.

We have thus identified a pair of lobbying costs, l_M and l_H, with the property that, if the policymaker expects the group to undertake lobbying of these differing intensities in the different states, the SIG will find it optimal to do as expected. In other words, we have described a separating equilibrium in which the policymaker discerns the policy state from the interest group's lobbying behavior.

We have assumed in this section that all lobbying expenses are voluntary. That is, the SIG might choose to bear costs in order to buy credibly, but none of these costs are strictly necessary for it to prepare and transmit its report. As long as we maintain this assumption, we can readily extend the arguments to any number of states of the policy environment. Even if $\tilde{\theta}$ is a continuous variable, there exists a lobbying equilibrium in which the group's lobbying behavior signals the state of the world. Our next task is to construct this equilibrium with full revelation of a continuous variable. After that, we will show that problems reappear when lobbying requires some minimum expense.

Let $\tilde{\theta}$ represent a continuous random variable that lies between $\theta_{\min}$ and $\theta_{\max}$. The policymaker believes initially that all values in the range are equally likely.[14] But she updates her beliefs based on the size of the interest group's lobbying effort. In particular, she anticipates that the SIG will spend an amount $l(\theta)$ in state of the world θ, where each state gives rise to a different level of expenditure. Because she associates each level of spending with a different state, she believes that her observation of the SIG's behavior allows her to identify the state of the world. Her response is to set $p = \theta$ for the value of θ she believes to prevail.

As before, we must ensure that the policymaker's beliefs are in line with the interest group's incentives. Two properties of the function $l(\theta)$ are needed to ensure this. First, we need $l(\theta_{\min}) = 0$, because the SIG has no reason to spend on lobbying when the result will anyway be the lowest conceivable level of policy. Second, we need the marginal cost of signaling a slightly higher value of θ to match the marginal benefit to the SIG in any state from having the policymaker believe that θ is a bit higher. The marginal benefit to the SIG from gaining a slightly higher policy than $p = \theta$ in state θ is 2δ. The marginal cost of signaling a higher value of θ is $l'(\theta)$. Equating the two gives $l'(\theta) = 2\delta$. Finally, combining the two requirements, we have a candidate for the lobbying function, namely

$$l(\theta) = 2\delta(\theta - \theta_{\min}). \tag{5.9}$$

We need to check that when the policymaker expects the SIG to spend according to $l(\theta) = 2\delta(\theta - \theta_{\min})$, the SIG actually has an incentive to behave in this manner. In state θ, the group could fool the policymaker into believing that the state is instead x by spending $l(x)$ on its lobbying campaign, where $l(x) = 2\delta(x - \theta_{\min})$. If it did so, the policymaker would set the policy $p = x$, and the SIG would achieve a welfare level of $U(x) = -(x - \theta - \delta)^2 - 2\delta(x - \theta_{\min})$. But note that $U(x)$ reaches a maximum at $x = \theta$ for all values of θ, which implies that the interest group has no incentive to mislead the policymaker. Thus, we have identified a lobbying function that generates full revelation when lobbying entails no fixed cost.[15]

14. Nothing in the remainder of this section hinges on this assumption.
15. Ball (1995) solves a related problem with more general utility functions, but with the added restriction that the function $l(\theta)$ must be linear. We have restricted the utility function to be quadratic, but we placed no restrictions on the shape of $l(\theta)$. With quadratic utility, the equilibrium lobbying function is linear, but it would not be so with other forms of the utility function.

Now let us suppose that the interest group must spend at least l_f to prepare a policy brief and present it to the policymaker. It can spend more than this amount if it wishes, but it can avoid the expense only by choosing not to lobby at all. We first observe that a minimum lobbying expense of l_f precludes the existence of an equilibrium in which the policymaker becomes fully informed. If the policymaker were to learn the policy state for all values of θ, she would implement $p = \hat{\theta}$ in state $\hat{\theta}$ and $p = \theta_{\min}$ in state $\theta_{\min}$. But if $\hat{\theta}$ is very close to $\theta_{\min}$, the benefit to the SIG from having a policy of $\hat{\theta}$ instead of $\theta_{\min}$ is very small. The interest group would not be willing to pay the minimum cost of l_f in order to persuade the policymaker that the state is $\hat{\theta}$, when a policy of $\theta_{\min}$ could be had at zero cost.

We construct an equilibrium in which the SIG refrains from lobbying for a range of values of θ between $\theta_{\min}$ and some θ_1, and its lobbying behavior reveals the state of the world for all values of $\theta \geq \theta_1$. In such an equilibrium, the policymaker sets the policy $p = (\theta_{\min} + \theta_1)/2$ whenever no lobbying takes place, and she sets $p = \theta$ when she infers that the state must be θ from the fact that the SIG has borne a lobbying expense of $l(\theta)$. To construct this equilibrium, we need to find a value of θ_1 and a function $l(\theta)$ with the properties that (i) $l(\theta) \geq l_f$ for all $\theta \geq \theta_1$; (ii) the SIG has no incentive to lobby for any $\theta < \theta_1$; and (iii) the SIG wishes to spend exactly $l(\theta)$ on lobbying for all $\theta \geq \theta_1$.

For (ii) to be true, the SIG must be indifferent between lobbying and not lobbying in state θ_1. Let us suppose that the group could convey the information that $\theta = \theta_1$ by conducting the minimally feasible lobbying campaign, which costs l_f. Then the SIG will be indifferent between paying this expense and not in state θ_1 if and only if $-[(\theta_{\min} + \theta_1)/2 - \theta_1 - \delta]^2 = -\delta^2 - l_f$, or

$$\theta_1 = \theta_{\min} + 2\left(\sqrt{\delta^2 + l_f} - \delta\right). \tag{5.10}$$

For (iii) to be true, the spending schedule must have a marginal benefit of signaling a higher state equal to the marginal cost. This in turn requires $l'(\theta) = 2\delta$, as we have seen before. A lobbying function that has all the required properties is depicted in figure 5.1. Its equation is

$$l(\theta) = \begin{cases} 0 & \text{for} \quad \theta_{\min} \leq \theta < \theta_1 \\ l_f + 2\delta(\theta - \theta_1) & \text{for} \quad \theta_1 \leq \theta \leq \theta_{\max} \end{cases}.$$

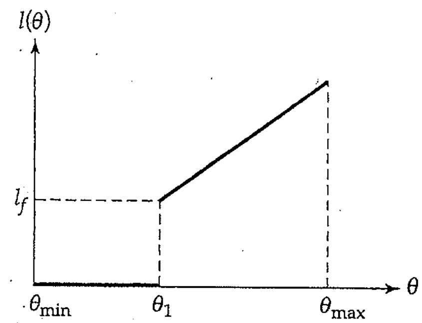

Figure 5.1
Equilibrium Lobbying Function with a Minimum Cost of Lobbying

To summarize, when lobbying requires a minimum outlay, the policymaker cannot discern the appropriate policy in all states of the world. In particular, there is a range of states that indicate a low level of policy for which the interest group refrains from lobbying. Then the policymaker must set a policy that is suitable for an average state in this (low) range. For states that indicate a higher level of policy, the interest group is able to communicate a precise report about θ. It does so by varying its lobbying expenses positively with θ in such a way that the size of its campaign signals the prevailing state.

5.2.3 *Multiple Interest Groups*

If there is no minimum cost to lobbying, then the presence of additional interest groups that know the state of the world does not change the story much. In particular, there always exist equilibria in which the policymaker becomes fully informed. The policymaker might rely on a particular group to signal the state of the world while the others enjoy a free ride. Or she may insist that several groups incur lobbying expenses before she is ready to update her views about θ. Although the policymaker has no reason to insist on confirmation from several groups when each group is fully informed, the SIGs would be willing to bear the expense if that is what it would take to convince her.

Lohmann (1995) has studied the more interesting situation that arises when several groups have some knowledge about the policy environment but none is perfectly informed. In our setting, we can imagine a situation with two like-biased SIGs, each of which

observes an independent, and possibly misleading, indicator of the state of the world. For example, when the state is θ_H, either SIG may observe with some reasonably high probability an indication that the value of θ is high. But with a smaller probability, a particular group may instead observe a signal that the state is θ_L. Similarly, a group may observe indications that the state is θ_L when actually it is so, or it may be misled into thinking that it is more likely that the state is θ_H.

If the groups' biases cause them to prefer higher levels of policy than the policymaker prefers in both states of the world, they may prefer that the policymaker believe the state is θ_H no matter what evidence they have observed. But they will be especially keen to have her believe the state is θ_H when they have observed indications that this actually is so. For this reason, it is possible to construct an equilibrium in which SIG 1 spends l_1 on lobbying when it observes a signal that the state is θ_H and spends nothing on lobbying when it observes a signal that the state is θ_L, and SIG 2 similarly spends l_2 on lobbying when it observes indications that the state is θ_H and nothing when it observes otherwise. In the equilibrium, the policymaker takes the acts of lobbying to reveal the evidence that each SIG has observed, and sets a policy accordingly. The endogenous lobbying costs l_1 and l_2 that apply in equilibrium are such that each group has an incentive to behave as expected. Since the calculation of these costs is a bit tedious, we will suppress the details and discuss only the qualitative features of the equilibrium.

First, consider the policymaker. She will observe lobbying by either two SIGs, or one, or none. If both groups lobby, this is an indication (in equilibrium) that each has observed the signal that the state is more likely to be θ_H. This can happen in state θ_L only if both signals happen to be inaccurate, that is, with probability $(1-\zeta)^2$, where ζ again denotes the probability that a given observation by a SIG is not misleading. The policymaker updates her beliefs after being lobbied by both SIGs and sets the policy equal to her new expected value of $\tilde{\theta}$, which implies $p(2) = [1-(1-\zeta)^2]\theta_H + [(1-\zeta)^2]\theta_L$. Here we use $p(2)$ to denote the policy that results when two groups lobby (an analogous notation for the other cases).

Similarly, if neither group engages in lobbying, the policymaker infers that both must have observed a signal that the state is θ_L. This suggests to her that the state is θ_L with probability $1-(1-\zeta)^2$ and is θ_H with probability $(1-\zeta)^2$, where the latter is the probability that both signals of θ_L were misleading. A policymaker who sees no lobbying sets $p(0) = [1 - (1-\zeta)^2]\theta_L + [(1-\zeta)^2]\theta_H$.

Finally, if one group lobbies and the other does not, then in equilibrium the two SIGs must have observed different signals. Each signal has the same precision, and each state has the same ex ante probability. It follows from Bayes' rule that the policymaker's beliefs do not change in the face of such conflicting evidence. Accordingly, she sets $p(1) = (\theta_H + \theta_L)/2$ when she sees lobbying by exactly one interest group.

To complete the construction of the equilibrium, we would need to find the values of l_1 and l_2 that give the SIGs an incentive to lobby when they think it more likely that the state is θ_H, but not when they think it more likely that the state is θ_L. Suppose, for example, that SIG 1 has observed an indication that the state is θ_L. Based on this observation, the group can update its beliefs about the likelihood that its counterpart has observed the same signal as it has, or that it has observed a conflicting indication that the state is θ_H. Then it can calculate the probability that its own lobbying campaign would make the difference between policy outcomes of $p(1)$ versus $p(0)$ or the difference between outcomes of $p(2)$ versus $p(1)$. Furthermore, it can calculate the probability of each of these events happening when the true state is θ_H and when the true state is θ_L. (Note that the interest group is aware that its own observations may have been misleading.) Putting all of this together, the group can calculate the increase in its expected welfare that comes from lobbying after it has observed an indication that the state is θ_L, compared to its expected welfare from not lobbying in that situation. An equilibrium value of l_1 must be large enough to dissuade the group from lobbying when it has observed an indication that the state is θ_L but not so large as to discourage lobbying when the group has observed an indication that the state is θ_H. A similar calculation applies for l_2.

The equilibrium described here has two noteworthy features. First, the greater the bias in a group's preferences relative to the policymaker's preferences, the more it must spend to convince her that its evidence indicates a high level of policy. Thus, if both groups lobby, the more lavish campaign will be conducted by the group with the more extreme preference bias. Second, the greater the number of groups that are active in lobbying, the higher the policy level that results in equilibrium. Lohmann has shown, in a related model, that these findings extend to situations with any number of SIGs.

5.3 Access Costs

Not all lobbying expenses are real costs of collecting and disseminating information. Sometimes the policymakers impose costs on interest groups by insisting that they contribute to their reelection campaigns before agreeing to meet with them. Indeed, when interest groups contribute to political campaigns, they often claim that what they are buying is access. Access allows a group a chance to plead its case. If the politicians require such payments, many groups will be ready to comply.

In this section we study situations in which an interest group must contribute to a politician's campaign if it wishes to lobby for a preferred policy. Why might a politician require such a payment, when the information the group has to report is potentially valuable to her? We entertain three possible answers to this question. First, the policymaker might consider her time to be a scarce resource. Then she may use an access fee to ensure that the value of the information exceeds the opportunity cost of her time. Second, the policymaker may value campaign contributions in their own right, as we shall emphasize in Chapter 7 and beyond. She may be willing to trade off a loss of information from those who are unwilling to pay the fee for the benefit of raising valuable funds. Finally, the politician may use access fees to help distinguish moderate interest groups from ones that are more extreme, in situations where she is unsure about the extent of a group's policy bias.

An issue that immediately arises when we think about access fees is the timing of when they must be paid. Must a SIG secure its visitation privileges before it knows exactly what its lobbyist will advise the policymaker, or can it wait to buy access until after it becomes better informed? In reality, both of these sequences are relevant. The descriptive literature tells of cases in which contributions are paid well before the groups know what issues will be on the table and even before they know whether a politician will succeed in her election bid.[16] In these cases, the purchase of access can be seen as happening when the group has little or no informational advantage vis-à-vis the policymaker. In other cases, however, groups approach policymakers with requests for an audience in order to lobby on specific issues. These may be issues that appear on the legislative

16. See, for example, Bauer, de Sola Pool, and Dexter (1963) or Sabato (1981).

agenda, and the groups may already be knowledgeable about them. Under these circumstances, a willingness to lobby conveys information to the policymaker about the state of the world. Since such situations are similar to what we have already studied in Section 5.2,[17] we shall focus our attention here on access fees that must be paid when the groups are still imperfectly informed.

In this section we investigate the interaction between a policymaker and a single interest group. The policymaker wishes to enact a policy that is appropriate to the policy environment. But she also values campaign contributions and recognizes the opportunity cost of her time. We write her welfare function as the sum of three components, each representing one of these concerns. In particular, we take $G = -\lambda(p-\theta)^2 + (1-\lambda)c - \hat{\tau}$, where c denotes the contributions amassed by the policymaker, and $\hat{\tau}$ equals some $\tau > 0$ if the policymaker devotes time to listening to the lobbyist and zero if she does not. As before, the policymaker does not initially know the value of θ but regards it as the realization of a uniformly distributed random variable that may take on values between $\theta_{\min}$ and $\theta_{\max}$.

For simplicity, we ignore any asymmetries of information that may exist at the time that access must be secured. Instead, we assume that the SIG, like the policymaker, initially regards the values between $\theta_{\min}$ and $\theta_{\max}$ as being equally likely. The SIG's objective is to maximize $-E(\tilde{p} - \tilde{\theta} - \delta)^2 - c$, where the expectation is taken over the possible values that $\tilde{\theta}$ might take and the policies that would ensue. If the SIG buys itself a place on the policymaker's schedule, it will have an opportunity to lobby before the policy decision is made. By then the SIG will know the true value of θ and can make any report about it that would be credible to the policymaker.

5.3.1 *Group with a Known Bias*

Suppose, to begin, that the policymaker knows the extent of the interest group's bias. If the policymaker can dictate the terms of access, she can require a contribution equal to the largest amount that the SIG would be willing to pay. We ask now, How much would

17. Indeed, the previously cited paper by Lohmann (1995) on signaling by multiple interest groups refers to the costs borne by the groups as "campaign contributions" and the quid pro quo as "access." When the costs are borne ex post in order to lend credibility to a report, it does not matter for the argument whether these funds go to public displays (e.g., advertising) or whether they go into the politician's campaign coffers.

the group pay for an opportunity to lobby, and will that amount be enough, together with the expected value of the information, to cover the opportunity cost of the policymaker's time?

In Chapter 4 we saw that if lobbying takes place, the SIG at best will be able to advise the policymaker of a range of values that includes θ. The lobbying game may have several different equilibria, each with a different number of messages that the lobbyist might use. We also learned that the maximum number of messages decreases with the extent of the group's bias relative to the policymaker. Moreover, the ex ante welfare of each side grows with the number of messages among which the lobbyist chooses.

More specifically, we derived conditions on δ, $\theta_{\min}$, and $\theta_{\max}$ that allow for the existence of an n-partition equilibrium (see (4.11)) and characterized an equilibrium by the values of θ at which the lobbyist is indifferent between sending one message and the next. Then we used the conditions that determine $\theta_1, \theta_2, \ldots, \theta_{n-1}$ to express the expected welfare of each side as a function of n alone (see (4.12), (4.13), and (4.14)). Of course, these calculations did not include any adjustments for campaign contributions or for the opportunity cost of the policymaker's time.

Using the results from the earlier calculations, we can compute the maximum amount that the SIG would be willing to pay for access to the policymaker. This figure is just the difference between the expected welfare it can achieve in a lobbying equilibrium and the welfare it would achieve in an equilibrium with no lobbying. Let us suppose that the group anticipates that if it buys access, the outcome will be the lobbying equilibrium with the maximum feasible number of messages, $n_{\max}$. Then the largest amount the SIG would pay for access is given by[18]

$$c_{\max} = \frac{n_{\max}^2 - 1}{12}\left[\frac{(\theta_{\max} - \theta_{\min})^2}{n_{\max}^2} - 4\delta^2\right].$$

Notice that $c_{\max}$ is larger, the smaller is δ. That is, a group that has a modest bias in its preferences relative to the policymaker is willing to pay more for access than a group that has a larger bias. This is true for two reasons. First, given the number of partitions in the equilibrium, the communication between a group and the policymaker

18. Using (4.13) and (4.14), we evaluate $c_{\max} = EU^{n_{\max}} - EU^1$ to obtain the expression in the text.

imparts better information the smaller is δ. In a 2-partition equilibrium, for example, the dividing point that separates the two regions is closer to the midpoint of the range between $\theta_{\min}$ and $\theta_{\max}$, the more aligned are the interests of the SIG and the policymaker. Second, the maximum number of partitions also grows as δ shrinks. For these two reasons, it is possible for a SIG to communicate better information to a "friendly" politician than to one whose policy objectives are very different from its own. Since a group cannot fool the policymaker in a lobbying equilibrium, its expected welfare grows with the amount and quality of information that it can convey.

Next consider the policymaker. If she were to grant access to the lobbyist in exchange for a contribution of $c_{\max}$, she would gain new understanding of the policy environment. This would allow her to make a better informed policy choice. Using expressions (4.12) and (4.14) from Chapter 4, we can calculate the contribution of the lobbying report to the policymaker's expected welfare. We find the expected gain in W to be equal to $\lambda c_{\max}$. The direct value of the campaign gift is, of course, $(1-\lambda)c_{\max}$. Thus, the direct and indirect benefit to the policymaker from granting access to the SIG sum to $c_{\max}$. If $c_{\max} > \tau$, the benefit exceeds the scarcity value of the policymaker's time, and so she will grant access for a fee of $c_{\max}$. If $c_{\max} < \tau$, she will make herself unavailable to the SIG by charging a fee in excess of $c_{\max}$.

Our discussion suggests an inverse relationship between contributions and bias. A group with preferences that are rather different from those of the policymaker has relatively little to gain from lobbying, and so is willing to pay less for the opportunity. And a group with quite a large bias in its preferences would be willing to pay so little for access, and would provide the policymaker with so little by way of useful information, that the value of the meeting would not be worth the policymaker's time. This pattern of contributions is depicted by the boldface curves in figure 5.2. Up to $\delta = \delta_1$, contributions decline as the relative bias increases. For even greater degrees of bias than δ_1, the SIG does not buy access, and contributions are nil. This pattern is in keeping with the empirical evidence, inasmuch as groups seem to contribute most to politicians they perceive as sympathetic to their cause.[19]

19. See, for example, McCarty and Poole (1998), who provide evidence that contributions by political action committees are inversely related to the disparity between the group's preferences and those of the recipients. Further evidence is presented by Welch (1980) and Poole and Romer (1985).

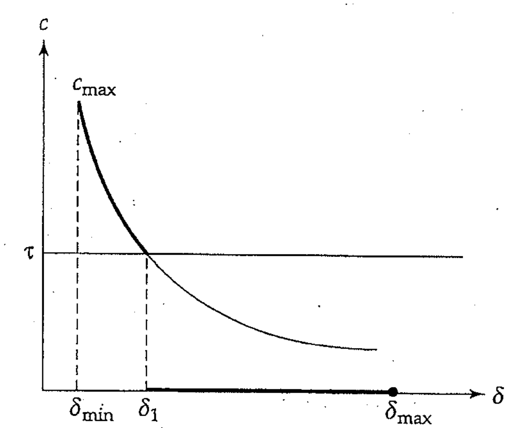

Figure 5.2
Contributions as a Function of δ

Our conclusion does not require the assumption that all bargaining power resides with the politician. We have so far assumed that the policymaker sets the requirements for a meeting, and that the group must either accept or reject her terms. Alternatively, the two sides might negotiate over the price of access. For example, the SIG might reject the politician's demand for a contribution of $c_{\max}$ and respond with a counterproposal. One possible outcome of bargaining is that the two sides will share equally in the gains from informative lobbying. In the event, the gain to the politician from having the SIG's report and a contribution of size c (net of the opportunity cost of meeting with the group) would match the gain to the SIG from making the report at a cost of c. An equal division of the surplus implies a contribution of size[20]

$$c_b = \frac{1}{2-\lambda}[\tau + (1-\lambda)c_{\max}].$$

Notice that c_b decreases with δ, because $c_{\max}$ does. Therefore, in this case too, the size of the contribution is inversely related to the disparity in preferences between the donor and the recipient.[21]

20. The surplus for the policymaker from the information and the contribution equals $\lambda c_{\max} + (1-\lambda)c - \tau$. The surplus for the interest group equals $c_{\max} - c$. By equating the two, we obtain the expression in the text.
21. More generally, if the two sides reach a Nash bargaining solution in which the policymaker captures a fraction η of the surplus, then the contribution will vary inversely with δ provided that $\eta > \lambda(1-\eta)$.

5.3.2 *Group with an Unknown Bias*

Now suppose that the policymaker is unsure about the interest group's preferences. The policymaker knows that the group has an objective function of the form $U = -(p - \theta - \delta)^2 - c$, but she does not know the extent of its policy bias. She suspects that δ falls in a range between $\delta_{\min}$ and $\delta_{\max}$, and regards all values in this range as equally likely.

To keep our discussion simple, we shall impose some limits on the values of $\delta_{\min}$ and $\delta_{\max}$. First, we assume that $\delta_{\min} > (\theta_{\max} - \theta_{\min})/12$, so that even if the group's bias is as small as is imaginable to the policymaker, the largest number of messages that the lobbyist can choose in a lobbying equilibrium is two. Second, we assume that $\delta_{\max} < (\theta_{\max} - \theta_{\min})/4$, so that even if the bias is as large as is imaginable, a 2-partition equilibrium always exists. With these restrictions, the policymaker is justified in expecting the lobbyist to report either "θ is low" or "θ is high." Her problem is to interpret the meaning of these reports in view of her uncertainty about the interest group's preferences.

For now we let the policymaker dictate the terms of access. To find the optimal fee for the policymaker, we need first to compute the likelihood that the SIG would pay a given price, c. Then we need to gauge the information that the policymaker would receive in circumstances in which a meeting would take place. Once we have done all of that, we can examine how a change in the fee affects the quality of the policy decision and the policymaker's expected revenues, and find the contribution level that maximizes her expected welfare.

We will see that lobbying is most attractive to the interest group when its bias is either small or large. In other words, if there are values of δ for which the SIG would refrain from lobbying, these are values that fall in the interior of the range between $\delta_{\min}$ and $\delta_{\max}$. This is very different from what was true for a group with a known bias, where the value of lobbying declined monotonically with δ.

Let us hypothesize that the SIG buys a chance to lobby if and only if δ falls between $\delta_{\min}$ and δ_1, or between δ_2 and $\delta_{\max}$, for some values of δ_1 and δ_2 that depend on the cost of access, c. With this conjecture about the SIG's behavior, we can investigate what the policymaker's optimal response would be to the alternative reports she might hear.

Consider first the possibility that the SIG has opted to pay c and that its lobbyist reports that "θ is low." For each possible value of δ

for which the SIG would lobby, there is a cut-off point $\theta_1(\delta)$ with the property that the SIG would report "low" if and only if $\theta \le \theta_1(\delta)$. The cut-off point is the state that leaves the SIG indifferent between reporting "low" and "high" when its bias is δ and it correctly anticipates the policymaker's response to either report. Such indifference occurs when the policy p_l that the group expects to see implemented after a report of "low" is the same distance from the group's ideal point of $\theta + \delta$ as the policy p_h that it expects to see implemented after a report of "high"; that is, $\theta_1(\delta) + \delta - p_l = p_h - \theta_1(\delta) - \delta$. Thus,

$$\theta_1(\delta) = \tfrac{1}{2}(p_l + p_h) - \delta.$$

With this understanding of the group's reporting strategy, the policymaker can calculate an average value of θ conditional on hearing a report that "θ is low." This calculation takes into account not only the different possible values of θ for a given $\theta_1(\delta)$, but also the different possible values of δ that would result in lobbying. It yields $E[\tilde{\theta}|\text{"}low\text{"}] = (3\theta_{\min} + \theta_{\max})/4 - \bar{\delta}$, where $\bar{\delta}$ is the average value of δ among those values that the policymaker believes will result in lobbying.[22] The policymaker sets the policy equal to her updated mean value for $\tilde{\theta}$, which implies that

$$p_l = \frac{3\theta_{\min} + \theta_{\max}}{4} - \bar{\delta}. \tag{5.11}$$

By a similar calculation, we find that $E[\tilde{\theta}|\text{"}high\text{"}] = (\theta_{\min} + 3\theta_{\max})/4 - \bar{\delta}$, and thus

$$p_h = \frac{\theta_{\min} + 3\theta_{\max}}{4} - \bar{\delta}. \tag{5.12}$$

Now let us consider the interest group's decision about whether to buy access when its bias is δ and when it anticipates the policymaker's responses as described above. First we calculate what the SIG stands to gain from lobbying, considering the report it would give in each possible state and the policy outcome that would result. This gain, which we denote by $B(\delta, \bar{\delta})$, is the expected difference between the group's utility from a policy of p_l (should it report "low") or p_h (should it report "high") and the utility it would derive from a

22. Specifically,

$$\bar{\delta} = \frac{1}{2}\left[\frac{(\delta_1)^2 - (\delta_{\min})^2}{\delta_1 - \delta_{\min} + \delta_{\max} - \delta_2}\right] + \frac{1}{2}\left[\frac{(\delta_{\max})^2 - (\delta_2)^2}{\delta_1 - \delta_{\min} + \delta_{\max} - \delta_2}\right].$$

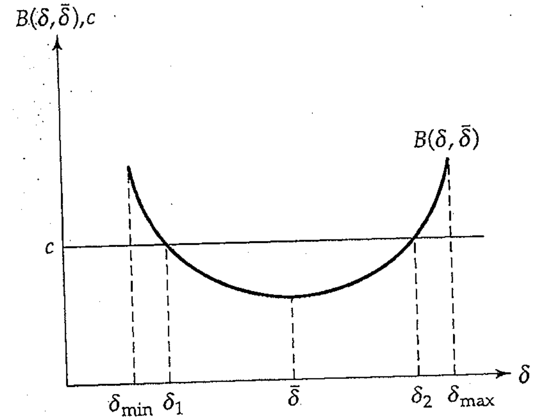

Figure 5.3
The SIG's Incentive to Lobby

policy of $p = (\theta_{\min} + \theta_{\max})/2$. The latter policy is the one that would be implemented in all states of the world if the group were to refrain from lobbying. The calculation of the expected gain is tedious, but not difficult, and yields

$$B(\delta,\bar{\delta}) = \tfrac{1}{2}(\delta - \bar{\delta})^2 - \bar{\delta}^2 + \tfrac{1}{16}(\theta_{\max} - \theta_{\min})^2.$$

The function $B(\delta,\bar{\delta})$ is shown figure 5.3. Notice that it reaches a minimum at $\delta = \bar{\delta}$. That is, the incentive to lobby is least for a group whose bias is equal to the average of the values for which lobbying would take place and greatest when the group's bias is far from this average. It follows that, if the SIG is just indifferent between paying the access fee and not when its bias is δ_1, then it will be unwilling to pay the fee when its bias slightly exceeds δ_1. Similarly, if the SIG is just indifferent between bearing the access fee and not when its bias is δ_2, it will not be willing to pay the fee when its bias is slightly less than δ_2. This validates our hypothesis that the SIG will lobby only if its bias is either small or large.

For a given access fee, the lobbying equilibrium is characterized by three equations. The first two define δ_1 and δ_2, the degrees of bias that leave the SIG indifferent between purchasing access at price c and not. They are $B(\delta_1,\bar{\delta}) = c$ and $B(\delta_2,\bar{\delta}) = c$. The third equation ensures that the policymaker's view of the group's expected bias is consistent with the group's optimal behavior. Specifically, from the definition of $\bar{\delta}$ we obtain

$$\bar{\delta} = \frac{1}{2}\left[\frac{(\delta_1)^2 - (\delta_{\min})^2}{\delta_1 - \delta_{\min} + \delta_{\max} - \delta_2}\right] + \frac{1}{2}\left[\frac{(\delta_{\max})^2 - (\delta_2)^2}{\delta_1 - \delta_{\min} + \delta_{\max} - \delta_2}\right].$$

These three equations determine δ_1, δ_2, and $\bar{\delta}$, which in turn determine p_h and p_l. Note that $B(\delta_1,\bar{\delta}) = B(\delta_2,\bar{\delta})$ implies that δ_1 and δ_2 are symmetrically placed around $\bar{\delta}$, which in turn implies that

$$\bar{\delta} = \tfrac{1}{2}(\delta_{\min} + \delta_{\max}).$$

Now we turn to the policymaker's choice of the access fee. Starting from a given value of c, a small increase in the fee has three effects. First, it narrows the range of values of δ for which the SIG would elect to purchase access (see figure 5.3). This means a smaller probability that the policymaker will need to spend time with the lobby, and hence a reduced expected cost of the policymaker's time. Second, it changes the quality of the policymaker's decision. An increase in c does not change $\bar{\delta}$, and hence it does not change the policymaker's response to a report of "low" or "high." An increase in the fee does, however, change the likelihood that any lobbying will take place. Since the expected quality of the policymaker's decision improves when she has a greater likelihood of becoming better informed, an increase in the fee imposes a cost on her for this reason.[23] Finally, an increase in c affects the expected revenues for the politician. The expected contribution is equal to the probability that access will be purchased times the size of the typical gift, and thus it can rise or fall with an increase in c.

The optimal fee balances these various effects. If the policymaker places a great weight on making the correct policy decision (i.e., if λ is large) and if the opportunity cost of her time is relatively small, then she may set a fee of $c = B(\bar{\delta},\bar{\delta})$, which is the largest value of c for which the probability of lobbying is one. Alternatively, if the opportunity cost of her time is large and the policy issue is not so important to her, she may set a high fee that precludes lobbying even if $\delta = \delta_{\min}$ or $\delta = \delta_{\max}$. For intermediate cases, the optimal fee will induce lobbying by the group if its interests are closely aligned with those of the policymaker, or if its bias is rather extreme. On the margin, the welfare that the policymaker could gain by setting a lower fee, thereby increasing the probability of attaining useful information, is offset by

23. The reader may verify that the policymaker's expected welfare $E[-(\tilde{p} - \tilde{\theta})^2]$ rises with δ_1 and declines with δ_2, as long as $\delta_{\max} < \frac{1}{4}(\theta_{\max} - \theta_{\min})$. Since an increase in c decreases δ_1 and increases δ_2, it must lower $E[-(\tilde{p} - \tilde{\theta})^2]$.

the potential loss of expected revenue and by the expected loss of her valuable time.

5.3.3 *Access Fees as Signals of SIG Preferences*

In the last section we allowed the policymaker to dictate the terms of access. She might prefer, however, to allow the SIG to choose the size of its contribution. By suggesting to the SIG that it make a voluntary contribution of any size, the policymaker affords the group an opportunity to signal the extent of its policy bias. Then she can use what she learns about the group's willingness to pay in assessing the meaning and credibility of its messages.

We have seen that voluntary spending can be used by an interest group with a known bias to signal the state of the policy environment. Might voluntary contributions by a group with an unknown bias similarly allow it to signal the nature of its preferences? Austen-Smith (1995) has posed this question in a model that is related to our own. He has shown that in fact, full revelation of the group's bias cannot occur in any equilibrium. We proceed now to illustrate his finding and to explain why it is so.

In the same setting as in the last section, let us imagine that the interest group is left to decide how much to pay for access to the policymaker. The policymaker takes the size of the contribution to indicate the extent of the SIG's policy bias. To show that there can exist no equilibrium with full revelation of δ, we suppose the opposite to be true. We attempt to construct an equilibrium in which the group contributes $c(\delta)$ when its bias is δ, where $c(\cdot)$ is a function that takes on a different value for every δ in the range from $\delta_{\min}$ to $\delta_{\max}$. When each contribution level can be associated with a distinct bias (which requires that $c(\cdot)$ be either monotonically increasing or monotonically decreasing), the policymaker can infer the group's exact bias from the size of its contribution. We will show that the monotonicity assumption leads to a contradiction.

Consider first the policymaker's response to the alternative reports she might hear. If the SIG reports "low," she will believe that θ falls between $\theta_{\min}$ and $\theta_1(\delta) = (\theta_{\max} + \theta_{\min})/2 - 2\delta$.[24] She will also believe

24. We compute $\theta_1(\delta)$ from

$$\theta_1(\delta) + \delta - p_l(\delta) = p_h(\delta) - \theta_1(\delta) - \delta$$

where $p_l(\delta) = [\theta_{\min} + \theta_1(\delta)]/2$ and $p_h(\delta) = [\theta_{\max} + \theta_1(\delta)]/2$.

that she knows δ, which she has deduced from the size of the group's contribution. Thus, she will set the policy equal to her updated beliefs of $E[\tilde{\theta}|\text{"}low\text{"}] = [\theta_{\min} + \theta_1(\delta)]/2$. This implies

$$p_l(\delta) = \frac{3\theta_{\min} + \theta_{\max}}{4} - \delta.$$

If the SIG instead reports "high," the policymaker will set the policy equal to $E[\tilde{\theta}|\text{"}high\text{"}] = [\theta_1(\delta) + \theta_{\max}]/2$. This implies

$$p_h(\delta) = \frac{\theta_{\min} + 3\theta_{\max}}{4} - \delta.$$

Now we turn to the incentives facing the interest group, which anticipates the policymaker's response. The group must decide how much to contribute, knowing that the policymaker will take its generosity as an indication of the extent of its bias. Let $c(x^*)$ denote the size of its optimal contribution, which induces the policymaker to believe that its bias is x^*. For an equilibrium with full revelation, the group must have an incentive to set $x^* = \delta$ for all values of δ; that is, it must not see a potential benefit from misleading the policymaker by contributing an amount different from what would be expected given its true bias.

If the SIG signals a bias of x, it expects the policymaker to set $p = p_l(x)$ in response to its own subsequent report that "θ is low" and to set $p = p_h(x)$ in response to a report that "θ is high." Of course, it will be able to choose the content of its report optimally once it learns the state of the world. Having signaled a bias of x when its true bias is δ, the optimal strategy for the SIG is to report "low" when $\theta \le \theta_1(x;\delta) = (\theta_{\min} + \theta_{\max})/2 - \delta - x$, and to report "high" otherwise.[25] Anticipating the policymaker's response to its optimal reports, the group can calculate the expected welfare that it achieves by a contribution of $c(x)$ when its bias is δ. We find that

$$U(x;\delta) = -\tfrac{1}{48}(\theta_{\max} - \theta_{\min})^2 - \tfrac{1}{2}(\delta + x)^2 - c(x), \qquad (5.13)$$

where $U(x;\delta)$ denotes this expected welfare level.

25. The optimal reporting strategy for the SIG when its bias actually is δ but the policymaker believes it to be x is found by solving

$$\theta_1(x;\delta) + \delta - p_l(x) = p_h(x) - \theta_1(x;\delta) - \delta,$$

where $p_l(x) = (3\theta_{\min} + \theta_{\max})/4 - x$ and $p_h(x) = (\theta_{\min} + 3\theta_{\max})/4 - x$.

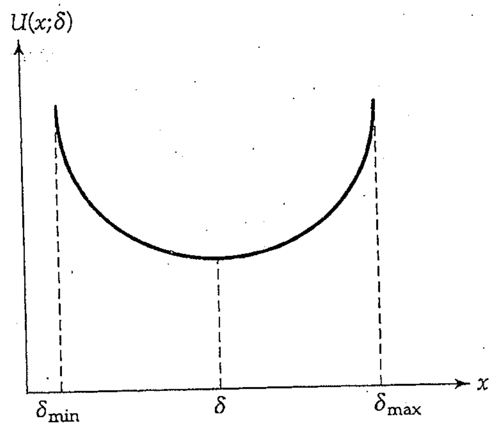

Figure 5.4
Expected Utility for a SIG with Bias δ

The optimal contribution for a SIG with a bias δ is $c(x^*)$, where x^* is the value of x that maximizes $U(x;\delta)$. To find x^*, we compute the first-order condition, which implies $c'(x^*) = -(\delta + x^*)$. If the SIG is to signal truthfully for all values of δ, it must be true that $x^*(\delta) = \delta$ for all δ. This can be satisfied only if $c'(x) = -2x$, and thus $c(x) = A - x^2$, for some constant value of A. Thus, $c(x) = A - x^2$ is our candidate contribution function. Notice that this function is monotonic for $x > 0$, so in principle it would allow the policymaker to identify δ as long as $\delta_{\min} > 0$.

There is a problem, however. If $c(x) = A - x^2$, the second-order condition for maximizing $U(x;\delta)$ is not satisfied at $x = \delta$, because $\partial^2 U/\partial x^2 = 1$ is positive. In other words, the group's expected welfare of $U(x;\delta)$ reaches a minimum, not a maximum, at $x = \delta$, as can be seen in figure 5.4. Thus, the incentive facing a SIG with a bias δ is not to contribute $c(\delta)$, but rather to contribute either $c(\delta_{\min})$ or $c(\delta_{\max})$. It follows that the hypothesis of full revelation of the group's bias cannot be sustained.

Our finding can be understood as follows. As we saw in Section 5.3.2, when the policymaker does not know the group's bias, the group gains the most from lobbying when its bias actually is either small or large. Hence, it has the greatest willingness to pay for access when its bias is small or large. But a signaling equilibrium with full revelation requires a monotonic relationship between the unobserved characteristic and the willingness to pay. Either the group must be willing to pay more when its bias is small than when it is larger, in which case a large contribution would signal a small bias, or the group must be willing to pay more when its bias is large than when it is smaller, in which case a large contribution would signal a large bias. Since the benefit from lobbying falls with δ for $\delta < \bar{\delta}$, and rises with δ for $\delta > \bar{\delta}$, the policymaker cannot rely on the contribution to distinguish between cases in which δ is quite small and those in which it is quite large.

Austen-Smith (1995) has established a similar result in a related model for a wider class of utility functions than the quadratic. He shows that if the contribution reveals anything at all to the policymaker about the group's bias, there must be ranges of values of δ with the property that all values of δ in the range give rise to the same level of contribution. Moreover, it is possible that the same contribution will be made for all δ between some δ_1 and δ_2 as well as for all δ between some δ_3 and δ_4 (with $\delta_1 < \delta_2 < \delta_3 < \delta_4$), and yet for δ between δ_2 and δ_3 the contribution will be something different. Voluntary contributions can only partially resolve a policymaker's uncertainty about an interest group's preferences and thus its reliability.

In this chapter, we have studied lobbying in settings where collecting and presenting information are costly. We began with the assumption that lobbying costs are fixed and independent of the content of a group's message. We showed that a group's willingness to bear these costs conveys information to the policymaker, independent of anything the group might say to her in a meeting. In settings in which the group's claims about the policy environment would not be credible, its lobbying may nonetheless have real effects. And when a group can communicate some information with its words alone, the demonstration of a willingness to pay can further enhance its credibility.

Interest groups often spend more on lobbying than would seem necessary to deliver their messages. This behavior can be understood in the light of the discussion in this chapter. By showing their willingness to bear a large cost of lobbying, groups may signal the urgency of their message. The policymaker may be able to infer quite a lot from the scale of a lobbying effort, and make a better policy decision as a result. However, when lobbying uses real resources, an interest group may suffer from being expected to reveal its information in this manner.

Sometimes the costs of lobbying are imposed by policymakers themselves. Interest groups often claim that their political contributions serve to buy access. We asked, Why would a policymaker place a price on access, and what effect do such fees have on the quality of her policy decision? Policymakers might levy fees in order to ration their time, or because they covet contributions for their usefulness in waging a campaign. When an interest group voluntarily contributes to a policymaker before it becomes informed about the policy issues and environment, the amount of its gift might also signal something about the nature of its preferences.