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Lobbying and asymmetric information*

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Abstract. Informational lobbying – the use by interest groups of their (alleged) expertise or private information on matters of importance for policymakers in an attempt to persuade them to implement particular policies – is often regarded as an important means of influence. This paper analyzes this phenomenon in a game setting. On the one hand, the interest group is assumed to have private information which is relevant to the policymaker, whilst, on the other hand, the policymaker is assumed to be fully aware of the strategic incentives of the interest group to (mis)report or conceal its private information.

It is shown that in a setting of partially conflicting interests a rationale for informational lobbying can only exist if messages bear a cost to the interest group and if the group's preferences carry information in the 'right direction'. Furthermore, it is shown that it is not the content of the message as such, but rather the characteristics of the interest group that induces potential changes in the policymaker's behavior. In addition, the model reveals some interesting results on the relation between, on the one hand, the occurrence and impact of lobbying and, on the other hand, the cost of lobbying, the stake which an interest group has in persuading the policymaker, the similarity between the policymaker's and the group's preferences, and the initial beliefs of the policymaker. Moreover, we relate the results to some empirical findings on lobbying.

> *Much of the pressure placed upon government and its agencies takes the form of freely provided "objective" studies showing the important outcomes to be expected from the enactment of particular policies* (Bartlett, 1973: 133, his quotation marks).

> *The analysis here is vague. What is needed is an equilibrium model in which lobbying activities have influence. Incomplete information ought to be the key to building such a model that would explain why lobbying occurs (information, collusion with decision makers, and so on) and whether lobbying expenses are socially wasteful.* (Tirole, 1989: Ch. 1.3, p. 77, Rent-seeking behavior).

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1. Introduction

Providing policymakers and legislators with information is often asserted to be one of the most important means by which interest groups influence the policymaking process. As Ornstein and Elder (1978: 75) put it, "the ability of a group to command facts, figures, and technical information in support of its positions is another key organizational resource. (...) Whether it is labor offering evidence on the noninflationary impact of increasing the minimum wage, oil interest groups outlining the limits of available oil reserves in the United States, Rockwell International detailing the technical capabilities and strategic necessity of the B-1 bomber, or companies describing the scientific reason for opposing specific limits on various chemical auto emissions, a group that can provide persuasive data to support its case has an important advantage." Although policymakers recognize that interest groups may have valuable expertise and specialized private information, they are quite aware of the strategic incentives interest groups have in presenting (or withholding) this information in a 'favorable' way (see, e.g., Zeigler and Baer, 1969: 109; Schlozman and Tierney, 1982: 298). "This need not imply outright lie or dishonest manipulation, although these cannot be excluded with certainty" (Appels, 1985: 308).

From a positive-theoretic point of view then, the omnipresence and importance of informational or persuasive lobbying is not unproblematic. Why should a policymaker believe the messages by an interest group if the latter can be assumed to submit its information in a self-interested manner whenever this is profitable? Alternatively, if policymakers would not take account of messages by an interest group, why then should the latter take the (often substantial) cost or trouble of lobbying? But differently, is there a scope and rationale for informational lobbying in a world of self-interested agents with rational expectations? Furthermore, if such a base exists, when is informational lobbying more or less likely to occur and when is the policymaker's response likely to be favorable for the interest group? The present paper is a first attempt to provide some answers to these questions in a game-theoretical analysis.

The organization of the paper is as follows. In the remainder of this section, the present paper will be related to the literature. Section 2 presents a simple but basic game in which an interest group has private information (on the state of the world) which is relevant for the policymaker's decision. This decision affects the payoffs of both players, and the interest group has the possibility of sending a message (lobby report) to the policymaker at a fixed cost. Section 3 presents the equilibria of the game under various sets of parameters and derives comparative statics results between, on the one hand, the occurrence of and the response to lobbying messages and, on the other hand, the cost of lobbying, the interest group's stake in persuading the policymaker, and the policymaker's preferences and initial beliefs. Section 4 discusses two extensions to the basic model. First, it is shown that the scope for information transfer may increase if the cost of lobbying is a decision variable for the interest group. Second, we introduce an intermediary stage in the game, which 'screens' a message before it reaches the policymaker. Section 5 contains a discussion of the results and relates them to other, theoretical and empirical, work on interest groups. Section 6 concludes.

Relating the present paper to the literature, it is first noted that the predominant formal literature on interest groups and rent-seeking typically uses an *influence function* to represent the transformation of inputs by interest groups (money, labor, and capital) into political influence (e.g., Becker, 1985; Tullock, 1980). A major criticism of these models is that the (inter)action underlying his transformation is lacking (cf. Mitchell, 1990). It is simply assumed that pressure is produced by spending resources. Moreover, the political agents are not treated as players in these models but are assumed to respond mechanically to interest groups' pressures. In contrast, in the model to be presented, the policymaker is treated as a player and one aspect of the interaction is explicitly modelled, to wit, information transmission. This goes, however, at the cost of not incorporating any competition *between* interest groups. In a sense, the model may be seen as an attempt to find a microfoundation for the use and specification of an influence function.

By using a game setting the model differs from models of persuasion (e.g., Bartlett, 1973; Calvert, 1985) in which the sender of messages is not treated strategically (as a player). Furthermore, our model differs from *principal-agent* models (e.g., Grossman and Hart, 1983) in that we do not assume that the uninformed player (policymaker) can commit itself to a message-response profile at the beginning of the game. Such a commitment specifies conditional actions by the principal of the form: 'If yo send me report M on your private information, I commit myself to do X.' We do not think such commitments (contracts) to be relevant or credible in the context of informational lobbying.

Being a signalling game, our model, of course, bears resemblance to the signalling literature in general. But it differs from *cheap talk* games, for instance, in that we do not assume that communications (lobbying messages) are costless. In addition, we allow the players to have a 'substantial' difference of interests (contrary to, e.g., Crawford and Sobel, 1982; Farrell, 1988) and we do not assume that lying is impossible (Milgrom, 1981). Furthermore, our basic model (Section 2) differs from a wide class of signalling games (so-called monotonic signalling games; see Cho and Sobel, 1990) in that we assume that the cost of a message is fixed, that is, independent of the content of the message (signal) and the private information of the sender.

2. The basic model

For a lobbying model it is difficult to write down the appropriate game form since the institutional setting within which lobbying takes place is rather diffuse and obscure. Therefore, we have deliberately chosen to start off with a lobbying game with a 'thin' institutional structure, but which incorporates all the necessary ingredients for strategic informational lobbying. There are two players, a policymaker (government) G and an interest group F. Player G has to take an action x from a set of feasible actions X. The payoffs (utilities) the players derive from x depend on some (state of the world) variable $\theta \in \Theta$, where Θ is a finite set. It is assumed that the 'true' value of θ is private information of F. The variable θ may reflect the action taken by F in response to the action x by G. For example, if θ reflects the competitiveness of a firm F it may determine the demand for labor (the reaction) by F in response to subsidies or protection (x) provided by G. The state of the world θ, however, may also refer to reactions to x by other agents than F, including 'nature'. For example, an environmental group F may have private information on the state of nature θ, which determines the consequences of an environmental policy x. Or, if F is a trade union, θ may reflect the preferences of its members and, consequently, their voting intentions in response to x.

Before G decides on its action, F can send G a message (lobby report) m from the (finite) set of feasible messages M. It is perhaps most natural to think of the set M as containing all elements of Θ or all subsets of Θ, but, as will be seen below, the specification of M is immaterial to the equilibrium outcomes of the game. We assume that sending a message bears a fixed exogenous cost c to F but not to G, and that sending no message, denoted by n, bears no exogenous cost.[1] The important assumption we make here is that this cost is independent of both the 'content' of the message (i.e., the particular element of M) and the private information θ of F. Testifying at a congressional hearing, making a telephone call, or hiring a lobbyist, for instance, bears a cost but this cost is independent of what F says and of what F knows. Thus, for the cost of a 'signal' s, we assume $c(s) = 0$ if $s = n$, $c(s) = c$ if $s = m \in M$. Furthermore, we assume here that there is no way that G can check the accuracy of F's message. In Section 4 we shall discuss two alternative specifications.

For the ease of presentation attention is focused on the case that both X and Θ contain only two elements, $X = \{x_1, x_2\}$ and $\Theta = \{\theta_1, \theta_2\}$. Whenever the results depend qualitatively on this restriction, this will be indicated. It is assumed that G assigns a prior probability p $(1-p)$ to the case that $\theta = \theta_2$ $(\theta = \theta_1)$ and that every element of the game except θ, which is private information of F, is common knowledge. Without further loss of generality we can normalize the payoffs over action-state pairs such that they can be represented by the following matrix.

G, F	$\theta = \theta_1$	$\theta = \theta_2$
$x = x_1$	$a_1, 0$	$0, 0$
$x = x_2$	$0, b_1$	a_2, b_2

It is assumed that $a_i > 0$, for $i = 1, 2$. Hence, we can say that a_i is the (net) payoff to G of making the 'right' choice (x_i) when the state is θ_i, and that the action x_2 by G gives F a (net) payoff of b_i if its private information is θ_i. In the sequel, F_i will indicate the interest group with private information θ_i.[2]

To define equilibrium formally, we need some additional notation. Let $\sigma(s)$ denote G's strategy, defined as the probability that G plays $x = x_2$ after having received 'signal' $s \in S: = M \cup \{n\}$. Let $\rho_i(s)$, $i = 1, 2$, denote F_i's strategy, that is, the probability that F sends signal $s \in S$ when its private information is $\theta = \theta_i$. Finally, q(s) denotes G's posterior belief, defined as the (subjective) probability that $\theta = \theta_2$ after having received signal s. Now, a *Lobbying Equilibrium* (LE) is defined by a pair of strategies σ, ρ, satisfying the following conditions:

(1) if for some $s \in S$, $\rho_i(s) > 0$ then s maximizes $b_i\sigma(s) - c(s)$; in addition $\Sigma_s\rho_i(s) = 1$ for $i = 1,2$,
(2) if $\sigma(s) > 0$ (< 1) for some $s \in S$, then $q(s) \geq (\leq)\ \alpha: = a_1/(a_1 + a_2)$,
(3) $q(s) = \text{Prob}\{\theta = \theta_2 | s\} = p\rho_2(s)/[(1-p)\rho_1(s) + p\rho_2(s)]$ if the denominator is positive; if not, the belief q(s) must be concentrated on the type F_i which is 'most likely' to send the off-equilibrium signal s.

Condition (1) states that s (ρ) should maximize the expected payoff of F, taking the strategy of G as given. Condition (2) requires that x (σ) maximes G's expected payoff given its posterior beliefs. Condition (3) requires G's posterior beliefs to be consistent with Bayes' rule, whenever possible. In addition, in case of a signal s which is not sent in equilibrium, beliefs must be concentrated on the type which is 'most likely' (i.e., has the weakest disincentive) to deviate and to send s instead of the equilibrium signal. This latter requirement precludes sequential equilibria which are supported by unintuitive off-equilibrium beliefs.[3]

Now, we will motivate a further restriction of our focus of attention. Three basic situations or incentive structures can be distinguished, dependent on the values of b_1 and b_2. Firstly, there is *no* conflict of interest between G and F if $b_1 < 0 < b_2$. In this case both F and G prefer the action x_1 if $\theta = \theta_1$ and the action x_2 if $\theta = \theta_2$. Hence, F never has an incentive to make a dishonest or untruthful report on its private information. It is easy to show that there is no problem regarding the scope for information transfer from F to G in this case of completely congruent interests. There is no reason for the policymaker to mistrust a message by the interest group.[4] Secondly, there is *full* conflict of interests if $b_2 < 0 < b_1$. In this case G prefers to play x_1 if $\theta = \theta_1$ and x_2 if $\theta = \theta_2$, whereas F prefers G to play x_1 if $\theta = \theta_2$ and x_2 if $\theta = \theta_1$. Hence, F always has an incentive to be dishonest and misinform G about its private information: F_1 would like to make G believe that $\theta = \theta_2$, and F_2 would like to make G believe that $\theta = \theta_1$. It can be shown that no scope for information transfer exists in this case of completely opposite preferences. Due to the rational expectations character of the equilibrium concept, the policymaker will always interpret a message in a manner which is unfavorable for the interest group, and hence, no message will be sent.[5] Finally, there is a case of *partial* conflict of interest if $b_1, b_2 > 0$ (or, similarly, $b_1, b_2 < 0$). In this case F prefers G to play x_2 independent of its private information. Consequently, F always has an incentive to make G belief that $\theta = \theta_2$. Hence, F_2 would like to report truthfully on its private information whereas F_1 has an incentive to misinform G about its private information. The problem of the scope for information transfer and the rationale for sending costly messages is most pertinent in this case of partly conflicting interests. Therefore, we shall concentrate on this case and assume henceforth that,

$$b_i > 0, i = 1, 2.$$

To illustrate this set-up, consider the following example. Let θ denote the competitiveness of a firm (or industry) F, which can either be low (θ_2) or high (θ_1). The government G has to decide whether (x_2) or not (x_1) to give in to F's preference ($b_i > 0$) for an infrastructural project. G prefers to give in to this demand if and only if $\theta = \theta_2$. This may be due to the costs $(0 - a_2)$ to G of the substantial loss of employment which will ensue (only) if G does not provide the project when F's competitiveness is low (θ_2). If $\theta = \theta_1$ then F's competitiveness is too high to warrant the (social) costs of the project ($a_1 > 0$).

3. Equilibrium

First, it will be shown – proofs are in the Appendix – that in equilibrium different messages cannot induce different actions, as we have stated in the previous section. As a consequence, the specification of the message space M, is immaterial to the outcomes of the game.

Lemma. Every message $m \in M$ which is sent with positive probability induces the same action.

The intuition behind this result is the following. Once F has decided to send a message, it already has to bear the fixed exogenous cost c, independent of *what* it is going to say. After this decision, a message is essentially equivalent to 'cheap talk'. Thus, if the content of a message would make a difference for G's action, F will always send a message with the most favorable impact on G's action. All messages which are sent in equilibrium must induce the same, most favorable (mixed) action by G. The Lemma can be interpreted as saying that it is not the content of a message as such that reveals information to G, but merely the *fact* that a message is being received (or not). Consequently, nothing is lost in terms of equilibrium actions and payoffs if we henceforth assume that the set of feasible messages M contains only one element, m° say. Although the content of a message does not really matter (cf. Crawford and Sobel, 1982) we could think of m° as saying that '$\theta = \theta_2$.' To simplify notation, we can now define: $\rho_i := \rho_i(m^\circ)$ and $1-\rho_i = \rho_i(n)$, for $i = 1, 2$.

The next proposition indicates that no information transfer can occur if the interest group's preferences carry information in the 'wrong direction'. As a consequence, G will base its decision on its prior belief p.

Proposition 1. If $b_1 > b_2 > 0$ then $\rho_i = 0$, $i = 1, 2$, and $\sigma(n) = \sigma(q(n)) = \sigma(p)$ in any LE.

The intuition behind this result is as follows. Only if $\theta = \theta_2$, F would want to reveal its private information because then G is willing to play x_2. However, if $b_1 > b_2$ then F_1 has a larger stake in persuading G that $\theta = \theta_2$ than F_2. In other words, when F wants to report honestly (F_2) it has a smaller stake to send a message than when it wants to report dishonestly. From G's perspective, the 'bad' type is more willing to invest in a persuasive message than the 'good' type. Knowing this, G is tempted to interpret a message as coming from F_1 rather than F_2. From F's perspective, however, this would be unfavorable. Consequently, F will not send a costly message.

Hence, a necessary condition for informative messages is: $b_1 > b_2$. This sorting condition – which is not new in the signalling literature – in a sense requires that there is 'sufficient' congruence of preferences between the policymaker and the interest group. More specifically, it implies that F's preferences carry information in the 'right direction'; F's stake in persuading is larger when its private information is of the kind that justifies persuasion from G's point of view.

Another necessary condition for the occurrence of lobbying is that $b_2 > c$. If the cost of a message is prohibitive ($b_1 < b_2 < c$) then obviously no lobbying can occur in equilibrium and G will base its decision on its prior beliefs. To enable the occurrence of lobbying it is, henceforth, assumed that,

$$0 < b_1 < b_2 \text{ and } c < b_2.$$

The next two propositions present the equilibria of the game under the latter assumption. An important distinction that must be made is between the case that the cost of sending a message is prohibitive for F_1 ($b_1 < c$) and the case that it is not ($b_1 > c$). Not surprisingly, a further distinction must be made between the case ($p > \alpha = a_1/[a_1 + a_2]$) where, on the basis of its *prior* beliefs, G would take the action (x_2) which is preferred by F and the case ($p < \alpha$) where G would take a decision (x_1) unfavorable to F. We start with the latter case.[6]

Proposition 2

If $p < \alpha$ there is a unique LE,

(a) if $c < b_1 < b_2$:

LE1: $\rho_1 = p(1-\alpha)/[(1-p)\alpha]$, $\rho_2 = 1$, $\sigma(n) = 0$, $\sigma(m°) = c/b_1$;

(b) if $b_1 < c < b_2$:

LE2: $\rho_1 = 0$, $\rho_2 = 1$, $\sigma(n) = 0$, $\sigma(m°) = 1$.

The equilibrium exhibits the following qualitative properties. [Comparative statics will be discussed later.] If lobbying cost are prohibitive for type F_1 (case b), then only F_2 sends a message which then is conclusive evidence that $\theta = \theta_2$. If cost are not prohibitive (case a) then F_2 always sends a report and F_1 plays a mixed strategy. The rationale for this is as follows. G will play x_2 only if its belief – that $\theta = \theta_2$ – increases. This belief will be increased by a message only if a message is more likely to come from F_2 than from F_1. Therefore, F_1 must play a mixed strategy. Although a message is informative in this case, G still remains in doubt about θ after a message since both ρ_1 and ρ_2 are positive. Thus uncertainty (specifically $q(m°) = \alpha$) induces G to play a mixed strategy, and this strategy in turn justifies F_1's mixed strategy. No message (silence), however, is conclusive evidence that $\theta = \theta_1$. In this case G takes the same action (x_1) as it would have taken on the basis of its prior beliefs (p). We could say that in LE1 'silence is consent'.

Proposition 3

If $p > \alpha$, there are multiple LE,

(a) if $c < b_1 < b_2$:

LE3: $\rho_1 = \rho_2 = 0$, $\sigma(n) = 1$, $\sigma(m°) = 1$

LE4: $\rho_1 = 0$, $\rho_2 = 1 - (1-p)\alpha/[p(1-\alpha)]$, $\sigma(n) = 1-c/b_2$, $\sigma(m°) = 1$

LE5: $\rho_1 = \rho_2 = 1$, $\sigma(n) = 0$, $\sigma(m°) = 1$;

(b) if $b_1 < c < b_2$: LE2 and LE3.

We see that no-lobbying (LE3) is always a LE if G's prior beliefs ($p > \alpha$) are already favorable for F's preference (x_2). There is no need to send a message for F in LE3 since G does not expect a message and will make a favorable decision anyhow. Interestingly, and somewhat surprisingly, there are also equilibria in which a message is being sent. In LE4, only F_2 sends a message with positive probability and, hence, a message is conclusive evidence that $\theta = \theta_2$. However, the probability $\sigma(n)$, that G concedes to F's wishes if no message is being received, is so large ($b_1\sigma(n) > b_1\sigma(m^\circ) - c$) that it does not pay for F_1 to send a message. In LE5, G expects to receive a message with probability one. If G would not receive a message it will argue that it is most likely that $\theta = \theta_1$, since in this state F benefits less ($b_1 < b_2$) from the sure concession ($\sigma(m^\circ) = 1$) after a message. Consequently, after the out-off-equilibrium signal $s = n$, G would update to $q(n) = 0$ and play $\sigma(n) = 0$. Due to these (posterior) beliefs and the corresponding strategy of G, F is 'forced' to send a costly message (independent of its private information), even though such a message does not convey any information ($q(m^\circ) = p$). Finally, note that in LE2, LE4 and LE5, G takes a (mixed) action, if it does not receive a message, which is less favorable for F than the action which G would take on the basis of its prior beliefs [$\sigma(n) = \sigma(q(n)) < \sigma(p) = 1$]. Rather than 'silence is consent', a more appropriate proverb for this result would be 'no news is bad news' (cf. Milgrom, 1981), or even better 'silence is bad news'. Hence, if F is not certain that the equilibrium which will be played is LE3, then it will have to send a message if it wants to be sure that G will play x_2.

Now we shall make some payoff comparisons. Let E_G, E_1, and E_2 denote the expected payoffs of G, F_1, and F_2, respectively. Simple computation reveals that,

$$\begin{aligned}
E_G(LE1) &= (1-p)a_1,\ E_G(LE2) = (1-p)a_1 + pa_2,\ E_G(LE3) = E_G(LE4) = E_G(LE5) = pa_2;\\
E_1(LE1) &= E_1(LE2) = 0,\ E_1(LE3) = b_1,\ E_1(LE4) = b_1(1-c/b_2),\ E_1(LE5) = b_1 - c;\\
E_2(LE1) &= c(b_2/b_1 - 1),\ E_2(LE2) = b_2 - c,\ E_2(LE3) = b_2,\ E_2(LE4) = b_2 - c,\ E_2(LE5) = b_2 - c.
\end{aligned}$$

We see that G attains the maximum feasible expected payoff (only) in the *separating* equilibrium LE2. This equilibrium exists if $b_1 < c < b_2$.[7] In the other equilibria G's expected payoffs are identical to the expected payoffs in the case where G would base its decision on its prior belief p, that is, $(1-p)a_1$ if $p < \alpha$, and pa_2 if $p > \alpha$. This is a straightforward result for the equilibria LE3 and LE5, since no information is disclosed in these *pooling* equilibria ($\rho_1 = \rho_2$). For LE1 and LE4, however, this result is less straightforward because in these *semi-pooling* equilibria 'some' information is being transmitted ($\rho_1 \neq \rho_2$).[8] Note, however, that G may be misled by F's signal. In LE1 there is a chance – $(1-p)\rho_1\sigma(m^\circ)$ – that G 'wrongly' decides to play x_2, and in LE4 there is a chance – $p(1-\rho_2)(1-\sigma(m^\circ))$ – that G wrongly decides to play x_1.

Nevertheless, in terms of expected payoffs, G does not lose from F's (possibility of sending a) message in any LE.

The interest group (both F_1 and F_2) may either lose or benefit from the possibility of sending a message. If G would base its decision on its prior belief, then both F_1 and F_2 would receive a payoff of 0 in the case that $p < \alpha$. Hence, in terms of expected payoffs F_2 strictly benefits from the possibility of sending a message in this case and F_1 'breaks even' (LE1 and LE2). Ex post, of course, F may regret to have sent a costly message – namely, when G nevertheless plays x_1 (which happens with probability $1 - \sigma(m°)$). If $p > \alpha$, then both F_1 and F_2 attain the maximum feasible payoff if lobbying were impossible and G would base its decision on its prior belief. Hence, in this case both F_1 and F_2, either lose from the possibility of sending a message (LE2, LE4, LE5) or, at best, break even (LE3).[9]

Summarizing, we can say that in some cases (LE2) both the policymaker and the interest group benefit from the costs invested in a lobbying message, but that in other cases (LE5) the costs invested in informational lobbying are a pure social waste.

Now, we shall relate the analysis to the questions posed in the introduction, concerning the scope for information transfer and the rationale for lobbying. First, we have seen that an opportunity for information transfer exists – even in a situation where there is a partial conflict of interests and where lobbying costs are independent of both the content of the message and the private information of the sender – if the interest group's preferences carry information in the 'right direction' ($b_1 < b_2$), that is, if F has a larger stake in persuading G when it wants to inform (F_2) than when it wants to misinform (F_1). Although the assumption $b_1 < b_2$ may seem arbitrary, we belief that (empirically) it is a more relevant case than $b_1 > b_2$. Remember that G is willing to give in to F's demand for x_2 only if $\theta = \theta_2$. If $b_1 < b_2$ then θ_2 is also the case that F benefits most from G's concession (x_2). Hence, $b_1 < b_2$ in a sense implies that G is willing to give in to F's claim only in the case that F wants or 'needs' a concession most.[10]

Second, from the interest group's perspective, a rationale for costly lobbying exists (a) if it induces a favorable change in the policymaker's behavior relative to the latter's propensity based on its prior beliefs (Proposition 2, LE1, LE2), and (b) if F knows or believes that G expects to receive a lobbying message and will make a less favorable decision in case of silence (Proposition 3, LE2, LE4, LE5). As a consequence, a lobbying message may in some situations provide a real service to the policymaker and the interest group (LE2), but may be a pure social waste in others (LE5).

In addition, the following comparative statics can be inferred from the analysis – even though some care must be taken in case of multiple equilibria

(Proposition 3). First, note that in Proposition 2 ($p < \alpha$) the *expected occurrence of lobbying* O, defined as O: $= (1-p)\rho_1 + p\rho_2$, is non-decreasing in b_1 and non-increasing in c, due to the fact that we can switch from regime (a) to regime (b). Moreover, if b_2 decreases or c increases we eventually end up in the case where $b_2 < c$ and lobbying costs are prohibitive. Hence, a quite intuitive result is that lobbying is more likely to occur if the cost decreases and/or if the potential benefit or stake increases. Furthermore, an easy calculation reveals that $O = p/\alpha$ in equilibrium LE1 ($c < b_1 < b_2$). This suggests that lobbying is more likely to occur if G is closer (due to a higher p/α) to the regime ($p/\alpha > 1$) in which, on the basis of its prior beliefs, G would make the decision (x_2) which is preferred by F. The rationale is that with larger p/α, G can be induced to play x_2 with a smaller increase ($q(m^\circ) - p$) in its belief. A message need not 'surprise' G so much, and hence, F_1 can send a message with a larger probability. However, the relation between O and p/α is not necessarily monotonous, because an increase in p/α eventually leads to a jump from the regime of Proposition 2 ($p/\alpha < 1$) to the regime of Proposition 3 ($p/\alpha > 1$), and in this latter regime there are two equilibria (LE3 and LE4) where O is smaller than in LE1 (but also one, LE5, where O is larger).

A second endogenous variable that is of interest is the policymaker's *response to lobbying*, $\sigma(m^\circ)$. From proposition 2 we can infer that $\sigma(m^\circ)$ is increasing in c and decreasing in b_1. We could say that G 'discounts' F's message, depending on the stake which F_1 has to misinform G, relative to the cost of a message. In the limiting case where messages are costless ($c = 0$) it follows that $\sigma(m^\circ) = 0$ and G takes the same action (x_1) it would have taken on the basis of its prior beliefs.[11] Furthermore, focussing again on the regime $c < b_1 < b_2$, we see that $\sigma(m^\circ) < 1$ if $p < \alpha$ (LE1), whereas, $\sigma(m^\circ) = 1$ if $p > \alpha$ (LE3, LE4, and LE5). Thus, if we switch from $p/\alpha < 1$ to $p/\alpha > 1$, $\sigma(m^\circ)$ increases. Hence, $\sigma(m^\circ)$ is non-decreasing in p/α. We can say that G's response to lobbying is more favorable for F, if G would already have made ('tended' to make) this favorable decision on the basis of its prior beliefs.

4. Additional validating mechanisms

In this section, two extensions of the basic model of the previous sections will shortly be discussed. First, we shall treat a model in which the cost of lobbying is endogenous. Second, a model is presented in which the content of the lobbying message matters, in the sense that 'true' messages are more likely to be accepted than 'false' messages. Both of these extensions will be seen to increase the scope for information transfer and the impact of a message.

4.1. Endogenous lobbying costs

In the basic model it is assumed that the cost of sending a message is fixed. The idea is that this cost is determined exogenously by the communication channel used by the interest group to put forward its message (e.g., paying a personal visit, writing a letter, testifying at a hearing), and that this cost is independent of the content of the message and the private information of the interest group. However, to some degree the cost of lobbying may be endogenous to the interest group. For instance, by paying more visits, writing more letters, having more subscribers to a petition, hiring more lobbyists, or by placing more or larger advertisements, an interest group can to some extent vary the cost of a message. It follows that even if the costs to an interest group are independent of the content of the message and its private information, an interest group with 'favorable' private information could try to increase the persuasiveness of its message by increasing the cost (or effort) of its message.

To illustrate the consequences we amend the basic model as follows. Recall that, independent of its private information, F has a stake in making G belief that $\theta = \theta_2$. Therefore, we fix the 'content' of a message as saying that 'θ is (likely to be) θ_2', and we assume that the cost of signalling – that is, to send the message at a particular cost – can be varied continuously. For simplicity, it will be assumed with respect to these costs, denoted by c(s), that $c(s) = s$, where s now denotes the cost (effort) which F chooses to invest in the message, instead of the content of the signal as in the basic model. If $s = 0$ then F does not make any cost, which means that it does not send the message. It is allowed, furthermore, that there is some upperbound s^+ on the costs which F can make. This bound may be caused by budgetary restrictions, or to limitations imposed by the communication channel. Hence, we assume that $s \in S := [0, s^+]$. The strategy $\rho_i(s)$, $i = 1, 2$, now denotes the probability that F_i makes a cost s (= c(s)) in sending the message that $\theta = \theta_2$. An equilibrium is again defined by the conditions (1)-(3) from Section 2.[12] For brevity we shall only give the equilibrium for the case ($p < \alpha$) that, on the basis of its prior beliefs, G tends to take a decision (x_1) which is unfavorable for F.

Proposition 4
If $p < \alpha$, $0 < b_1 < b_2$ the following is a LE:
(a) if $s^+ < b_1$: $\rho_1(s^+) = 1-\rho_1(0) = p(1-\alpha)/[(1-p)\alpha]$, $\rho_2(s^+) = 1$, $\sigma(s) = 0$ for $s < s^+$, $\sigma(s^+) = s^+/b_1$;
(b) if $s^+ > b_1$: $\rho_1(0) = 1$, $\rho_2(b_1) = 1$, $\sigma(s) = 0$ for $s < b_1$, $\sigma(s) = 1$ for $s \geq b_1$.

Case (b) shows that perfect revelation of information (a separating equilibrium) is possible if the maximum feasible cost s^+ which can be invested in the message is large enough. In this case the type (F_2) with the favorable information makes just so much cost ($s = b_1$) that it does not pay for the type with the bad information (F_1) to follow. Hence, with F_1 not making any costs (not sending a message), F's private information is completely revealed and G acts accordingly: it plays x_2 if and only if the message sent by F bears a cost to F of at least b_1.

In case (a) the upperbound on the cost of a message is too tight to allow for complete separation. Even if F_2 invests maximally ($s = s^+$) in its message with probability one, it pays for F_1 to follow if this induces a favorable change in G's behavior. This change, however, will occur only if F_1 (contrary to F_2) plays a mixed strategy, since then a message with cost s^+ is more likely to come from F_2.

Although the equilibrium of Proposition 4 is very similar to the one of Proposition 2 if $s^+ = c$, case (b) is different. The reason is that F_2 will not (have to) spend more on lobbying than b_1 to compete out F_1 if $s^+ > b_1$. In addition, lobbying costs cannot be prohibitive now; contrary to $c > b_2$ in Section 2, $s^+ > b_2$ does not prohibit F_2 to send a message. Consequently, as simple payoff comparisons reveal, if $s^+ \geq c$ then both G and F_2 are better off in the LE of Proposition 4 than in the LE of Proposition 2, whereas F_1 is indifferent. Hence, in *ex ante* terms both the policymaker and the interest group benefit from the fact that there is no restriction on the effort or cost that can be invested in sending a message.

It is worth noting that the scope for information transfer also increases if the interest group's cost of sending a message is a decision variable of the policymaker. Recall from Section 3 that G attains the maximum feasible payoff in equilibrium LE2, which exists if c lies between b_1 and b_2. If G would have the possibility to vary c – for instance, by being more or less accessible and hospitable for messages – then G would have an incentive to set c between b_1 and b_2. In that case, G should increase the cost of lobbying if F potentially (i.e., if $\theta = \theta_1$) has a high stake (b_1) to misinform G.[13]

4.2. Screening of messages

In the analysis of Section 3, the *content* of the message appeared not to have any impact on the equilibrium outcome. This is due to the assumption that the policymaker cannot, in any way, distinguish between 'false' and 'true' messages. Although this is a quite common assumption in signalling models, and an interesting one as a benchmark case, it is, of course, a quite extreme assumption. There may be mechanisms or institutions which provide some screening of (the content of) messages. For instance, an interest group may try to make its case ('$\theta = \theta_2$,' in our game) more credible by employing (at a cost c) outside consultants or experts. Although there is often pressure (either direct or implicit) on the consultant to produce a report which supports the case of the interest group, this does not imply that the consultant will always deliberately lie if this favors the interest group's case (there may be a loss of credibility for the consultant at stake). It could be argued that the probability that the consultant comes up with a report that favors the interest group (i.e., saying '$\theta = \theta_2$') is more likely when the true state is favorable for the group's case ($\theta = \theta_2$) than when it is not ($\theta = \theta_1$). However, if the consultant turns up with a report that harms the group's case (i.e., a report saying that '$\theta = \theta_1$') then the interest group will not transmit this report (message) to the policymakers. It will only transmit the consultant's findings if they are favorable (i.e., support θ_2). In a sense, the interest group 'screens' the reports produced by outside ('objective') consultants. We shall now illustrate that this mechanism can increase the scope for information transfer and the impact of messages on the policymaker's action.

Let π_i, i = 1, 2, denote the exogenous (and commonly known) probability that the consultant turns up with a report saying '$\theta = \theta_2$' when actually $\theta = \theta_i$, and assume that $0 \leq \pi_1 \leq \pi_2 \leq 1$. Now, ρ_i denotes the probability that F_i hires a consultant at a fixed cost c. Instead of condition (1), $\rho_i > 0$, now requires that $\pi_i b_i[\sigma(m) - \sigma(n)] - c \geq 0$. Furthermore, if G receives a message (s = m) saying that '$\theta = \theta_2$', then the posterior probability q(m) that $\theta = \theta_2$ is: $q(m) = p\rho_2\pi_2/[(1-p)\rho_1\pi_1 + p\rho_2\pi_2]$. If G does not receive a message (s = n) then there is a probability $(1-p)(1-\rho_1) + p(1-\rho_2)$ that F did not hire a consultant, and, a probability $(1-p)\rho_1(1-\pi_1) + p\rho_2(1-\pi_2)$ that the consultant turned up with a report (saying '$\theta = \theta_1$') which F did not transmit to G. Hence, the posterior probability that $\theta = \theta_2$ when no message is received is: $q(n) = p(1-\rho_2\pi_2)/[(1-p)(1-\rho_1\pi_1) + p(1-\rho_2\pi_2)]$. In the following illustration of the increased scope for information transmission we shall, for brevity's sake, again restrict attention to the – more interesting – case that $p < \alpha$.

Proposition 5
If $p < \alpha$, the following is a LE:
(a) if $c < \pi_1 b_1 < \pi_2 b_2$ then
 (i) if $\beta < 1$: $\rho_1 = \beta$, $\rho_2 = 1$, $\sigma(n) = 0$, $\sigma(m) = c/(\pi_1 b_1)$;
 (ii) if $\beta \geq 1$: $\rho_1 = \rho_2 = 1$, $\sigma(n) = 0, \sigma(m) = 1$;
 where $\beta := \pi_2 p(1-\alpha)/[\pi_1(1-p)\alpha]$;
(b) if $\pi_1 b_1 < c < \pi_2 b_2$ then $\rho_1 = 0$, $\rho_2 = 1$, $\sigma(n) = 0$, $\sigma(m) = 1$.

Case (b) is similar to Proposition 2(b). If for type F_1 the sure cost exceeds the maximum potential gain ($c > \pi_1 b_1$) then it will not hire a consultant. Furthermore, the (intuition behind the) result of part (ai) is similar to the one of Proposition 2(a), and will not be repeated here. Only part (aii) is 'new'.

Note first that the ratio π_2/π_1 in fact measures the (perceived) reliability or reputation of the consultant. In the limiting case that $\pi_2 = 1$ and $\pi_1 = 0$, the consultant is perfectly reliable. This agent will always find out and report the true state. Type F_1, however, will not hire a costly consultant in this limiting case which is equivalent to regime (b) were we have perfect revelation of information (provided that $\pi_2 b_2 > c$). In case (aii) the cost of hiring a consultant is not prohibitive for F_1 ($c < \pi_1 b_1$) and at the same time π_2/π_1 is relatively large (such that $\beta \geq 1$). In this case both types hire a consultant and the policymaker plays x_2 if and only if it receives a message. A noteworthy corollary of this result is that even costless messages ($c = 0$) can now induce G to play x_2 if there is sufficient confidence in the consultant ($\beta \geq 1$).[14] Furthermore, if $c < b_1$, we are in regime (a) of Proposition 2, but due to $\pi_1 < 1$, we may be in regime (b) of Proposition 5, where we have a separating equilibrium (provided that $c < \pi_2 b_2$). These facts illustrate the increased scope for information transfer, in comparison to the basic model. Moreover, a comparison between $\sigma(m^\circ)$ in Proposition 2 and $\sigma(m)$ in Proposition 5, reveals the increased impact of a message on the policymaker's action.

Similar results can be derived if the content of a report or message is being 'screened' *after* it has been sent (made public) by an interest group. There may be situations where a message by an interest group (saying that $\theta = \theta_2$) does not directly reach a policymaker but first passes one or more intermediary agents. For instance, messages may (have to) pass bureaucrats, the media, opinion leaders, or congressional staff members before they reach a policymaker or legislator. These agents often do not just mechanically transmit the message but give an opinion on the content of the message (agree/disagree; likely to be true/false). Hence, before the policymaker receives a subjective report by an interest group, there is often an 'objective' opinion attached to it. Although a policymaker is not likely to fare blindly on these opinions – for one thing, they may also be motivated by self-interest – it may be the case that they are considered to be reliable to 'some extent' (indicated by π_2/π_1). It can be shown formally that the existence of such an ('objective') intermediary screening stage, increases the scope for information transfer and the impact of messages sent by interest groups in much the same way as in Proposition 5.[15]

5. Discussion

In this section we shall relate our results to some (of the scarce) empirical studies on lobbying, and to some theoretical hypotheses that have been put forward in the literature on interest groups. In addition, we shall give some suggestions for further research.

First, we consider the *(expected) occurrence of informational lobbying*. An intuitively plausible result from Section 3 is that lobbying is more likely to occur when it cost (c) decreases and the stake (b_i) increases. However, we do not know of any empirical studies that directly address this relationship.[16] A relationship which has been addressed in empirical studies, is between the occurrence of lobbying and the congruence of the players' interests and views. The general finding is that lobbyists tend to address their efforts and messages to legislators and policymakers which are 'friends' and which are 'on their own side' (Bauer et al., 1963: Parts IV and V; see also Berry, 1977; Zeigler and Baer, 1969). This observation gives partial but not full theoretical support to our model. First, we could say that in our model the interest group F and the policymaker G are 'friends' if the former has an incentive to report truthfully on its private information, but not if F has an incentive to misinform or conceal its private information. Defined this way, F_2 is a friend of G, but F_1 is not. In any of the equilibria of Sections 3 and 4, it holds that $\rho_1 \leq \rho_2$. This is supported by the empirical observation that lobbying reports are more likely to come from friends. There is, however, a second, alternative way to define 'friendliness' in the relationship between F and G. We could say that there is more congruence of preferences between G and F if $\alpha = a_1/[a_1 + a_2]$ decreases, since then G is more inclined or tempted to take the action (x_2) which is preferred by F (both F_1 and F_2). And, indeed, as we saw in Proposition 2 (LE1), the expected occurrence of lobbying O is decreasing in α (and increasing in p), finding support by the empirical observation. Recall from Section 3, however, that this relation is not necessarily monotonic, since with decreases in α we might jump from the regime of Proposition 2 ($p < \alpha$) to the regime of Proposition 3 ($p > \alpha$), where O is higher in LE5 but lower in LE3 and LE4. If LE3 were selected then the relation between O and α is non-monotonic: O decreases with α if $p < \alpha$, but falls to zero if α becomes smaller than p. The relation between O and α is unambiguously negative (non-positive) – supporting the observation by Bauer et al. (1963) – only if LE5 is selected in the regime of Proposition 3. Thus, summarizing, our model gives a partial but not full theoretical explanation of the observation that lobbyists tend to turn to policymakers which have similar interests and already hold a favorable view.[17]

Second, we consider the policymaker's *response to lobbying,* $\sigma(m)$. One result from Section 3 is that G is more likely to be persuaded (to play x_2) by a message if G is already tempted to do so on the basis of its prior beliefs ($p/\alpha > 1$). This is roughly consistent with the observation 'that the lobbyist becomes in effect a service bureau for those congressman already agreeing with him, rather than an agent of direct persuasion' (Bauer et al., 1963: 353). In addition, as Berry (1977: 217) puts it, '[b]ecause lobbyists tend to talk to people who already agree with them it seems incongruous that such high percentages of public and private interest lobbyists feel that it is such an effective activity'.[18]

The other result concerning the policymaker's response is that G tends to 'discount' F's message depending on the stake which F has to persuade G, relative to the cost of lobbying. This is consistent with the last part of Gross's (1972: 269) assertion that communications may be 'extremely influential – particularly when there is confidence in the wisdom or disinterestedness of the proposers or advisers'. It is, furthermore, in line with the observation that the cost or trouble of writing letters is positively related to their impact on legislators (Bauer et al., 1963): 439; Berry, 1977: 234). Further tentative support for the positive relationship between the cost of lobbying messages and its impact can be found in Van der Putten (1980). After a thorough investigation of the realization of some important policies in the Netherlands, he concludes (*inter alia*) that reports from official advisory councils had a negligible impact on the policy process, whereas messages and reports from unofficial advisers did have a substantial impact on the policy process, especially in those cases where they were not invited by policymakers to give advice. Since official advisory councils have easy access to policymakers and are often even invited to send a report, they seem to bear a lower cost of sending a message than the agents and interest groups which have to proceed on their own initiative in putting their uninvited messages across to policymakers. Therefore, the higher costs of the latter type of messages could be (part of) an explanation of their greater impact.[19]

Finally, we shall relate our results to the *influence function*, which is often used to model interest group competition (e.g., Becker, 1983; Tullock, 1980). In these models it is assumed that influence is produced by spending resources. However, (a) it is not modelled on what these resources are being spent, and (b) it is not explained why these spendings should elicit a favorable response from the policymaker. Our model gives at least a partial rationalization. Resources might be spent on lobbying messages (e.g., reports, letters, personal visits, hearings), and they elicit a favorable response because private information of the interest group is transmitted by these spendings. Our model indicates that information may be transmitted by messages independent of the content of the message and even if policymaker cannot check the accuracy of the message. This is, of course, only one way of resource-spending to produce influence – alternative ways are campaign contributions (Aranson and Hinich, 1979; Austin-Smith, 1987) and the use of punishments and rewards (Aumann and Kurz, 1977; Potters and Van Winden, 1990) –, but it is often asserted to be an important one.[20] Moreover, our model at least partially explains the empirical finding that *more* letters (Schneider and Naumann, 1982) or *more* personal visits (Zeigler and Baer, 1969: 97) produce a *more* favorable response by legislators. Repeated communication is more costly to the interest group and higher costs elicit a more favorable response (Propositions 2 and 4) because private information is signalled more persuasively. Even if the content of the message is always the same, *frappez, frappez toujours* may indeed be rational and effective (cf. Stekelenburg, 1988: 55).

We close this section with some points of critique concerning the institutionally simple set-up of the model, and some suggestions for further analysis. Most important perhaps, is the assumption that there is no penalty on lying. One way such a penalty could come about is through a loss of credibility or reputation. Studies of lobbying stress that in an ongoing relationship ''credibility comes first'' (Berry, 1984: 119) and that a ''reputation for being credible and trustworthy is especially critical for those organizations whose representatives have direct contact with government officials'' (Schlozman and Tierney, 1986: 103). Perhaps the most natural way to incorporate this feature is to model the interaction as a repeated game. An interest group may then be forced to report truthfully in cases where it would find this unprofitable in a one shot interaction (cf. Sobel, 1985).

A second point we want to mention is that in our model the interest group, if it wants to influence the policymaker's action, can only choose to send a message. It would be interesting to extend the action space of the interest group and allow it to spend its resources on other channels of (potential) influence like campaign contributions and the use of (positive and negative) sanctions. A final point we would like to raise is that in our model there is only one interest group. There are situations where reports made by one interest group can be contradicted or affirmed by messages from another interest group. It would be interesting to see how the scope for informational lobbying is affected by the presence of more, potentially competing or colluding, interest groups.[21]

6. Concluding remarks

We have seen that lobbying messages from an interest group to a policymaker may be informative *even* if there is a substantial conflict of interest – that is, if the group's preference ordering, contrary to the policymaker's, is independent of the state of the world –, and *even* if the cost of a message is independent of both what the interest group reports and what it knows. The ground for information tranfer in such a setting is that an interest group with 'good' information to some extent distinguishes itself from the one with 'bad' information, where 'good' and 'bad' refer to whether the interest group wants to inform or misinform the policymaker. We have seen that such a distinction may be due to the fact that the good type ('friend') has a larger stake in persuading the policymaker than the bad type ('foe'). In some sense, one can say that there is scope for informational lobbying if there is sufficient congruence in the preferences of the players. Even then, however, it need not to be the *content* of the message as such that transmits information, but merely the *fact* that a message is being received.

Moreover, we have shown that, even if the interest group's message does not convey any information at all, it may still choose to send a message if it knows or thinks that the policymaker is expecting a message, and will interpret silence as bad news. As a consequence, a costly lobbying message provides a real benefit to the policymaker and the interest group in some cases, but is a (social) waste in others.

From the comparative statics analysis it appeared, *inter alia*, (a) that lobbying messages are more likely to occur if the interest group has 'good' information, and if the costs of a message are small relative to the potential benefits, and (b) that the policymaker is more likely to respond favorably to the message if it already tended to do so on the basis of its prior beliefs and if the group's incentive to lobby is relatively weak. It was shown that, by and large, these results are in line with empirical observations. Moreover, it was argued that our analysis may give some microfoundation for the use and specification of the *influence function* which is often used in interest group and rent-seeking models.

Notes

1. We could assume that a message sent by F bears a fixed cost to G as well. Provided that G cannot refuse to receive messages, this does not affect the equilibrium strategies. Of course, it would affect G's equilibrium payoffs. See also note 13, below.
2. We do not allow for *side payments*, that is, we do not allow F to make direct (monetary) transfers to G in order to induce (bribe) G to take action x_2.
3. This latter restriction requires the sequential equilibrium to be consistent with the refinements of *D1, Universal Divinity*, or *elimination of Never Weak Best Responses*, which all have the same power in our model (see, e.g., Cho and Sobel, 1990).
4. Define m_i: = '$\theta = \theta_i$'. It is easy to check that $\rho_1(n) = 1$, $\rho_2(m_2) = 1$, $\sigma(n) = 0$, $\sigma(m_2) = 1$ is a LE if $b_2 > c$, and that $\rho_1(m_1) = 1$, $\rho_2(n) = 1$, $\sigma(n) = 1$, $\sigma(m_1) = 0$ is a LE if $-b_1 > c$. Moreover, $\rho_1(m_1) = 1$, $\rho_2(m_2) = 1, \sigma(m_1) = 0$, $\sigma(m_2) = 1$, $-c/b_1 \leq \sigma(n) \leq 1 - c/b_2$ is a LE if $-c/b_1 + c/b_2 \leq 1$.
5. Assume to the contrary that $\rho_1(m) > 0$ for some $m \in M$. This can only be optimal for F_1 if $b_1\sigma(m) - c \geq b_1\sigma(n)$, which in turn requires that $\sigma(m) > \sigma(n)$. As a consequence, by $b_2 < 0$, F_2 will not send m: $\rho_2(m) = 0$. Now, by Bayes' rule, it follows that m is conclusive evidence that $\theta = \theta_1$: $q(m) = 0$. Consequently, G will play $\sigma(m) = 0$, which contradicts $\sigma(m) > \sigma(n)$. In a similar manner, a contradiction can be derived by assuming that $\rho_2(m) > 0$ for some $m \in M$.
6. Here, and in the sequel, we disregard 'knife-edge' cases, such as $b_1 = b_2$ and $p = \alpha$.
7 The result that complete separation with fixed cost messages is possible is due to the assumption that $\Theta = \{\theta_1, \theta_2\}$. If Θ contains more than two or an infinite number of elements, then the only LE which involves information transfer is a partition equilibrium of size two, where the F types separate in two groups. One group of types (with 'good' information) does send a message, whereas the other group (with 'bad' information) does not (see Potters, 1990). Of course, with only two types a partition equilibrium of size two is a separating equilibrium.
8. This result, however, is due to the assumption that $X = \{x_1, x_2\}$, entailing that 'small' improvements of information do not induce G to take different action. If we would, instead, have

assumed that $X = [x_1, x_2]$ then G would strictly benefit from the information transmitted in equilibria LE1 and LE4 (but less than in the separating equilibrium LE2).

9. The existence of multiple equilibria – which is not due to the assumption that X and Θ contain only two elements – is quite common in games with asymmetric information, and it is hardly possible to say which of the equilibria is the more reasonable one on the basis of positive-theoretic arguments. The equilibria in Proposition 3 all satisfy the most stringent requirements which have been proposed to refine the sequential equilibrium concept (cf. note 3). In case $c < b_1 < b_2$, one could perhaps argue in favor of the payoff-dominating equilibrium LE3, but strictly speaking, such payoff considerations only bite in normative analysis. Also, a case could perhaps be made in favor of the LE which is most favorable for G, since it is G's beliefs and strategy which (if known to F before it chooses its signal) 'force' F to send a message in LE2, LE4 and LE5.
10. It is difficult to think of situations where $b_1 > b_2$. A somewhat contrived example is the following. Suppose that G considers whether (x_2) or not (x_1) to grant (a fixed amount of) investment subsidies – such as for the purpose of technological development – to a particular branche of industry in which there is one big firm (F) and several smaller firms. Suppose that G wants to play x_2 if especially the smaller firms will benefit from x_2 ($\theta = \theta_2$) but not if mainly F will benefit from x_2 ($\theta = \theta_1$), and that F knows θ. In this case F's benefits from x_2 are larger if $\theta = \theta_1$ than if $\theta = \theta_2$: $b_1 > b_2$. Proposition 1 suggests that in this case, F will not send a message on its private information, in order to pledge for x_2.
11. Costless messages can have an impact in case there is no conlict of interest between G and F, that is, if $b_1 < c = 0 < b_2$ (cf. note 4). To see this, define m_1: = '$\theta = \theta_1$' and m_2: = '$\theta = \theta_2$'. It is easy to check that the following strategies are a LE: $\rho_1(m_1) = 1$, $\rho_2(m_2) = 1$, $\sigma(m_1) = 0$, $\sigma(m_2) = 1$. The fact that costless messages can be informative only if the sender's preference *ordering* (over the receiver's actions) is dependent on its private information is demonstrated in a more general setting in the seminal paper by Crawford and Sobel (1982).
12. In condition (1), however, $\Sigma_S \rho_i(s) = 1$ has to be replaced by $\int_S \rho_i(s)ds = 1$.
13. We could assume that a lobbying message bears a (fixed) cost, d say, to policymaker as well. G's payoff in LE2 now is: $E_G(LE2) = (1-p)a_1 + p(a_2-d)$. This payoff still exceeds the payoff in case of no lobbying – $(1-p)a_1$ if $p < \alpha$, and pa_2 if $p > \alpha$ – provided that $d < \min\{a_1(1-p)/p, a_2\}$.
14. Similarly, in Milgrom's (1981) model costless messages are informative due to the assumption that lying is impossible (cp. $\pi_1 = 0$), and in Kambhu's (1988) model messages are informative due to the assumption that true reports are always accepted, whereas false message are rejected with a positive probability (cp. $\pi_1 < 1$, $\pi_2 = 1$).
15. The presence of *two* interested audiences may also affect the scope for information tranfer and the incentives to send messages (Farrell and Gibbons, 1985). For instance, a firm may be reluctant to report in public on its need for subsidies or protection. Although this might elicit a favorable response from policymakers, it might simultaneously elicit an unfavorable one from shareholders.
16. Mueller and Murrell (1986) find some support for the hypothesis that the *number* of active interest groups in a country is positively related to the size of government. This is in line with our result that lobbying is more likely to occur when there is more at stake (a larger government involvement).
17. It should be noted that the empirical regularity itself is not completely undisputed (cf. Schlozman and Tierney, 1986: 313).
18. It is interesting to note that these assertions at the same time provide some empirical support for the selection of LE5 in Proposition 3. The policymaker's response is favorable [$\sigma(m) = 1$] but the message does not induce a change in behavior, relative to G's prior beliefs [$\sigma(m) = \sigma(q(m)) = \sigma(p)$]. The chairman of the Dutch Federation of Trade Unions (FNV) conjectures

in similar vein that "lobbying is just like advertising: one has to do it because everyone else does it. But the question is what it yields" (Stekelenburg, 1988: 44).

19. It is noteworthy that also experimental studies suggest that the persuasiveness of a communication is negatively related to the self-interest or stake of the communicator (Tedeshi et al., 1973: 92).
20. For instance, it is ranked first by the major interest groups which try to influence the policy of the European Community (Kirchner and Schwaiger, 1981).
21. The importance of competition in informational lobbying should not be exaggerated, however. Schlozman and Tierney (1986: 213) report a number of studies where it was found that in a majority of cases and arena's interest groups were active only on one side of the issue.

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Appendix

Proof of Lemma. Assume that in some equilibrium there exist messages m^1 and m^2 such that $\sigma(m^1) < \sigma(m^2)$. Then due to $b_i > 0$, $i = 1, 2$, both types of F would prefer to send message m^2 rather than m^1. Consequently, in the equilibrium $\rho_i(m^1) = 0$ for $i = 1, 2$, and message m^1 is not sent with positive probability. QED.

Proof of Proposition 1. Assume to the contrary that $\rho_i > 0$ for some i. This strategy can only be a best response if $\sigma(m^\circ) - \sigma(n) \geq c/b_i > 0$. To derive a contradiction we shall deal separately with cases that (a) $p < \alpha$ and (b) $p > \alpha$.

(a) $\sigma(m^\circ) \geq \sigma(n) + c/b_i > 0$ requires that $q(m^\circ) \geq \alpha$ or, equivalently, $\rho_2 \geq \rho_1 \{(1-p)\alpha/[p(1-\alpha)]\}$. Since $p < \alpha$, necessarily $\rho_2 > \rho_1$. In turn $\rho_2 > 0$ requires $\sigma(m^\circ) - \sigma(n) \geq c/b_2$. But then, since $b_1 > b_2$, $\sigma(m^\circ) - \sigma(n) > c/b_1$, implying $\rho_1 = 1$. As a consequence, $\rho_2 > \rho_1$ cannot hold.

(b) $\sigma(n) \leq \sigma(m^\circ) - c/b_i < 1$ requires $q(n) \leq \alpha$, or, equivalently, $(1-\rho_2) \leq (1-\rho_1)\{(1-p)\alpha/[p(1-\alpha)]\}$. Since $p > \alpha$, necessarily $\rho_2 > \rho_1$ if $\rho_1 < 1$ and $\rho_2 = \rho_1$ if $\rho_1 = 1$. If $\rho_1 < 1$ then, by $c/b_2 > c/b_1 \geq \sigma(m^\circ) - \sigma(n)$, F_2 will play $\rho_2 = 0$, which contradicts $\rho_2 > \rho_1$. Hence, assume $\rho_1 = \rho_2 = 1$ implying that q(n) cannot be updated by Bayes' rule (the denominator is zero). The additional condition in (3), however, requires that $q(n) = 1$ implying $\sigma(n) = 1$, which contradicts $\sigma(n) < 1$. To see this, note that, due to $b_1 > b_2$, F_2 has a strong incentive to deviate from $s = m^\circ$ to $s = n$, whenever F_1 has a weak incentive to do so. Hence, the off-equilibrium signal $s = n$ is more likely to come from F_2. QED.

Proof of Proposition 2. (a) First, note that the sequential equilibrium with $\rho_1 = \rho_2 = 0$, $\sigma(n) =$

0, and $\sigma(m^\circ) \le c/b_2$ is not an LE. Although, $q(m^\circ)$ cannot be determined by Bayes' rule, the additional condition requires that $q(m^\circ) = 1$ since, by $b_2 > b_1$, F_2 is more likely to send the off-equilibrium signal $s = m^\circ$ than F_1. In turn, $q(m^\circ) = 1$ implies $\sigma(m^\circ) = 1$, which upsets the equilibrium with $\rho_1 = \rho_2 = 0$. Hence, it must hold that $\rho_i > 0$ for some i, requiring $\sigma(m^\circ) \ge \sigma(n) + c/b_i > 0$. To support this we need $q(m^\circ) \ge \alpha$, or, equivalently, $\rho_2 \ge \rho_1 \{(1-p)\alpha/[p(1-\alpha)]\}$. It follows that $q(n) < \alpha$ – implying $\sigma(n) = 0$ – and that $\rho_1 < 1$. Hence, we have $0 < \sigma(m^\circ) \le c/b_1 < 1$, which requires $q(m^\circ) = \alpha$. By $b_1 < b_2$, this necessarily leads to $\rho_2 = 1$ and $\rho_1 = p(1-\alpha)/[(1-p)\alpha]$. Furthermore, $0 < \rho_1 < 1$, requires that $\sigma(m^\circ) = c/b_1$.

(b) Due to $b_1 < c$, necessarily, $\rho_1 = 0$. Furthermore, $\rho_1 = \rho_2 = 0$, $\sigma(n) = 0$, $\sigma(m^\circ) \le c/b_2$ is not an LE. The off-equilibrium message $s = m^\circ$ is most likely to come from F_2 ($b_1 < c < b_2$), and hence, the additional condition in (3) requires that $q(m^\circ) = 1$, implying $\sigma(m^\circ) = 1$. Consequently, we must have $\rho_1 = 0$ and $\rho_2 = 1$, implying $q(n) = 0$ and $q(m^\circ) = 1$, and $\sigma(n) = 0$ and $\sigma(m^\circ) = 1$. QED.

Proof of Proposition 3. (a) First, note that $1 > \rho_1 = \rho_2 > 0$ implies by Bayes' rule that $q(n) = q(m^\circ) > \alpha$, leading to $\sigma(n) = \sigma(m^\circ) = 1$. This cannot be an equilibrium since, by $c > b_i[\sigma(m^\circ) - \sigma(n)]$, both F_1 and F_2 would want to deviate to $\rho_1 = \rho_2 = 0$, which leads to LE3. In LE3, condition (3) does not restrict $q(m^\circ)$, which justifies $\sigma(m^\circ) = 1$. Moreover, if G unexpectedly receives a message, then $\sigma(m^\circ) = 1$ is the only response which is consistent with another LE in this regime (LE4 or LE5; see below). Second, $\rho_1 = \rho_2 = 1$, $\sigma(m^\circ) = 1$ leads to LE5. Now, $q(n)$ cannot be determined by Bayes's rule, but the additional condition requires that $q(n) = 0$ and $\sigma(n) = 0$, since F_1 ($b_1 < b_2$) is the type which has the weakest disincentive to deviate from $s = m^\circ$ to $s = n$. Finally, assume that $\rho_1 \neq \rho_2$. Then it must hold that $\sigma(m^\circ) - \sigma(n) \ge c/b_2$, requiring $q(n) \le \alpha$, or, equivalently, $(1-\rho_2) \le (1-\rho_1)\{\alpha(1-p)/[p(1-\alpha)]\} \le (1-\rho_1)$. Now, from $\rho_1 < \rho_2$, it follows that $q(m^\circ) > p > \alpha$, and hence that $\sigma(m^\circ) = 1$. Furthermore, $0 \le \rho_1 < \rho_2 \le 1$, requires that $(0 <)\ 1 - c/b_1 \le \sigma(n) \le 1 - c/b_2\ (< 1)$. For $0 < \sigma(n) < 1$ it is needed that $q(n) = \alpha$, which, due to $b_1 < b_2$, can only hold if $\rho_1 = 0$ and $\rho_2 = 1-(1-p)\alpha/[p(1-\alpha)]$. F_2's mixed strategy is a best response – condition (1) – only if $b_2[\sigma(m^\circ) - \sigma(n)] = c$. Part (b) of the proposition, now is trivial. QED.

Proof of Proposition 4. (a) It is straightforward to verify that the strategies satisfy conditions (1)-(3). [Moreover, uniqueness can be proved – although not trivially –, by first proving that $s = s^+$ is the only signal which is sent with positive probability by both types.] (b) It is again easy to check that the strategies are a LE. Strictly speaking, the equilibrium strategy of F_1 given in the proposition is not unique. In fact F_1 is indifferent between $s = 0$ and $s = b_1$. It is also a LE for F_1 to send $s = b_1$ with positive probability, provided that $\rho_1(b_1) = 1 - \rho_1(0) \le p(1-\alpha)/[(1-p)\alpha]$. Only in that case we have $q(b_1) \le \alpha$, which is needed to justify $\sigma(b_1) = 1$. Note, however, that he strategies given in the proposition are the limit, as ϵ ↓0, of the strategy combination $\rho_2(b_1 + \epsilon) = 1$, $\rho_1(b_1 + \epsilon) = 1 - \rho_1(0) = 0$, in which F_2 'competes out' F_1. QED.

Remark. If $p > \alpha$, then there are multiple equilibria. For instance, for any s' with $0 \le s' \le b_1$, it is a LE for both F^1 and F^2 to send s' with probability 1 and for G to respond with $\sigma(s') = 1$. This result, however, is an artifact of the assumption that $X = \{x_1, x_2\}$. If X is a continuum then there can only by separating or (semi-)pooling on the highest signal as in Proposition 4 (see Cho and Sobel, 1990).

Proof of Proposition 5. (a) First, assume that $\rho_1 = \rho_2 = 1$. Then Bayes' rule leads to $q(n) = p(1-\pi_2)/[(1-p)(1-\pi_1) + p(1-\pi_2)] < p < \alpha$, implying $\sigma(n) = 0$. Hence, $\rho_1 = 1$ requires that $\sigma(m) \le c/(\pi_1 b_1)[> c/(\pi_2 b_2) > 0]$. Clearly, this requirement is satisfied by $\sigma(m) = 1$. In turn, $\sigma(m) = 1$ requires that $q(m) = p\pi_2/[(1-p)\pi_1 + p\pi_2] \ge \alpha$, which can only hold if $\beta \ge 1$. However, with

$\beta < 1$, $\rho_1 = \rho_2 = 1$ cannot be an LE. In this latter case, similar reasoning as in the proof of Proposition 2(a) leads to the (unique) LE of Proposition 5(ai).

(b) Due to $\pi_1 b_1[\sigma(m) - \sigma(n)] \leq \pi_1 b_1 < c$, we must have $\rho_1 = 0$, and consequently, Bayes' rule leads to $q(n) \leq p < \alpha$ and $\sigma(n) = 0$. Moreover, if $\rho_2 > 0$, then Bayes' rule leads to $q(m) = 1$, and hence, $\sigma(m) = 1$. Due to $\pi_2 b_2[\sigma(m) - \sigma(n)] = \pi_2 b_2 > c$ it follows that $\rho_2 = 1$. QED.

Remark. With $p > \alpha$, similar to Proposition 3, there are multiple LE.