Taking Advice from Imperfectly Informed Lobbyists: When to Match Hawks with Hawks

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Abstract

In this paper we study a sender-receiver game between an uninformed government and two informed lobbyists. There is a conflict of interest between government and lobbyists in the sense that the government's payoff is state-dependent while lobbyists prefer a certain policy irrespective of the contingency. Hence, lobbyists' recommendations cannot be trusted a priori and a single lobbyist will convey no information in equilibrium. When two or more lobbyists interact non-cooperatively, matters improve. Our main result is that, contrasting previous results, homogeneous panels may be preferred to a heterogeneous one. If lobbyists are perfectly informed the first-best equilibrium exists even when the game has cheap talk. Moreover, if inaccurate messages impose a cost on the sender, i.e., if lobbyists care about their *prestige,* the assumption of perfectly informed advisors is not necessary to sustain truthtelling. In other words, reputational concerns work as a substitute for informational precision.

Keywords: Heterogeneous vs. homogeneous panels, informational efficiency, reputation, external forces.
JEL: D71, D82.

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1 Introduction

How do poorly informed policy-makers induce their collaborators – or adversaries - to share their competence? To be sure, any decisionmaker will as far as possible seek advice from experts who share her own convictions and ideals, and consequently have little reason to mislead her. However, such loyal advisors may or may not arrive on the scene. Further, a legislator, as opposed to a decisionmaker within the market, may not be free to use pecuniary remunerations in order to align incentives. An important research agenda in political science has therefore been to examine under what circumstances legislators effectively can extract useful information from other interested parties, such as experts, lobbyists or committee members.[2] In this paper we take the institutional environment as a given and focus on how a decisionmaker optimally composes her panel of advisors.[3] Our main result is that - from a strict informational viewpoint - homogeneous panels may be preferred to a heterogeneous one. Moreover, as to the existence of informative equilibria exogenous preferences for honesty may substitute for poor informational conditions.

The existent literature is more or less unison in the view that heterogeneous panels are informationally superior to homogeneous ones. (cf. Milgrom and Roberts (1986), Gilligan and Krehbiel (1989) and Krishna and Morgan (1999)). To cite Gilligan and Krehbiel (1989, p. 463): "In the presence of uncertainty, diversity of interests on the committee promotes informational efficiency, just as do restrictive rules." Briefly put, the advantage of heterogeneous panels is that diverging preferences foster a "competition of interests", which the decisionmaker can exploit to extract relevant information. Nevertheless, arguments of this flavor are deeply contrasted by the empirical prevalence of committees and cabinets largely composed of agents with homogeneous preferences.[4]

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[2] Important contributions include Austen-Smith and Riker (1987), Austen-Smith (1990, 1993) and Gilligan and Krehbiel (1987, 1989).

[3] Calvert (1985) is probably the first paper to address the problem of choosing among biased advisors. In his model, a decisionmaker is to select an advisor who in turn will help the decisionmaker to evaluate different policy alternatives. Advisors may be biased towards one or another policy but this bias is exogenous and known to the decisionmaker. Calvert concludes that the optimal advisor is not neutral but biased in the same direction as the decisionmaker. The intuition behind this result is that advice counter to the decisionmaker's own predisposition - which is the only kind of advice that can make a difference - is more informative under such bias.

[4] The predominance of such "extreme" committees has rarely been questioned. Krehbiel (1990) rejects a hypothesis that committees in the US Congress to a large extent consist of homogeneous preference-

Though other, non-informational explanations have been put forward in defense of homogeneous panels[5] we here aspire to provide a purely informational rationale. Our intuition why a homogeneous panel may perform better is in a sense the opposite of competition: as advice from one source is compared to that of another, the *absence* of competing interests will make each advisor's claim easier to verify, which in turn will deter advisors from distorting their information.

We consider one of the simplest possible settings: a decisionmaker, "the government", is to choose one of two actions. Two policy-interested experts, "lobbyists", simultaneously send the government a message, recommending either alternative. The government then updates its prior over the two alternatives, and chooses the policy with the highest expected payoff. A lobbyist's payoff from each policy alternative is exogenously given so lobbyists are biased in a very absolute sense.[6] This means that the interests of lobbyists of different types are never aligned, i.e., they never have a common interest in sharing information. Perhaps this is exactly how we like to think about lobbyists, policies rather than the eventual outcomes seem to be their main concern.

We also hypothesize that lobbyists (experts, committee-members, etc.) also derive some utility from providing good advice. This aspect is usually ignored in models of information transmission, which generally model talk as "cheap".[7] An individual's utility from maintaining a good reputation per se, or from having a "clear conscience" etc., is considered negligible relative monetary rewards. However, casual observations as well as experimental studies suggest that such concerns do affect our behavior.[8] There is little reason why this should not also be true for professional lobbyists or experts. In Terry Moe's words (1989, p 172):

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outliers. Among many accounts of the "preference outlier hypothesis", see Hall and Grofman (1990) for a direct counter-argument to Krehbiel's results.

[5] See, for example, Marshall and Weingast (1988).

[6] This payoff may either be a direct political or commercial interest in a certain policy, such as a pork-barrel project. Alternatively, the lobbyist could be paid "upon delivery" by third parties.

[7] In a sense, one purpose of institutional design is to generate endogenous costs of sending certain (uninformative) messages. For a discussion see, for example, Austen-Smith (1993).

Most individuals in the expert market come with reputations that speak to their job-relevant traits: expertise, intelligence, honesty, loyalty, policy preferences, ideology. "Good" reputations provide reliable information. The reason is that individuals value good reputations, they invest in them – by behaving honestly, for instance, even when they could realize short-term gains through cheating ...

Naturally, a reputation-based argument requires that the state and thereby the quality of advice eventually can be verified - which we shall assume. Henceforth, we express these reputational concerns as a value of prestige. Of course, utility from honest behavior could also be modeled as a penalty for lying. Such a penalty, or statement-specific cost, is an example of what McCubbins and Lupia (1998) denote "external forces".[9] Importantly, while Lupia and McCubbins recognize that external forces can be a substitute for common interests they serve here as a substitute for informational precision.

1.1 Related Literature

The seminal contribution by Crawford and Sobel (1982) is one of the first papers to investigate a cheap-talk game. There is one informed agent (sender) and one principal (receiver). The agent sends a message to the principal, whose subsequent decision affects the welfare of both parties. Both the message and decision space are continua. The authors conclude that - unless the parties' interests completely coincide - the sender must include some noise in his message in any informative equilibrium. This result applies directly to a single committee-member and open rule in Gilligan and Krehbiel (1989), where no information ever is conveyed. The latter result is particularly disturbing since the measure of states where both parties would profit from a transmission of information may be indefinitely larger than that where they do not. Though the modeling assumptions are different, the analogue of this result is reproduced in the current paper.

[8] Another example of such "exogenous" concerns is altruism. See, for example, Andreoni and Miller (1993).
[9] The force is "external" to the "underlying" cheap talk-game.

When more advisors are present, matters improve. In Gilligan and Krehbiel (1989) there is one uninformed decisionmaker, the Legislature (or rather, the median voter in the Legislature) and two informed committee members. The authors conclude that information is conveyed in those states where *both* committee members prefer an informed decision to the status quo. Otherwise someone will prefer to babble. By so doing she knows that no information can be conveyed by the other member either, and the status quo policy prevails.

Milgrom and Roberts (1986) employ a more general setting than Gilligan and Krehbiel (1989), but assume that the true state must be included in any agent's message to the decisionmaker. In a sense, an advisor must here tell "the whole truth" but not necessarily "nothing but the truth". Under this assumption the conclusion is stronger. Provided that there in any state is at least one advisor who prefers the full-information decision to any other decision (i.e., advisors are heterogeneous), the full-information decision is the outcome in any pure strategy Nash equilibrium. This holds even if the decisionmaker is unsophisticated, i.e., if he simply selects a state from the intersection of all messages. More recently, Krishna and Morgan (1999) reach similar conclusions to Gilligan and Krehbiel. In their model, a cabinet composed of experts from opposite sides of the spectrum, or even a single expert(!), are superior to homogeneous cabinets.

Less related papers include Dewatripont and Tirole (1998) and Shin (1994). Dewatripont and Tirole provide a rationale for the use of partisan advocates. They conclude that competition among enfranchised agents generate better results than using neutral advocates who are "impaired by their pursuing several conflicting causes at one time" (p. 33). However, these efficiency gains stem from the advocates' interests being aligned with those of their clients rather than from the heterogeneity of interests as such. In Shin's model, an arbitrator is to determine the appropriate level of compensation to a plaintiff from a defendant. Shin shows that the arbitrator's optimal decision rule changes with the informational precision of the two parties. In the current paper, a change in informational precision may cause the government to change its choice of advisors.

The remainder of this paper is structured as follows. Section 2 presents the formal model. Section 3 contains all results. Amongst others we show that unless prestige concerns are very high, either kind of homogeneous panel is informationally superior to a heterogeneous panel. Section 4 concludes and discusses some possible extensions. All proofs are found in appendix.

2 The Model

There are two states of the world, $\omega \in \{0, 1\}$. In state zero, the government prefers to stick to its current policy choice, “status quo” while state one signifies that a policy change, “reform”, is desirable. Agents share a common prior probability distribution over the states where we let $p \equiv \Pr(\omega = 0)$. Without loss of generality, we assume that maintaining the status quo policy is the a priori better decision, i.e. $p > 0.5$.[10] There are three agents, the government and two lobbyists, which are chosen by the government. There are two types of lobbyists, “conservatives” or “progressives”. As the names suggest, a progressive lobbyist always prefers reform while a conservative lobbyist prefers the status quo policy. After being selected the two lobbyists each receive a signal s.t. $s_i \in \{0, 1\}$, $i = 1, 2$. Signals are statistically independent conditional on the state and their realization is private information. For simplicity we shall assume that the probabilities of signal zero (one) conditional on state zero (one) are identical, denoted q. The parameter q may be interpreted as a lobbyist’s accuracy or informational precision, here independent of the state and identical for both types of lobbyists. After receiving their signals the lobbyists independently send a message to the government, indicating which state is true. Finally, after listening to the two messages the government decides whether to carry on reform or to stick to the status quo, $g \in \{r, s\}$. The timing of the game is illustrated below.

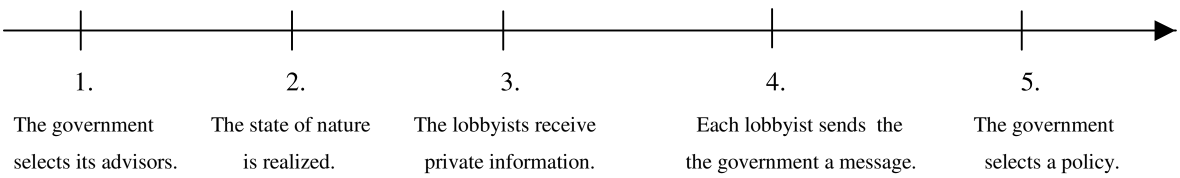

Figure 1: Timing

Assumption 1: Signals are *influential*, $q > p$.

Assumption 1 implies that private information "matters" in a particularly strong way: if a lobbyist's accuracy is greater than the prior probability of either state, the posterior probability of state zero (one), given signal zero (one), is each greater than one half. This means that if a lobbyist were solely interested in predicting the true state, she would report her signal.

Utility

The government's payoff is normalized to one if it makes a correct decision and none if it makes an incorrect decision. A progressive lobbyist receives a positive payoff, a "vested interest", if reform is initiated, while the reverse holds for a conservative lobbyist. For simplicity, we let this payoff be the same for both progressives and conservatives, normalized to unity. A lobbyist's payoff from the "wrong" policy is zero. In addition, lobbyists care about prestige. This means that they derive some positive utility u whenever their message was correct.[11] Prestige gains are thus independent of the government's actual decisions. Finally, we think that vested interests are more important than the value of prestige, i.e., $u \in [0, 1)$.

Strategies and Equilibrium

A pure strategy for lobbyist i is a mapping l_i: $\{0,1\} \rightarrow \{0,1\}$. A pure strategy for the government is a mapping g: $\{0,1\}^2 \rightarrow \{r, s\}$. Mixed strategies are defined accordingly. In order to eliminate some equilibria where the meaning of messages ("talk") simply are reversed, we impose the following intuitive restriction: a conservative (progressive) lobbyist always reports signal zero (one) honestly. In other words, a lobbyist never lies in

[10] For simplicity we ignore the case when p is exactly one half. No insights should be lost because of this restriction.

[11] Note that this is not really a concern for sincerity per se. With additional (external) information, prestige concerns could clearly drive the lobbyist to misreport her signal. See e.g. Ottaviani and Sörensen (1997).

the “wrong” direction. This is a weak assumption since, if the government is aware of this restriction and acts rationally, it will indeed be in the lobbyist’s interest to comply with it. The structure of the game, as well as the parameters p, q and u, are common knowledge. In order to simplify the comparison between different panels we will only characterize the most informative (perfect Bayesian) equilibrium for any set of parameters (in general there may be multiple equilibria).

Definitions: A lobbyist’s strategy is separating or *honest* if the lobbyist always (with probability one) reports his signal. A strategy is pooling or *insistent* if the lobbyist always reports the same state, irrespective of her signal. An equilibrium is called honest iff both lobbyists are honest.

3 Results

In the lemma below, we show that the government can extract no information from a single lobbyist, irrespective of type. In other words, the government may as well make an uninformed decision, i.e. maintaining the status quo, which gives expected payoff p. This result holds as long as the vested interest is more important to the lobbyist than the value of prestige. Clearly, a conservative lobbyist has no reason to be truthful, since insisting on state zero will give her the desired policy, s. A progressive lobbyist on the other hand would like to commit herself to honest reporting. Since she lacks the means to do so however, the government must remain skeptical. The lemma gives us a useful corollary, namely that if one of two lobbyists provides no information, the other cannot either.

LEMMA: With a single lobbyist, no information is provided in equilibrium.

COROLLARY: With two lobbyists, if one of them *insists*, no information is provided in equilibrium. Proof omitted.

We now turn to the case of two lobbyists. Intuitively, the government cannot do worse with two lobbyists than one, since more information (potentially) is available. As we will see however, unless the value of prestige and/or the quality of information are relatively high, no information is generally gained. We start by characterizing the existence of an honest equilibrium, which of course is the most informative one.

PROPOSITION 1:

a) If $q = 1$, an honest equilibrium is sustained with either homogeneous pair of lobbyists for any value of u, and with a heterogeneous pair iff $u \geq 0.5$.

b) If $q < 1$, there is an honest equilibrium iff both lobbyists are progressives and:

(1) $$u \geq \frac{q(1-q)}{p+q-1}$$

When lobbyists are perfectly informed, no prestige concerns are necessary to sustain the honest equilibrium if the two lobbyists have the same type. The reason is simple: suppose the lobbyists receive their "unfavorable" signal. Since both lobbyists accurately report the true state, a unilateral deviation (a lie) cannot deceive the government. Hence, in equilibrium, a lobbyist may as well remain honest.[12] When lobbyists are heterogeneous, the government finds it harder to deter dishonesty. In particular, it cannot use a pure strategy since that would induce either lobbyist to lie (consider the government's action after one message of each kind). However, if $u \geq 0.5$, the government can successfully threaten to choose each policy with equal probability should the messages differ - which will deter both lobbyists from lying.

When the informational precision is less than 100% however, there is a possibility that some lobbyist received an inaccurate signal. Consequently, the government may get one message of each kind even if lobbyists are honest. If this happens, the government strictly prefers to stick to the status quo – because state zero is the a priori likelier state. Realizing this, a conservative lobbyist can not be honest in equilibrium. Simply put, conservatives are informationally inferior to progressives since conservatives always benefit from an uninformed decision. With two progressive lobbyists the honest equilibrium may still exist, provided that prestige concerns are sufficiently important. Inspection of (1) tells us that the necessary prestige value is decreasing in both q and p.[13] The intuition for the latter result is that a higher prior probability of state zero makes it more likely that the other lobbyist received signal zero, ceteris paribus. If she did – and reports honestly – the government will choose to stick to the status quo irrespective of what the first says. Consequently, since honesty increases her chances to gain prestige, a progressive lobbyist's incentive to be honest increases with p. This effect is reinforced by high informational precision. In a sense, the government's ability to detect, and thereby to deter, a false statement increases with q. As q approaches unity the two lobbyists almost

[12] Of course, a crucial assumption throughout the paper is that lobbyists cannot coordinate their strategies. We also note that the equilibrium when $u = 0$ is not trembling hand perfect.
[13] Recall that $q > p > 0.5$.

always receive the same signal, which means that an honest lobbyist almost always "verifies" the other.

For illustration the set of parameter values that supports the honest equilibrium is displayed below for the case $p = 0.7$. We briefly note that in the honest equilibrium the government is strictly better off as compared to when no lobbyist is present. This is trivially true since $q > p$ by assumption.

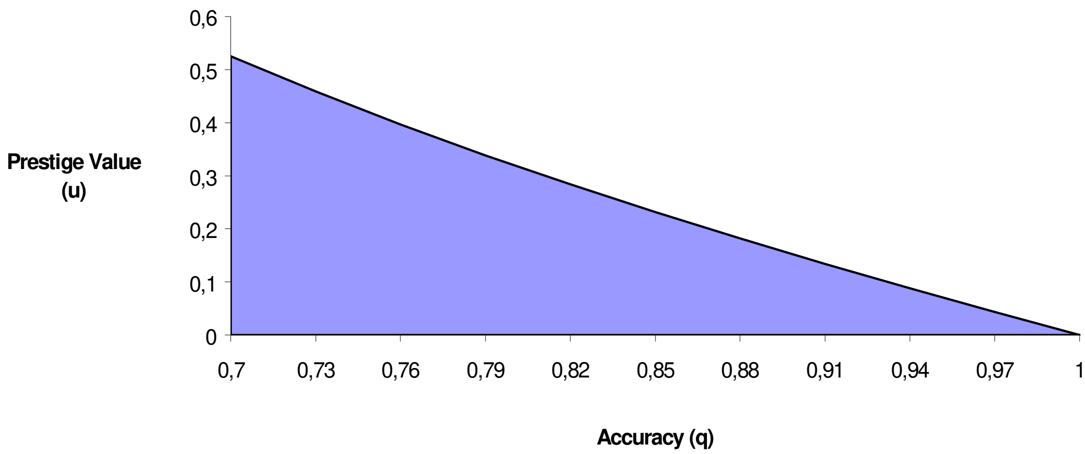

Figure 2: Honest equilibrium with two progressive lobbyists (p ≡ 0.7). Existence is sustained in the region above the line.

We are now ready to state our main result, basically a generalization of the intuition gained from proposition 1. First, progressive lobbyists are overall easier to "threat" into honest behavior. Hence, if the government may choose a panel of progressives only, it will always do so. Second, if the value of prestige is not too high also a homogeneous *conservative* panel will be preferred to a heterogeneous one. This is more surprising since conservative lobbyists always benefit from an uninformed decision.

PROPOSITION 2:

a) The government (weakly) prefers a progressive panel to any other panel.
b) The government strictly prefers a conservative panel to a heterogeneous one iff:

$$(2) \qquad \frac{2pq(1-q)}{q-p} \le u < \frac{(1-p-q+2pq)(2pq+q^2-p-2pq^2)(p+q^2-2pq)}{2p^2(1-p)+qp(8p^2-8p-1)+4q^2p(1+3p-3p^2)+2q^3(4p^3-4p^2-3p)+q^4(7p-2p^2-1)+q^5(1-2p)}$$

To reiterate, with a heterogeneous panel it proves more difficult to implement a decision rule that satisfies both lobbyists' incentive constraints. This is the drawback of using "opposing interests": whenever the lobbyists' messages disagree, the government must still choose some policy, which inevitably increases either lobbyist's incentive to be dishonest. The trade-off is illustrated in figure 3 for the case $p = 0.6$. Intuitively, a higher p makes a conservative lobbyist less useful, i.e., more prone to lie, so a homogenous conservative panel is more likely to perform better than a heterogeneous one when p is small relative q.

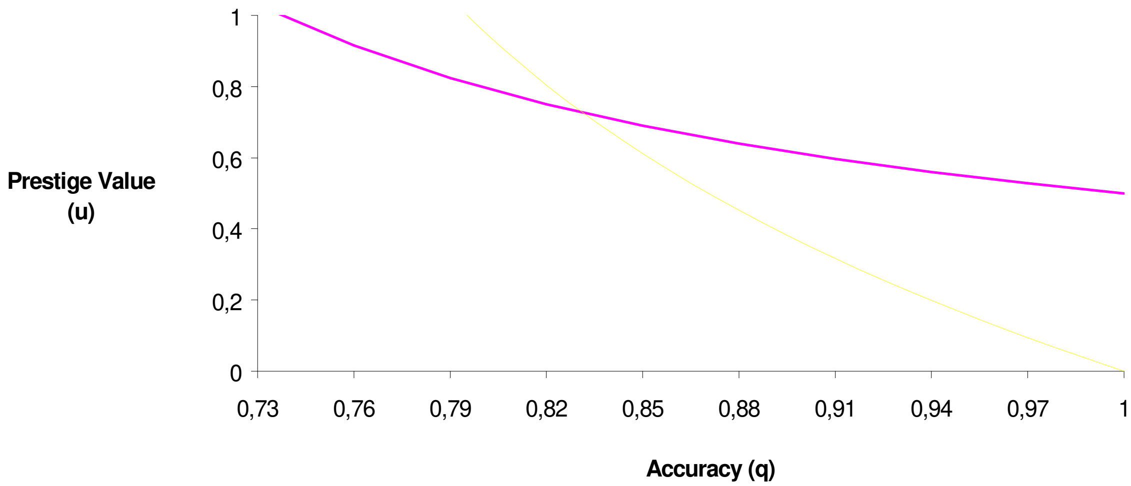

Figure 3: Comparison of a conservative panel and a heterogeneous one (p ≡ 0.6).
In the lower-left region, no informative equilibrium exists. In the upper-left region, it exists only with the heterogeneous panel, in the lower-right region only with the homogeneous one, and in the upper-right region an informative equilibrium exists with both panels, though the heterogeneous one provides more information.

4 Discussion

We have studied a simple game of information transmission between a government and two informed lobbyists. In previous models of strategic advising, decisionmakers optimally use advisors with opposing interests. A heterogeneous panel of advisors enables a "competition of interests" which the decisionmaker can exploit to extract information. However, this competition may be harmful if one advisor prefers an uninformed decision. If this advisor babbles, conflicting interests will hamper the other one's ability to credibly transmit information. In real political situations it is probably not uncommon that informed parties prefer uninformed decisions. Our results suggest that - in the task of composing an advisory panel - such parties should sometimes be matched with more of the same kind. Although we have not investigated the case here, nothing suggests that the intuition behind this result changes if more than two advisors are available. For a more general environment than the binary one we have provided, our conjecture is that the more similar the preferences of two advisors, given a certain noise level, the better the panel will perform. Interestingly, this conjecture is reminiscent of Calvert's (1985) conclusions, albeit the rationale there is purely statistical.

In several previous models the existence of the first-best equilibrium requires that advisors are perfectly informed, evidently a strong assumption. In the current paper we relax this assumption but assume that inaccurate messages impose a cost on the sender, i.e., it implies a loss of prestige. We show that such an "external force" can work as a substitute for informational precision. Ceteris paribus, noisier signals necessitate a higher value of prestige in order to sustain an informative equilibrium. This is intuitive: the less certain one lobbyist's assessment is, the higher is the probability that the other will benefit from distorting her own information. This result may have implications for decisionmakers that are forced to rely on information provided by heavily biased sources. Quite likely, the decisionmaker himself possesses some means to increase the "reputational" rewards to apt advisors. If so, these rewards should be concentrated to policy areas where the informational conditions are the weakest. This conclusion contrasts results from the principal-agent literature where noisy environments usually are associated with less “powered” incentive schemes.

Finally a word on modeling strategy. In our simplistic model, a lobbyist’s “bias” has a one-to-one relationship with a single probability, i.e., the prior probability of the state in which an informed government would choose the lobbyists’ preferred policy. A direct result is that, in the case of homogeneous panels, the lower this probability the larger is the set of parameter values that supports the honest equilibrium. By employing lobbyists that are *extreme* in this sense, the government retains a credible threat - i.e., a viable policy alternative which both lobbyists disfavor - should the lobbyists be tempted to refrain from providing information. In the terminology of Milgrom and Roberts (1986), the decisionmaker makes sure she has a credible *skeptical strategy*. However, the result that extremists are easier to engage in truthtelling is not likely to hold if concerns for prestige are entirely endogenous, e.g., if they stem from fear of future retaliation in a repeated game. In short, if my preferred state has a low probability my continuation payoff from honest behavior will be low as well. Hence, the exogenous and endogenous ways of modeling reputational concerns are not completely interchangeable. More generally stated, it may be important to discern to what extent individuals’ concerns for renown, honesty, fairness, etc., are expressions of “true” preferences, rather than just induced (strategic) behavior. Though beyond the scope of the current paper, this looks like an interesting topic for future research.

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6 Appendix

PROOF OF THE LEMMA: The proof is straightforward. Recall that $u < 1$. With a conservative lobbyist, there is a unique pure strategy equilibrium. After message 1, the government knows that the lobbyist has been truthful and will therefore choose r, by assumption 1. Further, since $p > 0.5$, after message zero, the government's best action is s, irrespective of the lobbyist's strategy. Realizing this, a conservative lobbyist will always send message zero in order to reap her vested interest, worth one. Hence no information is provided. With a progressive lobbyist there is a unique mixed equilibrium. If the government always were to choose s, the progressive lobbyist should be honest in order to maximize her expected utility from prestige. If the lobbyist is honest however, the government should instead follow her advice. In turn, if the lobbyist knows she will be trusted, she should insist on message 1. But if she insists, she provides no information and the government had better choose policy s. Hence there is no pure strategy equilibrium. Consider a mixed equilibrium. Again, after message zero the government will always choose s. Consequently, after message one, the government must be indifferent between s and r and its payoff is identical to what it would get if it always chose s. No information is thus provided. QED

PROOF OF PROPOSITION 1: The proof of part a) is found in the text.

b) (*Sufficiency*) For the case $q < 1$, suppose one of the progressive lobbyists uses the honest strategy and the government uses the following strategy: choose policy r if both lobbyists sent message one, otherwise choose s. We examine under which circumstances the honest strategy is now optimal for the second progressive as well, and then confirm that the government's strategy is indeed a best response.

By assumption, a progressive lobbyist always reports 1 after signal 1. After signal zero however, she will only be honest if the expected gain in prestige after reporting zero is large enough. After signal zero we have the following:

(A1) $$\Pr(0) = \frac{qp}{qp + (1-q)(1-p)}, \quad \Pr(1) = \frac{(1-q)(1-p)}{qp + (1-q)(1-p)}$$

The difference between Pr(0) and Pr(1) multiplied by u gives the expected prestige gain from honest behavior. Conditional on a zero-signal, the conditional probability that the other lobbyist received signal one is:

(A2) $$\frac{q(1-q)}{qp + (1-q)(1-p)}$$

Now, if the other received signal one, she will also send message one. This will result in the government choosing policy r if and only if I chose to be dishonest, in which case I will get my vested interest, 1. Combining these results gives that honesty is optimal iff:

(A3) $qpu \geq (1-q)(1-p) * u + q(1-q)$, which gives us (1).

We now check that the government's strategy is optimal in the honest equilibrium. After message pair {1,1} the posterior probability of state zero is $\frac{(1-p)q^2}{(1-p)q^2 + p(1-q)^2} > \frac{1}{2}$, where the inequality follows from assumption 1. Hence the government should choose policy s. Clearly, s is also the optimal decision after message pair {0, 0}. Finally, after one message of each kind, the posterior probability of state zero is p so s is the optimal policy.

(*Necessity*) Imagine that at least one lobbyist is a conservative and that both lobbyists use the honest strategy. Suppose the government receives the message pair {0, 1} which is quite feasible when $q < 1$. The conditional probability of state zero is now equal to $\frac{p}{1-p} > \frac{1}{2}$, so the government should choose s.

Anticipating this however, insistence (i.e. always sending message zero) is a profitable deviation for a conservative lobbyist, so there is no honest equilibrium. QED

PROOF OF PROPOSITION 2:

a) First, if $q = 1$, the honest equilibrium exists with two progressive lobbyists for any value of u. Second, we have already shown that, when $q < 1$, there is no honest equilibrium unless both lobbyists are progressives. We now show that unless (1) holds, there is no informative equilibrium at all unless both lobbyists are progressives. Since no equilibrium can be more informative than the honest one, this proves part a) of the proposition.

Consider first an equilibrium with two conservatives. In any informative equilibrium at least one lobbyist must be indifferent between sending message zero and one after signal one. By symmetry, if there is such an equilibrium there is also a symmetric one, where each lobbyist is dishonest with some probability $x \in (0,1)$. Similar to the case of a single lobbyist, the government cannot credibly threat to choose r after message pair {0, 0}. Hence, the only way to induce some truthtelling is to choose policy r with some positive probability after message pair {0, 1}. To put the least possible restriction on the necessary prestige value, let it do so with certainty. After signal one, the probabilities of each state are:

(A4) $$\Pr(1) = \frac{q(1-p)}{q(1-p)+p(1-q)}, \quad \Pr(0) = \frac{p(1-q)}{q(1-p)+p(1-q)}$$

From our assumption above, if a lobbyist sends message one she knows with certainty that the government will choose r, in which case the lobbyist does not get her vested interest. If she lies however, she gets the vested interest if either the other lobbyist received signal zero or she received signal one and chose to be dishonest. In equilibrium, the conditional probability that the other sends message zero is:

(A5) $$\Pr(m_j = 0 : s_i = 1) = \frac{pq(1-q)+p(1-q)^2x+(1-p)q(1-q)+(1-p)q^2x}{q(1-p)+p(1-q)}$$

After collecting terms and combining (A4) and (A5) we get that a conservative lobbyist weakly prefers to be honest after signal one iff:

(A6) $$q(1-p)u \geq p(1-q)u + pq(1-q) + p(1-q)^2x + (1-p)q^2x + (1-p)q(1-q)$$

Rearranging gives:

(A7) $$u \geq \frac{q(1-q)}{q-p} + \frac{x\left[p(1-q)^2 + (1-p)q^2\right]}{q-p}$$

Further, for the government to rationally choose policy r after message pair {0,1} we must have that Pr (1: m = {0,1}) ≥ Pr (0: m = {0,1}) or:

(A8) $$2(1-p)q(1-q)(1-x) + 2(1-p)q^2x(1-x) \geq 2pq(1-q)(1-x) + 2p(1-q)^2x(1-x)$$

Rearranging gives:

(A9) $$x \geq \frac{q(1-q)(2p-1)}{q^2(1-p) - p(1-q)^2}$$

Since we are interested in the most informative equilibrium we would like to set (A9) to equality. Moreover, inspection of (A7) tells us that a smaller x gives a lower bound for u, so the most informative and least restrictive (in terms of u) equilibrium coincides. Substituting for x in (A7) gives:

$$\text{(A10)} \qquad u \geq \frac{2pq(1-q)}{q-p}$$

Since $q > p > 0.5$, (A10) clearly implies that (1) holds. Hence, (1) is a necessary condition for an informative equilibrium with two conservatives.

Consider now the case of one lobbyist of each type. We now let the message pair be ordered, let e.g. the first message be the conservative's. Since a lobbyist by assumption never lies against his own interests, the following always holds: Pr (0: m = {0, 0}) > 0.5, Pr (1: m = {1, 1}) > 0.5 and Pr (0: m = {1, 0}) > 0.5. Hence, the government has a unique best action after these three message pairs. Consequently, only after message pair {0, 1} is it possible that the government randomizes. If the government had a unique best action also in this case, one of the lobbyists would be induced to insist, again a situation that cannot be part of an informative equilibrium. Suppose the government is indifferent after message pair {0, 1}. Given this message pair, denote the probability with which it chooses policy r by $w \in (0,1)$. Further, let $\lambda \in [0,1]$ be the probability that the conservative lobbyist is dishonest after signal one, and let $\mu \in [0,1]$ be the probability that the progressive lobbyist is dishonest after signal zero. We now show that if (1) does not hold the government cannot choose a w as to keep both lobbyists indifferent (at least) at the same time.

After signal one, the conservative lobbyist weakly prefers to be honest iff:

$$\text{(A11)} \qquad \begin{aligned} &(1-p)qu + q(1-q)(1-\mu) \geq \\ &p(1-q)u + q(1-q)(1-\mu) + [(1-p)q^2 + p(1-q)^2](1-w) + q(1-q)(1-w)\mu \end{aligned}$$

This can be rearranged as:

$$\text{(A12)} \qquad w \geq 1 - \frac{(q-p)u}{(1-p)q^2 + p(1-q)^2 + q(1-q)\mu}$$

After signal zero, the progressive lobbyist weakly prefers to be honest iff:

$$\text{(A13)} \qquad qpu \geq (1-p)(1-q)u + q(1-q)(1-\lambda) + w\left[pq^2 + (1-p)(1-q)^2\right] + q(1-q)\lambda w$$

This reduces to:

$$\text{(A14)} \qquad w \leq \frac{(q+p-1)u - q(1-q) + q(1-q)\lambda}{pq^2 + (1-p)(1-q)^2 + q(1-q)\lambda}$$

Now, it easily verified that setting $\mu = 0$ in (A12) and $\lambda = 1$ in (A14) gives the least restrictive cases. (A12) and (A14) reduce to, respectively:

$$\text{(A15)} \qquad w \geq 1 - \frac{(q-p)u}{(1-p)q^2 + p(1-q)^2}$$

$$\text{(A16)} \qquad w \leq \frac{(q+p-1)u}{pq^2 + (1-p)(1-q)^2 + q(1-q)}$$

Suppose now that (1) does not hold, so that the upper bound for the prestige value is given by: $\dfrac{q(1-q)}{c+p-1}$.

Substituting this for u in (A15) and (A16) and combining the equations gives:

$$\text{(A17)} \qquad \frac{q(1-q)}{q(1-q)+pq^2+(1-p)(1-q)^2} \geq 1-\frac{(q-p)\dfrac{q(1-q)}{q+p-1}}{(1-p)q^2+p(1-q)^2}$$

Since $q > p > 0.5$, it is easily seen that the LHS is decreasing in p, while the RHS is increasing in p. Setting $p = 0.5$ thus puts the least possible restriction on the inequality. This reduces (A17) to $4q(1\text{-}q) \geq 1$, a contradiction. QED

b) We first obtain the minimum prestige values that sustain an informative equilibrium with either a heterogeneous or a conservative panel. For the conservative panel, this is already done in (A10). Consider again a heterogeneous panel. Inspection of (A12) gives that the lower bound for w is increasing in μ.. Clearly, a lower w helps to relax the progressive's incentive constraint (A13). Hence, since a lower μ also means more truthtelling, in the most informative equilibrium it must be true that $\mu = 0$. Setting (A12) to equality (higher w serves obviously no purpose) and substituting for μ gives:

$$\text{(A18)} \qquad w = 1-\frac{(q-p)u}{(1-p)q^2+p(1-q)^2}$$

Now, after message pair {0,1} the government is indifferent iff:

$$\text{(A19)} \qquad \begin{aligned} &\Pr(\{0\}) = pq(1-q)+pq^2\mu+p(1-q)^2\lambda+p(1-q)q\lambda\mu \quad = \\ &\Pr(\{1\}) = (1-p)q(1-q)+(1-p)(1-q)q\lambda\mu+(1-p)q^2\lambda+(1-p)(1-q)^2\mu \end{aligned}$$

Setting $\mu = 0$ and rearranging (A19) gives:

$$\text{(A20)} \qquad \lambda = \frac{q(1-q)(2p-1)}{(1-p)q^2-p(1-q)^2}$$

Finally we use the progressive lobbyist's incentive constraint. Again, after signal zero, the progressive lobbyist weakly prefers to be honest iff:

$$\text{(A21)} \qquad qpu \geq (1-p)(1-q)u+q(1-q)(1-\lambda)+[pq^2+(1-p)(1-q)^2]w+q(1-q)\lambda w$$

Using (A18) and (A20) we arrive at the following messy expression:

(A22)

$$u \geq \frac{(1-p-q+2pq)(2pq+q^2-p-2pq^2)(p+q^2-2pq)}{2p^2(1-p)+qp(8p^2-8p-1)+4q^2p(1+3p-3p^2)+2q^3(4p^3-4p^2-3p)+q^4(7p-2p^2-1)+q^5(1-2p)}$$

This bound should thus be compared to that in (A10). However, to complete the comparison, we must also characterize the government's utility in the informative equilibria. We start with two conservatives.

According to the strategy above, the government makes the wrong decision with the following probabilities:

(A23) $$\Pr(r:0) = 2pq(1-q)(1-x) + 2p(1-q)^2 x(1-x) + p(1-q)^2(1-x)^2$$

(A24) $$\Pr(s:1) = (1-p)(1-q)^2 + 2(1-p)q(1-q)x + (1-p)q^2x^2$$

Using the lower bound for x in (A9) and summing (A23) and (A24) gives that, after some algebra, the probability of a correct decision in the informative equilibrium with two conservatives is:

(A25) $$1 - \frac{p(1-q)(3q-2pq-1)}{2pq+q^2-2pq^2-p}$$

Differentiating (A26) w.r.t. p gives:

(A26) $$-q(1-q)\frac{3q^2-4q^2p+4q^2p^2+2p^2-4p^2q-q}{(2pq+q^2-2pq^2-p)^2}$$

Some algebra reduces (A26) to:

(A27) $$-q(1-q)\frac{2p^2(1-q)^2+2(q-p)^2+q(1-q)+(2q-1)}{(2pq+q^2-2pq^2-p)^2}$$

Since all brackets in (A27) are positive, this derivative is strictly negative. Hence, given that the informative equilibrium exists with two conservatives, setting p = 0.5 gives the highest possible utility. This reduces (A25) to q. Hence, q is the upper limit for the government's payoff with two conservatives.

With a heterogeneous pair of lobbyists, the probability of correct decision in the informative equilibrium is:

(A28)

$$1-pq(1-q)w+p(1-q)^2\lambda w+p(1-q)^2(1-\lambda)-(1-p)q(1-q)-(1-p)(1-q)^2-(1-p)q(1-q)(1-w)-(1-p)q^2\lambda(1-w)$$

Now, using (A18) and (A20) for λ and w, (A28) reduces to exactly q. So, given that these informative equilibria exist , the government's utility from using a heterogeneous panel is strictly higher than that from using two conservatives. Hence, the only instance when the government prefers two conservative lobbyists to one of each kind is when the informative equilibrium exists with the former pair but not with latter. That is, a conservative panel is preferred to a heterogeneous one iff (A10) holds but not (A22), which completes the proof of part b). QED