

Side-Effects of Campaign Finance Reform*

Matthias Dahm[†] and Nicolás Porteiro[‡]

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[†] Departamento de Economía. Universidad Carlos III de Madrid. Calle Madrid, 126. 28903 Getafe (Madrid). Spain. E-mail: mdahm@eco.uc3m.es. Phone: +34 916 245745. Fax: +34 916 249875.

[‡] Departamento de Economía, Met. Cuantitativos e H^a Económica. Area de Análisis Económico. Universidad Pablo de Olavide. Carretera Utrera km 1. Sevilla 41013. Spain. Email: nporfre@upo.es. Phone: +34 954 348913. Fax: +34 954 349339.

Abstract

Since campaign finance reform is usually motivated by the concern that existing legislation can not effectively prevent campaign contributions to ‘buy favors’, this paper assumes that contributions influence political decisions. But, given that it is also widely recognized that interest groups achieve influence by providing political decision makers with policy relevant information, we also assume that lobbies engage in non-negligible informational lobbying. We focus on a single political decision to be taken and offer a simple model in which the optimal influence strategy is a mixture of both lobbying instruments. Our main result is to show that campaign finance reform may have important side-effects: It may deter informational lobbying so that less policy relevant information is available and as a result political decisions become less efficient.

Keywords: party and candidate financing, lobbying, interest groups, experts, information transmission, contributions, influence, political decision making process.

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D72 (Economic Models of Political Processes: Rent-Seeking, Elections).

“...the experience of FECA [Federal Election Campaign Act] demonstrates that campaign finance laws also have unpredictable and, in some ways, undesirable consequences and BCRA [Bipartisan Campaign Reform Act] is almost certain to be no different in this respect.”

Grant (2004), p. 140

1. Introduction

Campaign finance reform is a hotly debated topic in many parts of the world.¹ Such a reform is usually motivated by the concern that existing legislation can not effectively prevent campaign contributions to ‘buy political favors’.² It is also widely recognized that interest groups achieve influence by providing political decision makers with policy

¹ In the United States and Britain the debate about campaign finance reform has not even been concluded by a new regulatory framework. In the United States a new law – the Bipartisan Campaign Reform Act (BCRA), popularly known as McCain-Feingold, – went into effect on November 6, 2002. It is considered the first major overhaul of campaign finance since the 1974 Federal Election Campaign Act (FECA). However, on February 1, 2005 a bipartisan group of lawmakers introduced legislation to confront the problems posed by so-called ‘527’ groups that spent hundreds of millions of dollars in ‘soft money’ to influence the 2004 elections. In Britain the Political Parties, Elections and Referendums Act of 2000 established for the first time a regulatory framework for party finance at national level. One consequence of this act was that several large donations became publicly known, prompting the chair of the new Electoral Commission to suggest that the question of donation caps might be considered in future. Moreover, the Electoral Commission (2004) in its advisory report on public funding of parties writes that any further significant increase of such funding must be contingent on acceptance of a tighter regulation of donations.

² Grant (2005), p. 84, makes this point: “the catalyst for the introduction of new laws has been scandals, real or imagined. Watergate led to the 1974 Federal Election Campaign Act regime; the Clinton approach of offering wealthy supporters the opportunity of staying as overnight guests at the White House in exchange for soft money contributions to his party paved the way for the new controls. The Enron scandal at the end of 2001, with the collapse of the giant energy company that had made extensive gifts to parties and candidates, helped to win over some vital additional votes in Congress which allowed the passage of Bipartisan Campaign Reform Act. In the UK allegations of Tory sleaze and the Ecclestone affair created the climate for new rules”.

relevant information. Despite the fact that there is a literature analyzing how lobbies influence political decisions by, on one hand, making campaign contributions and, on the other hand, providing policy-relevant information, little is known about the interaction of both lobbying instruments.³ While it is intuitively appealing that as a result of campaign finance reform contributions are deterred and informational lobbying is increased – if affected at all –, we challenge this view here. In our model reform may deter informational lobbying, too. In this case there is less policy relevant information available and political decisions may become less efficient.

To build a strong case for reform we build a model of lobbying on the assumption that special interests can influence political decisions through contributions. Thus, it seems from the outset that a strict campaign finance policy is desirable because it limits distortions of political decisions.⁴ However, in our model the power of contributions

³ Reviews of both strands of literature can be found in Austen-Smith (1997) or Grossmann and Helpman (2001). The only two works we are aware of that combine both instruments are Bennesen and Feldmann (2006) and Dahm and Porteiro (2006). Both papers will be reviewed later.

⁴ The view that money influences decisions of politicians goes back in the literature at least to George Stigler and Gary Becker. It is in line with a general uneasiness of the public concerning contributions and casual evidence through scandals or statements like the following from *The New York Times* (March 15, 2005): “If you go back to the railroad age, they talk about the robber barons, and going up to buy off the Legislature,” said Assemblyman William L. Parment, a Democrat from Chautauqua County. “I think now it’s just a little more refined, and there’s been a structure that’s been enacted - you can’t take \$1,000 in \$100 bills and put it into a brown bag and put it on a legislator’s desk. But you can contribute to a campaign.” However, the empirical evidence of a link between campaign contributions and influence is mixed. See Ansolabehere et al. (2003) for a critical assessment and the alternative view that contributions should be viewed primarily as a type of consumption good. Contributions are also seen as a means to gain access to a political decision maker in order to be able to lobby him through information provision, see e.g. Wright (1996). If either of the previous interpretations is correct, then it is not clear that stricter campaign finance regulation is desirable (see Section 5). In this sense, the assumption of the present paper captures an ideal case for tighter regulation. It is also worth pointing out that although Wright (1996) sees contributions as providing access he writes (p. 7) that the “belief that interest groups are able to purchase legislative influence with campaign contributions has sufficient

will be limited and this enables us to explain the empirical fact that lobbies use both contributions and informational lobbying together.⁵

We consider a model in which a politician has to take a single policy decision. She values both contributions and making ‘good’ decisions. In her decision the politician trades off ‘acting optimally given her beliefs about the suitability of each policy’ against the contributions of the lobby. The more ‘convinced’ she is that the group’s objective is a ‘good’ policy, the easier for the lobby to influence her through contributions.

Before deciding on contributions the lobby can invest in costly policy relevant information with the hope to affect the politician’s beliefs in such a way that she is more likely to decide in favor of the group. However, informational lobbying may be unsuccessful and as a result the politician is more convinced not to support the lobby’s cause. This structure implies that *informational lobbying exerts a strategic effect on the contribution game*. If informational lobbying is successful, this strategic effect is positive. If it is not, the strategic effect is negative.

We compare different lobbying environments by varying the marginal costs of con-

currency, and the implications for the political system are so significant, that it merits a most careful and thorough examination”. Lastly, our assumption motivates regulation as the Supreme Court of the United States wrote in its decision to uphold the Bipartisan Campaign Reform Act: “The prevention of corruption or its appearance constitutes a sufficiently important interest to justify political contribution limits”.

⁵ Formally speaking, in our model there will be ‘noise’ that represents other determinants of the politician’s decision. In this sense our model is in line with the aforementioned paper by Ansolabehere et al. (2003) who find that “[m]oney has little leverage because it is only a small part of the political calculation that a re-election oriented legislator makes”, p. 116. We discuss a model without noise in Section 4.2. The joint use of both instruments is e.g. reported in Wright (1990). Note that joint instrument use is also the basis for the before mentioned access literature.

tributions. This is intended to capture the feature that different campaign finance regulations depend on different contribution limits, establish different sanctions in case of violations and are not all equally enforced.⁶ Our model predicts – consistent with the empirical evidence mentioned before – that the lobby provides information *and* makes contributions (if it has the capacity and need to do so). We show that the overall effect of an increase in the marginal costs of contributions on informational lobbying depends on two opposite forces.

On one hand, there is a *relative price effect* that favors informational lobbying. But, on the other, there is a *deterrence effect* on informational lobbying. This activity is deterred, because the contribution activity is used to correct the negative strategic effect arising from informational lobbying. The correction activity becomes more costly as contribution costs increase. We determine the optimal level of informational lobbying and show that the relationship between both lobbying instruments depends on the relative size of these opposite effects. For low costs of contributions the relative price effect is stronger so that there is always a substitutive relationship. However, as the

⁶ An example is the creation of the Federal Election Commission (FEC) in the United States in 1974. The FEC is the independent regulatory agency charged with administering and enforcing the federal campaign finance law. It has jurisdiction over the financing of campaigns for the U.S. House, the U.S. Senate, the Presidency and the Vice Presidency. We argue that it affects the marginal costs of contributions when it designs regulations to carry out the intentions of campaign law. This claim is supported by the fact that (on March 10, 2005) US Senators McCain and Feingold filed a brief in the DC Court of Appeals as *amici curiae* accusing the agency of watering down the Bipartisan Campaign Reform Act. Moreover, we think that it is important whether such an agency has merely advisory responsibilities (as the Election Commission in Britain) or the authority to enforce the law. Our analysis can easily be extended to apply to the case of caps on political lobbying (see Section 4.5).

costs increase further, so does the relative size of the deterrence effect – resulting finally in a complementary relationship.

We build on the complementary relationship to show that any reform has the potential to hurt the efficiency of the political decision. If the relationship between the instruments is complementary, then reform deters both lobbying instruments. Therefore, reform has an *effect on distortion* because as contributions are reduced the political decision is less biased towards special interests. But there is also an *effect on information* because there is less policy relevant information available. We show that the effect on information has always the potential to overwhelm the effect on distortion. If the level of informational lobbying is non-negligible, final decisions become less efficient.

This allows us to draw our main conclusion that if (1) we believe that there is need for reform because contributions sway away political decisions and (2) we believe that informational lobbying plays an important role in lobbying strategies, then *campaign finance reform may decrease the efficiency of the political decisions*.

This conclusion stands in stark contrast to the literature on campaign finance reform which has largely argued that it is desirable to limit the capacity of interest groups to contribute to political parties and candidates.⁷ Our aim here is not to dispute these

⁷ This conclusion has been drawn both from models in which there is no positive effect of contributions (see e.g. Matějka et al (2002)) and from models in which contributions in principle have a positive effect because they are used to inform voters about candidates (see e.g. Prat (2002a and 2002b) or Coate (2004)). The earlier literature on campaign finance reform is reviewed in Morton and Cameron (1992), while Coate (2004) reviews the recent literature.

important results. Rather we would like to complement the existing normative analysis of campaign finance reform by another dimension. The existing literature is rooted in the idea that contributions influence decisions and integrates realistically informational aspects of elections. However, it abstracts from informational aspects of the policy decision. Our work abstracts from the informational aspects of elections but integrates those of the policy decision.⁸

2. The Model

We consider a political decision-maker DM and an interest group L . Assume the former decides between two alternative policies A and B . There are two states of the world a and b . While A is the correct decision in state a , in state b policy B should be chosen. We use D to indicate the decision taken and ω for the true state of the world. The probability of state a , $Pr[\omega = a] \equiv q \in [\frac{1}{2}, 1)$, is common knowledge.⁹

Suppose that if the politician successfully matches policy B and state b she obtains a payoff of $R \in [0, 1]$. For the other policy a successful match yields $1 - R$, while payoffs are zero if there is a mismatch. Assume that, while the politician knows R , the lobby only

⁸ Our paper contributes also to a small literature in which interest groups have more than one lobbying instrument. Yu (2005) analyzes the choice between lobbying the government and persuading the public. An analysis of contributions and informational lobbying is offered by Bennedsen and Feldmann (2006), who discover the strategic effect of informational lobbying, and in independent work in our companion-paper Dahm and Porteiro (2006). None of these papers analyzes the effects of campaign finance reform. We come back to these two papers in Section 4.

⁹ Many of the results derived in the next section are true for any q . The restriction on the prior is made for simplicity of the discussion. In a similar manner, the current model is designed to provide the simplest framework to analyze the interaction between the two lobbying instruments and its implications for campaign finance reform. We discuss robustness issues extensively in Section 4. Subsection 4.3 shows that for low priors our main result is even stronger.

knows that R is uniformly distributed on $[0, 1]$. The politician prefers policy B to A , that is, $E\Pi_{DM}(q, R, D = B) \geq E\Pi_{DM}(q, R, D = A)$ if and only if $(1 - q)R \geq q(1 - R)$. This is equivalent to $R \geq q$ and – from the point of view of the lobby – the probability of this event is $f_B = 1 - q$.

There exists an interest group L with state independent preferences. If policy B is chosen the lobby's utility is 1 and 0 otherwise. The idea here is straightforward. Without lobbying the politician chooses decision B with a probability smaller than $\frac{1}{2}$. So, the lobby always wants to influence the politician.

The lobby has two instruments to influence the politician. Firstly, he may engage in informational lobbying. At a cost $C(y) = k_i y^2$ the lobby can buy a test which reveals with probability $y \in [0, 1]$ the true state of the world, that is, $t = \omega$. With probability $1 - y$ the test is not successful, no information is obtained and $t = \emptyset$. The lobby must reveal the result of the test.¹⁰

Secondly, the group can choose a level c of campaign contributions at a constant marginal cost k_c . For simplicity we suppose that contributions increase the support of policy B such that $E\Pi_{DM}(q, R, D = B) + cR$ is compared to $E\Pi_{DM}(q, R, D = A)$. The

¹⁰ This set-up constitutes an extremely simple information game that captures lobbies commissioning university faculty or other established experts to conduct studies. External researchers have an incentive to reveal the result of the test because their reputation is at stake. As in Dewatripont and Tirole (1999) we assume first that evidence cannot be concealed and is automatically used for decision making. In Section 4.6 we discuss extensions and show that this assumption is much stronger than needed.

objective function of the lobby at the contribution stage is then¹¹

$$E\Pi(q, k_c, c) = \frac{1 - q + c}{1 + c} - k_c c.$$

The timing of this game is as follows. First, the lobby may engage in informational lobbying. When the lobby reveals the true state of the world, the politician updates her belief so that $q \in \{0, 1\}$. The group can then make a contribution. We solve this sequential game by backwards induction.

As Austen-Smith and Wright (1992), we measure the quality of the political decision process by $\zeta = \Pr(\omega = a) \Pr(D = B) + \Pr(\omega = b) \Pr(D = A)$, the ex ante probability that the ‘wrong’ policy is chosen. The political decision process without interest group is a natural benchmark of comparison of our model. In this case $\zeta_{\mathcal{L}} = 2q(1 - q)$.

¹¹ With a straightforward generalization these assumptions provide a micro-foundation for a non-deterministic contest game in the sense of Tullock’s seminal contribution. Defining the ‘support’ s for each policy, $s_A = q$ and $s_B = 1 - q + c$, respectively, we obtain Tullock’s decision rule $f_A = \frac{s_A^\alpha}{s_A^\alpha + s_B^\alpha}$, $\alpha \in [0, \infty)$ and $f_B = 1 - f_A$. The underlying idea is that the relative size of the support for the policies is an imperfect measure for success. The lower α , the less perfect the measure and the more ‘noise’ in the politician’s decision making process. The extreme case of $\alpha = 0$ corresponds to a fair lottery, while as $\alpha \rightarrow \infty$ the measure works perfectly: the policy with the highest support wins deterministically. This is the case of Baye et al. (1993) and Che and Gale (1998). The ‘noise’ in our model represents uncertainty of the lobby about factors that determine R . We may think of an interest to establish an environmental friendly voting record qualifying for higher office or of linkage between different political decisions in order to realize a vote trade (logrolling). Apart from the extensive literature on contests, a non-deterministic decision rule has a long tradition in discrete choice theory, see Anderson *et al.* (1992), and in the theory of probabilistic voting, see Coughlin (1992). In Section 4.2 we discuss the robustness of our results to alternative formulations. At the contribution stage we assume – as in the contest literature – constant marginal costs. Since we focus on marginal changes in k_c , we choose in the information game the simplest formulation yielding an interior solution for informational lobbying. Again, the precise functional form is much stronger than we need and chosen for clarity of the exposition. With linear costs of informational lobbying either the optimal choice is no informational lobbying at all or the test reveals always the truth. Moreover, adjustments to different marginal costs of contributions are equally extreme which would obscure the analysis.

3. The Lobbying Game

Given that campaign finance reform is usually motivated by scandals, we assume that the cost of contributions are low: $k_c \leq q$.¹² We start by analyzing the lobby's behavior at the contribution stage. Note that if $q = 0$, then $f_B(0, k_c, c) = 1$ and therefore $c(0, k_c)^* = 0$ and $E\Pi(0, k_c, c^*) = 1$. If $q > 0$, it is straightforward to solve the maximization program of the lobby. We have that

$$c(q, k_c)^* = \sqrt{\frac{q}{k_c}} - 1, \quad (3.1)$$

$$f_B(q, k_c, c^*) = 1 - \sqrt{qk_c} \quad \text{and} \quad (3.2)$$

$$E\Pi(q, k_c, c^*) = 1 - 2\sqrt{qk_c} + k_c. \quad (3.3)$$

The objective function at the informational lobbying stage is

$$\begin{aligned} E\Pi(q, k_c, k_i, c^*, y) &= yqE\Pi(1, k_c, c^*) + y(1 - q)E\Pi(0, k_c, c^*) \\ &\quad + (1 - y)E\Pi(q, k_c, c^*) - k_i y^2 \\ &= yq(1 - 2\sqrt{k_c} + k_c) + y(1 - q) \\ &\quad + (1 - y)(1 - 2\sqrt{qk_c} + k_c) - k_i y^2. \end{aligned} \quad (3.4)$$

With probability y the test reveals the state of the world. With probability yq the

¹² This assumption assures that there is a positive contribution level both after an unsuccessful test and after a test revealing state $s = a$. For high contribution costs ($q < k_c \leq 1$) there is a range of parameters in which contribution activity takes place only when state a is revealed. Increasing contribution costs further endows the interest group with a lobbying technology that has a marginal cost higher than the normalized value of the political prize.

politician is certain that she should not support the lobby's cause and the lobby exerts pressure yielding $E\Pi(1, k_c, c^*)$. With the remaining probability $y(1 - q)$ no pressure is necessary. With probability $1 - y$ the test is not successful and $E\Pi(q, k_c, c^*)$ is obtained. The next proposition follows from maximizing expression (3.4) w.r.t. y and deriving the maximizer y^* w.r.t. the marginal costs of political contributions.

Proposition 3.1. *The lobby always engages in informational lobbying, that is,*

$$y^* = \min \left\{ 1, \frac{\sqrt{k_c}}{2k_i} \left[2(1 - \sqrt{q})\sqrt{q} - (1 - q)\sqrt{k_c} \right] \right\} > 0.$$

For $k_c \in [0, Y]$, both lobbying instruments are substitutes, while for $k_c \in [Y, q]$ the relationship is complementary, where $Y = \left[\frac{\sqrt{q}(1 - \sqrt{q})}{1 - q} \right]^2 < q$.

The optimal amount of information is a positive strictly concave function of the cost of contributions. There is always first a substitutive and then a complementary relationship between both instruments.¹³

The reason for the existence of both relationships is that raising the costs of contri-

¹³ Interestingly, the threshold Y does not depend on the cost level of informational lobbying k_i . Although it is very intuitive, it is important for the analysis that follows to point out that both the optimal amount of informational lobbying and the (absolute value of the) adjustment to reform are higher, the cheaper informational lobbying is. In general both relationships exist for substantial intervals of the parameter space. In fact, there are more values for q for which $Y \leq q - Y$ than there are values of q for which the opposite inequality holds ($Y \leq q - Y$ if and only if $q \in [\sqrt{2} - 1, 1]$).

butions has two opposite effects on the level of informational lobbying. We can write

$$\frac{\partial y^*}{\partial k_c} = \frac{1}{2k_i} \left[\left(\frac{\sqrt{q}}{\sqrt{k_c}} - 1 \right) + \left(-\frac{q}{\sqrt{k_c}} + q \right) \right] = \frac{1}{2k_i} [RPE + DET].$$

First, there is a relative price effect *RPE*. The more often the test fails, the more often a subgame is reached in which the optimal contribution level must be decreased and the win probability as well as the resulting payoffs are negatively affected. The more informational lobbying, the less often the test fails. Therefore, the *RPE* is always positive and works in favor of informational lobbying. Second, there is a deterrence effect *DET*. The more often the test is successful, the more often the negative strategic effect applies, it becomes more difficult to reach the lobby's aim and the lobby wants to correct the outcome of informational lobbying. This provides incentives to provide less information in the first place and the *DET* is always negative.¹⁴

We turn now to an analysis of when the participation of the lobby in the political process is desirable. With a lobby the ex ante probability of an error is in equilibrium

$$\zeta_L = y^*q(1 - \sqrt{k_c}) + (1 - y^*) \left[(1 - \sqrt{qk_c})q + \sqrt{qk_c}(1 - q) \right]. \quad (3.5)$$

With probability y^*q the politician learns that the lobby's aim should not be supported but contributions sway away her decision with probability $1 - \sqrt{k_c}$. A fraction $1 - y^*$ of times the test fails and two different types of errors may occur. The lobby may be

¹⁴ Note that from equation 3.3 we obtain $\frac{\partial(-E\Pi(q,k_c,c^*))}{\partial k_c} = RPE$ and $\frac{\partial(qE\Pi(1,k_c,c^*))}{\partial k_c} = DET$.

successful through contributions when he should not, given by $(1 - \sqrt{qk_c})q$, and the lobby may be unsuccessful when he should, expressed by $\sqrt{qk_c}(1 - q)$. Note that with probability $y^*(1 - q)$ the right decision is taken because there is no conflict of interest. Equation (3.5) can be transformed into

$$\zeta_L = q + \sqrt{qk_c} \left[(1 - 2q) - y^* (1 - 2q + \sqrt{q}) \right].$$

And the difference in the quality of the decision with and without lobby, denoted by $\Delta\zeta = \zeta_L - \zeta_{\#}$, can be expressed as

$$\begin{aligned} \Delta\zeta &= \sqrt{qk_c} \left((2q - 1) \left(\sqrt{\frac{q}{k_c}} - 1 \right) - (1 - 2q + \sqrt{q}) y^* \right) \\ &= (1 - y^*) \sqrt{qk_c} \left((2q - 1) \left(\sqrt{\frac{q}{k_c}} - 1 \right) \right) + y^* q \left(\frac{(2q - 1)}{\sqrt{k_c}} - \sqrt{k_c} \right). \end{aligned} \quad (3.6)$$

The first term expresses the difference in decision quality given that the test fails, while the second specifies the difference conditional on the test revealing the truth. The lobby's contribution activity after a failed test is inefficient and therefore the first term is positive. However, if the marginal costs of contributions k_c are high enough, contributions after revealing state a are low enough and the second term is negative. This second term can even overwhelm the first if, in addition, k_i is sufficiently low and a high amount of information is provided. The precise condition for this to occur is

$$y^* \geq \frac{(2q - 1) \left(\sqrt{\frac{q}{k_c}} - 1 \right)}{1 - 2q + \sqrt{q}}. \quad (3.7)$$

Note that for any k_i the level of informational lobbying is strictly positive. Therefore, for high k_c , say $k_c = q$, condition (3.7) is fulfilled and the presence of the lobby is desirable. We have therefore proved the following Proposition 3.2.

Proposition 3.2. *There exist contribution costs such that contributions are low enough and the level of informational lobbying is sufficiently high to result in an overall lobbying activity that improves the quality of the decision. Formally, for all $q \geq \frac{1}{2}$ and for all k_i , there exist k_c such that $\Delta\zeta < 0$.*

This result can be interpreted as bridging the two literatures on lobbying. If contributions are cheap, then the politician is ‘captured’ and the overall effect of lobbying is harmful. However, if contributions are expensive enough, then lobbying becomes desirable (see e.g. Austen-Smith and Wright (1992)).¹⁵

We analyze now the effect of campaign finance reform. From equation (3.5), we obtain that

$$\begin{aligned}
\frac{\partial \zeta_L}{\partial k_c} &= -\frac{qy^*}{2\sqrt{k_c}} + q(1 - \sqrt{k_c})\frac{\partial y^*}{\partial k_c} - (1 - y^*)\frac{2q - 1}{2}\sqrt{\frac{q}{k_c}} - \left[q - \sqrt{qk_c}(2q - 1) \right] \frac{\partial y^*}{\partial k_c} \\
&= \frac{1}{2}\sqrt{\frac{q}{k_c}} \left[(1 - 2q) - y^*(1 - 2q + \sqrt{q}) \right] + \sqrt{qk_c}(1 - 2q + \sqrt{q}) \left[-\frac{\partial y^*}{\partial k_c} \right] \\
&= DIS + EI.
\end{aligned} \tag{3.8}$$

¹⁵ Note that for $q = \frac{1}{2}$, the result is even stronger than stated. In our model we fixed the stakes of the lobby to 1. Without this normalization the optimal lobbying behavior is determined by k_i and k_c relative to the stakes. Austen-Smith and Wright (1992) show that “the more important an issue is to a special interest group, the more likely is the legislator to make the correct full-information decision”. Given that 3.7 holds, increasing the importance of an issue (above 1) implies a higher level of y^* .

From the first equation we see that campaign finance reform has a direct and an indirect effect both when the test is successful (first two terms) and when it fails (remaining terms). Summing both direct effects defines *DIS*, the effect on distortion. Similarly, the sum of the indirect effects defines *EI*, the effect on information.

The effect on distortion *DIS* affects the inefficient contribution activity after a test revealing state *a* and when the test fails. Both activities are deterred through reform. However, this efficiency enhancing effect diminishes as k_c increases when there is a complementary relationship. Moreover, it diminishes the faster, the stronger the complementarity deters informational lobbying.¹⁶

The effect on information *EI* is captured by the fact that changing the level of informational lobbying implies altering the relative frequency of the different contribution games. The *EI* unifies two opposite forces. Since the sign of each of these forces depends on the relationship between both lobbying instruments, assume for now a complementary regime. Reform has an efficiency enhancing effect, because a lower level of informational lobbying implies that less often state *a* is revealed and so the distortion caused by the associated contribution game is less frequent. Reform has also an efficiency decreasing effect, since more often the test is unsuccessful and the inefficiencies

¹⁶ Under a complementary relationship

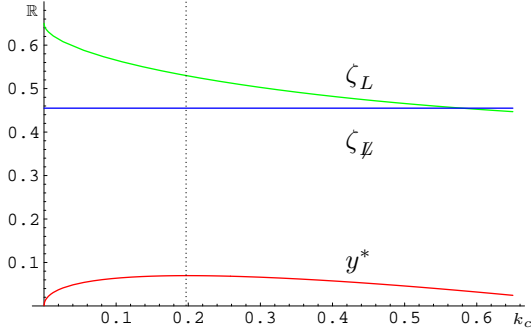
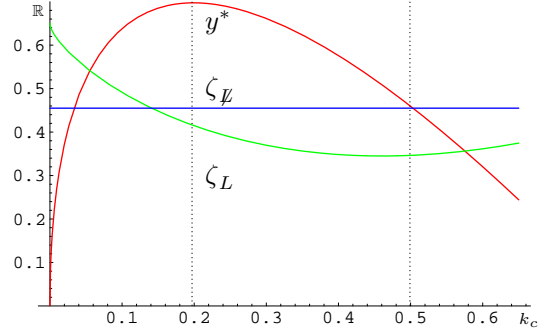
$$\frac{\partial DIS}{\partial k_c} = -\frac{\sqrt{q}}{4(\sqrt{k_c})^3} [(1-2q) - y^*(1-2q+\sqrt{q})] - \frac{\sqrt{q}}{2\sqrt{k_c}} (1-2q+\sqrt{q}) \frac{\partial y^*}{\partial k_c} > 0.$$

of the subsequent contribution game occur more often. It is straightforward to see that the second effect is always dominant. Thus, the *EI* is efficiency decreasing if and only if the lobbying instruments are complements: less often an informed choice is made.

We are now in a position to examine when the quality of the decision is monotonic in the cost of contributions. Three intervals for k_c must be distinguished. (1) For low values of k_c there is a substitutive relationship. Both the *DIS* and *EI* are aligned. The quality of the decision is improved. (2) For intermediate values of k_c there is a complementary relationship. Although the *DIS* and *EI* are no longer aligned, the first is stronger than the second. Therefore, the quality of the decision is still improved. (3) For high values of k_c the *DIS* may be dominated by the *EI* and as a result efficiency may decrease. Since the first two intervals exist always but the third only when the costs of informational lobbying are low enough, we conclude that *campaign finance reform increases monotonically the efficiency of the decision if informational lobbying is negligible*.¹⁷ We illustrate the importance of informational lobbying with two examples.

Example 3.3. *Figure 3.1 shows a case of high informational lobbying costs. The level of informational lobbying is low and the presence of the lobby in the political process is almost always undesirable. ζ_L is monotonic in contribution costs and a tougher regulation is unambiguously good. In Figure 3.2, however, information costs are cheaper*

¹⁷ This statement implicitly abstracts from the case in which information is so cheap that $y^* = 1$. This case is unrealistic because it means that informational lobbying resolves all uncertainty related to the state of the world. However, for completeness we mention that $y^* = 1$ implies that $IE = 0$ and thus a monotonic effect of reform.

Figure 3.1: $q = 0.65$ and $k_i = 0.5$ Figure 3.2: $q = 0.65$ and $k_i = 0.05$

and informational lobbying is much more important. For low contribution costs reform increases the efficiency of the political decision. For high contribution costs ($k_c \in [0.5, 0.65]$) the effect of reform on information provision is so strong that the efficiency of the decision decreases.

Our main result is to show that the situation in Figure 3.2 is not a special case: a non-monotonicity may always exist.

Proposition 3.4. *There exist lobbying costs such that the effect of campaign finance reform on informational lobbying is important enough to decrease the efficiency of the decision. Formally, for any $q \geq \frac{1}{2}$ there exist relative prices (k_c, k_i) such that $\frac{\partial \zeta_L}{\partial k_c} > 0$.*

Proof. We have to show that, for every q , there exists (k_c, k_i) such that $\frac{\partial \zeta_L}{\partial k_c} > 0$.

Fix $k_i = \sqrt{k_c} [2(1 - \sqrt{q})\sqrt{q} - (1 - q)\sqrt{k_c}]$. Substituting in $\frac{\partial \zeta_L}{\partial k_c}$, $y^* = \frac{1}{2}$ and $\frac{\partial y^*}{\partial k_c} =$

$\frac{1}{2k_i} \left[\frac{\sqrt{q}(1-\sqrt{q})}{\sqrt{k_c}} - (1-q) \right]$ yields that we have to show

$$\nabla = \frac{1}{2} (1 - 2q - \sqrt{q}) - (1 - 2q + \sqrt{q}) \frac{\sqrt{q}(1 - \sqrt{q}) - (1 - q)\sqrt{k_c}}{2(1 - \sqrt{q})\sqrt{q} - (1 - q)\sqrt{k_c}} > 0.$$

Note that $\frac{1-2q+\sqrt{q}}{2(1-\sqrt{q})\sqrt{q}-(1-q)\sqrt{k_c}} > 0$ always and $\sqrt{q}(1 - \sqrt{q}) - (1 - q)\sqrt{k_c} < 0$ if and only if $k_c > Y$. We find that $\nabla = 0$ if and only if

$$k_c = \tilde{k}_c \equiv \left(\frac{4q(1 - \sqrt{q})}{(1 - q)(1 - 2q + 3\sqrt{q})} \right)^2.$$

The threshold \tilde{k}_c is well defined since, for every q , we have that $Y < \tilde{k}_c < q$. Since ∇ is an increasing function of k_c , $\frac{\partial \zeta_L}{\partial k_c} > 0$ holds if and only if $k_c \in [\tilde{k}_c, q]$. ■

4. Discussion and Extensions

We discuss now briefly a variety of ways to relax some of our assumptions and argue that our main insights prevail in all these extensions of our basic framework.

4.1. The Timing

The sequential nature of our lobbying game gives rise to the strategic effect of informational lobbying and is thus very important for our argument. We believe that this assumption is both realistic and robust. It is realistic, since most political decisions follow a timetable in which the information transmission (think of hearings) is not directly followed by the decision.¹⁸ It is also robust, because in our model a lobby prefers the

¹⁸ The Center for Responsive Politics reports evidence that in agricultural committees contribution activity increases immediately before important decisions are taken: “Committee members typically

sequence information-contribution to any other. The reason is that it allows the group to adjust the contribution activity to the outcome of the informational lobbying stage.¹⁹

4.2. The Contribution Game and the Deterrence Effect

Our simplifying assumptions at the contribution stage determine the relative size of the deterrence and relative price effect. Their interplay decides about the existence of a complementary relationship between informational lobbying and contributions which is crucial for our main result.²⁰ We argue now that our specific assumptions are not indispensable. In Dahm and Porteiro (2006) we show that the optimal lobbying behavior can be understood by an analogy to the basic theory of choice under uncertainty.

Broadly speaking, informational lobbying followed by contributions (when necessary) is a more risky activity than relying exclusively on contributions but yields the same in expectation. Lobbying behavior depends, thus, on the lobby's attitude toward risk which in turn is determined by the characteristics of the contribution game. If the contribution game induces risk proclivity, both instruments are combined. In our companion paper we specify other micro-foundations that induce a complementary relationship. Without risk proclivity, informational lobbying is not optimal.

score contribution windfalls when major legislation is under debate. For example, the 1996 Farm Bill legislation setting the six-year budget for all of America's agricultural programs proved to be a cash cow for many committee members' campaign war chests." See <http://www.opensecrets.org/cmteprofiles/overview.asp?CmteID=H02&Cmte=HAGR&CongNo=108&Chamber=H>.

¹⁹ Detailed calculations are available upon request (and for the convenience of the referees included in Appendix A.1 which is not intended for publication).

²⁰ In Subsection 4.3 we will show that reform can be harmful even in cases in which the relationship is substitutive.

The role of uncertainty in the present paper is to induce risk proclivity for low costs of pressure by making information provision relatively more profitable. Without uncertainty the following is true. For low contribution costs only contributions will be used. Moreover, the deterrence effect plays an important role in impeding informational lobbying to become profitable as contribution costs increase. For high costs of contributions the group only engages in informational lobbying. However, for intermediate costs the level of informational lobbying rises linearly from zero to the level under high contribution costs. It is followed by contribution activity only when the test fails. Without uncertainty reform has either no effect on the efficiency of the decision (because only one instrument is used) or is beneficial.²¹

Uncertainty realistically means that lobbies do not know exactly how legislators weight all the factors in their decision and can not target their contribution level exactly. Without uncertainty the results are at odds with empirical findings reporting lobbying behavior using both instruments. But we are also forced to give up one assumption: Either there is no need for reform or informational lobbying is not important.

²¹ No uncertainty corresponds to $\alpha \rightarrow \infty$ in Tullock's decision rule. If R is high enough, then only the first parameter space corresponds to the cost range considered in this paper. The proof of the optimal lobbying behavior proceeds along the lines of the "simple game" (Subsection 4.2) in Dahm and Porteiro (2006). Detailed calculations under the assumptions of the present model are available upon request (and for the convenience of the referees included in Appendix A.2 which is not intended for publication). Although there are differences in the model, this is the intuition for Bennedsen and Feldmann's (2006) finding that for low contribution costs no information is provided.

4.3. Aligned Interests

In the model considered so far we have for simplicity assumed that more often than not the aim of the lobby is bad for the politician ($q \geq \frac{1}{2}$). In this sense the interests are opposed. Another relevant situation is when interests are aligned ($q < \frac{1}{2}$).²²

The main difference introduced is that the contribution activity is efficiency enhancing if the test fails. Policy B is now more likely to be the right choice and contributions induce B to be chosen more often. As a result, the presence of a lobby in the political decision process is desirable: although a part of the contribution activity is inefficient, the overall lobbying activity is always efficiency enhancing.²³

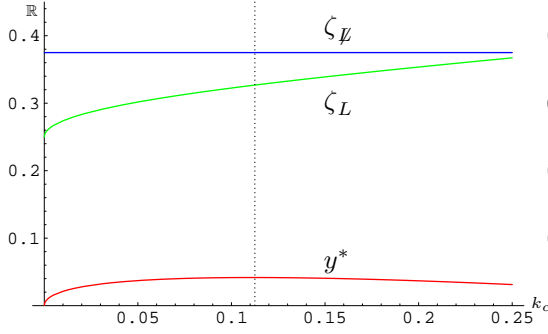
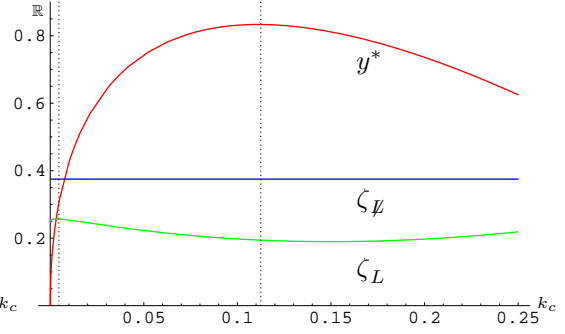
Moreover, we find that campaign finance reform decreases monotonically the efficiency of the decision if informational lobbying is negligible.²⁴ This is illustrated by the following examples.

Example 4.1. *Figure 4.1 shows a case of high informational lobbying costs. In this case ζ_L is monotonic in contribution costs. The level of informational lobbying is low*

²² A low degree of conflict may capture the sugar lobby in the United States, because the economic importance of this industry and the large representation of sweetener-producing states in the Congress. See Alvarez (2005) for an account.

²³ In this case our analysis of the optimal lobbying mix and the relationship between the instruments still holds. In equation (3.6) the first term is negative because the contributions are efficiency enhancing if the test fails. The second term is also negative, since often the test reveals state b and policy B is correctly chosen. Although sometimes state a is revealed and the lobby's contribution activity is inefficient, this event is relatively unlikely and overwhelmed by the efficient choice when b is the result of the test.

²⁴ The effect of reform is still characterized by equation (3.8) and what we have said about the EI is still true. The DE , however, is now ambiguous and efficiency enhancing if the amount of informational lobbying is relatively high.

Figure 4.1: $q = 0.25$ and $k_i = 1$ Figure 4.2: $q = 0.25$ and $k_i = 0.05$

and the *EI* never dominates the *DIS*. In Figure 4.2 information costs are cheaper and informational lobbying is much more important. This drives a wedge between the two intervals present in Figure 4.1.²⁵ For $k_c \in [0.003, 0.11]$, the *EI* is stronger than the *DIS* and efficiency is increased because both instruments are substitutes: increasing contribution costs encourages informational lobbying and better decisions are made. The example also demonstrates that the optimal campaign policy with aligned interests can be very different from the *laissez-faire*-policy ($k_c = 0$).

Therefore, when the interests of the lobby and the politician are aligned, then reform is much likelier to decrease efficiency. In addition to deterring informational lobbying it may deter desirable contributions.²⁶

²⁵ As before there exist lobbying costs such that the effect of campaign finance reform on the efficiency of the political decision is non-monotonic. To see this choose $k_c = \frac{4}{9}Y$ and $k_i = \frac{4q(1-\sqrt{q})^2}{9(1-q)^2}$. The relationship between lobbying instruments is substitutive and $y^* = 1 - q < 1$. A sufficient condition for a non-monotonicity is that the *DE* is negative, which is true.

²⁶ The case of aligned interest shows also that a substitutive relationship between lobbying instru-

4.4. Competitive Lobbying

Although there are many political decisions in which the advocates of one side of an issue are not organized and can therefore not coordinate on an effective lobbying strategy, situations in which competitive lobbying takes place are clearly relevant.²⁷ However, we believe that the one-lobby-case is the conservative assumption to make because it provides a stronger case for reform. If there are opposing interest groups with comparable abilities to sway away political decisions, it is more difficult for groups to succeed using contributions and the need for reform is lower.²⁸

4.5. Caps on political lobbying

Although regulations usually intend to establish caps on contributions, the public discussion of ‘loopholes’ shows that groups find ways to circumvent these restrictions. As the Supreme Court of the United States wrote in its decision to uphold the Bipartisan Campaign Reform Act, “[m]oney, like water, will always find an outlet”. To the extent that channelling money through these ‘loopholes’ is more costly, reform increases the marginal costs of contributions. However, we show now that our analysis can easily be

ments and efficiency decreasing reform can go hand in hand. Therefore, all four combinations of a complementary or substitutive relationship, on one side, and efficiency enhancing or decreasing reform, on the other, are logically possible.

²⁷ But note that e.g. Schlozman and Tierney (1986, p. 213) report a number of works finding that in a majority of cases and studies only lobbies on one side of an issue were active.

²⁸ For wide class of non-deterministic decision rules of the politician in the contribution game and general probabilities to obtain a favorable decision before contributions are made, Corchón (2000) shows that if two opposing interests have the same valuation, contributions have no effect on resource allocation. A similar result is true in the deterministic lobbying game of Baye et al. (1993) and Che and Gale (1998) if no policy has an informational advantage.

extended to apply to the case of caps on political lobbying.

Suppose there is a cap m on contributions. We consider $m < c(q, k_c)^*$ because then a cap has the maximal effect. It is easy to see that the optimal level of contributions is $\tilde{c} = m$. At the informational lobbying stage the objective function is

$$\begin{aligned} E\Pi(q, k_c, k_i, m, y) &= yq\left(\frac{m}{1+m} - k_cm\right) + y(1-q) \\ &\quad + (1-y)\left(\frac{1-q+m}{1+m} - k_cm\right) - k_iy^2. \end{aligned}$$

When the cap is restrictive, the maximizer is an interior solution and given by

$$y^*(m) = \frac{m(1-q)k_c}{2k_i} > 0.$$

A stricter cap *always reduces* informational lobbying. The quality of the decision is given by

$$\zeta_L = y^*q\frac{m}{1+m} + (1-y^*)\left[\frac{1-q+m}{1+m}q + \frac{q}{1+m}(1-q)\right].$$

We find that

$$\frac{\partial \zeta_L}{\partial m} < 0 \Leftrightarrow k_c > \frac{2q-1}{(1-q)^2}k_i.$$

We see that the effect of reform and the level of informational lobbying are both determined by k_i . Going back to Example 3.3, where $q = 0.65$, we have the same picture as before. For $k_i = 0.5$ reform is always efficiency enhancing. But if informational lobbying is important ($k_i = 0.05$), then reform can be harmful. Note that the interval for k_c in

which efficiency decreases is now even larger than in Example 3.3 ($k_c > 0.12$).

4.6. Manipulation of Information

A straightforward extension of our lobbying game allows for the manipulation of information. For example, apart from using experts (– henceforth buy a public test –) groups also do research by themselves. Suppose, therefore, that the lobby can invest in a private test $x \in [0, 1]$. The only difference being that the lobby may hold back information but cannot lie and convince the politician. Thus, if the state is a , the lobby does not need to reveal this information.²⁹ This increases the strategic scope of the lobby but limits the credibility of the message that the test failed. Formally, when the lobby says that the test failed, the politician updates her belief using Bayes' rule to $q(x) = \frac{q}{1-x(1-q)} > q$.

In Example 4.2 we use the setting of Figure 3.2 to show that our main conclusions are robust, because the relationship between informational lobbying and contributions may be non-monotonic and campaign finance reform may decrease efficiency.³⁰

However, in our model whenever the lobby can commit not to hold back information he will do so. The lobby always strictly prefers to commission external experts (public

²⁹ This is the case of concealment of information in Dewatripont and Tirole (1999). Bennedsen and Feldmann (2002) introduce a private test in the lobbying literature. Bennedsen and Feldmann (2006) relax the assumption that investment in information is observable and find that the negative strategic effect of informational lobbying is still present in equilibrium.

³⁰ Again, the interval for k_c in which reform is harmful is even larger than in Figure 3.2. The detailed calculations of the example are available upon request (and for the convenience of the referees included in Appendix A.3 not intended for publication).

Example 4.2. In Figure 4.3 informational lobbying is important. There is first a substitutive and then a complementary relationship. For high contribution costs, the EI is stronger than the DIS and efficiency is decreased.

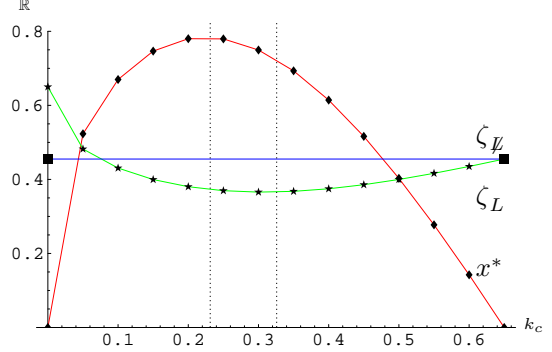


Figure 4.3: $q = 0.65$ and $k_i = 0.05$

test) to conduct the research by himself (private test). This follows from Proposition 3.1 in Dahm and Porteiro (2006), because equation (3.3) is convex in q .

The intuition builds again on the basic theory of choice under uncertainty. The key difference between both tests is that the external expert is more risky but yields the same in expectation. There is a link between the incentives for information provision and the desire to do so credibly because both depend in the same way on the lobby's attitude toward risk.

5. Concluding Remarks

This paper has shown that campaign finance reform may have negative side-effects on the efficiency of political decisions when the optimal lobbying strategy of interest

groups involves both strategic information transmission and campaign contributions. As in simple demand theory a change in the ‘price’ of one instrument affects not only the intensity of this instrument but also the overall lobbying mix. In our context this insight translates into the conclusion that the relationship between both lobbying instruments, on one hand, and between campaign finance reform and the efficiency of the political decision, on the other hand, may be non-trivial and non-monotonic.

We have stressed that to build a strong case for reform we use the assumption that campaign contributions influence political decisions. Think of the alternative hypothesis that contributions buy access to legislators whose time is scarce (see e.g. Wright (1996)). In this case informational lobbying and contributions are complements and campaign finance reform may affect informational lobbying by selectively restricting information providers.³¹

The descriptive literature on lobbying suggests that interest groups advance their aims through a wide range of activities.³² To conclude, we suggest a reinterpretation of our model as a model in which lobbies may use informational lobbying or issue ads. Legislative issue advertisements promote policy positions, political ideas or opinions about policy alternatives. The sponsors of issue ads may include advocacy organiza-

³¹ We are grateful to Michael Wallerstein for drawing our attention to this complementary relationship. Interestingly, in a model in which multiple lobbies make contributions to gain access, Austen-Smith (1998) derives some qualified support for limiting contributions.

³² For example lobbies undertake grassroots lobbying campaigns and engage in voter mobilization. Groups inform voters through issue adds and endorsement of candidates. For a more detailed review of lobbying activities and references to the descriptive literature see Wright (1996). See also Yu (2005).

tions, corporations, labor unions, trade associations, business groups, individuals and political parties. In the United States the Bipartisan Campaign Reform Act (BCRA) affects the strategic choice of lobbies because it classifies how ads have to be paid for and therefore which adds are subject to which limits on contributions and disclosure requirements. Following Snyder (1989) we may capture advertising spending by c .³³ Then the analysis of this paper suggests that different regulatory frameworks will have different side-effects on informational lobbying and on the quality of political decisions. Therefore, our analysis suggests that further research on the strategic interaction of lobbying instruments and the effect of regulation should be fruitful.

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³³ Our model fits the finding that issue ad spending is usually very uneven so that one side of an issue dominates the public policy debate, reported by The Annenberg Public Policy Center (2005).

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A. Appendix: Not Intended For Publication

This Appendix is for the convenience of the referees only.

A.1. The Timing

In this section we prove that the lobby prefers the sequence information-contribution to contribution-information and a simultaneous game. Note first that the latter two sequences are equivalent because when choosing contributions the lobby does not know what value of q the politician will use. In such a case, given a lobbying mix (\tilde{c}, \tilde{y}) , the pay-off function of the lobby is

$$E\Pi(q, k_c, k_i, \tilde{c}, \tilde{y}) = \tilde{y}q \frac{\tilde{c}}{1 + \tilde{c}} + \tilde{y}(1 - q) + (1 - \tilde{y}) \left(1 - \frac{q}{1 + \tilde{c}} \right) - k_c \tilde{c} - k_i \tilde{y}^2.$$

But this is dominated by setting $y = 0$, since $\forall \tilde{y}$

$$\frac{\partial E\Pi(q, k_c, k_i, \tilde{c}, \tilde{y})}{\partial \tilde{y}} = -2k_i \tilde{y} < 0.$$

Moreover, we already know that any $(\tilde{c}, \tilde{y} = 0)$ is inferior to the sequence information-contribution.

A.2. The Contribution Game and the Deterrence Effect

In this section we prove the claims made in Subsection 4.2. A similar result and intuitions can be found in Dahm and Porteiro (2006).

Assume that R is common knowledge. For any q and R , the politician chooses

$D = B$ iff $c \geq \tilde{c}(q, R) \equiv \frac{q}{R} - 1$. Assume in the sequel $q > R$ (because otherwise there is no need for lobbying). We have that for any q , $c^* \in \{0, \tilde{c}(q, R)\}$ and $c^* = \tilde{c}(q, R)$ iff $k_c \leq \frac{R}{q-R}$. Moreover, $E\Pi_L^C(q, R, \tilde{c}) = 1 - k_c \frac{q-R}{R}$. We prove the following:

Proposition A.1. (i) For $k_c \leq \frac{R}{1-R}$: there is exclusive use of political pressure, that is, $y^* = 0$ and $c^* = \tilde{c}(q, R)$.

(ii) For $\frac{R}{1-R} < k_c < \frac{R}{q-R}$: there is combined use of “some” political pressure with “some” informational lobbying, that is,

$$y^* = \begin{cases} \frac{1}{2} \frac{1}{k_i} [\tilde{c}k_c - q] & \text{if } \tilde{c}k_c - q \leq 2k_i \\ 1 & \text{otherwise.} \end{cases}, \text{ and } c^* = \begin{cases} 0 & \text{if } M \in \{a, b\} \\ \tilde{c}(q, R) & \text{otherwise.} \end{cases}$$

(iii) For $\frac{R}{q-R} \leq k_c$: there is exclusive use of informational lobbying, that is, $y^* = \min \left\{ \frac{1-q}{2k_i}, 1 \right\}$ and $c^* = 0$.

Proof. Consider the expected profits of combining contributions and information

$$E\Pi_L^{IC}(y) = qy \max \left\{ 0, 1 - k_c \left(\frac{1}{R} - 1 \right) \right\} + y(1 - q) + (1 - y) \max \left\{ 0, 1 - k_c \left(\frac{q}{R} - 1 \right) \right\} - k_i y^2.$$

Note the special cases (1) for $y = 0$ (only contributions), $E\Pi_L^{IC}(y) = E\Pi_L^C$ and (2) for $c = 0$ (only info), $E\Pi_L^{IC}(y) = E\Pi_L^I$. We have that

$$\frac{\partial E\Pi_L^{IC}(y)}{\partial y} = q \max \left\{ 0, 1 - k_c \left(\frac{1}{R} - 1 \right) \right\} + (1 - q) - \max \left\{ 0, 1 - k_c \left(\frac{q}{R} - 1 \right) \right\} - 2k_i y \equiv 0$$

characterizes a maximizer of expected utility. Suppose case (i) (both pressure games

are affordable). From the first order condition $y^* = \frac{k_c}{2k_i}(q-1) < 0$. Suppose now case (iii) (no pressure game is affordable). In this case as remarked above $E\Pi_L^{IC}(y) = E\Pi_L^I$. Assume case (ii) (only the cheaper pressure game is affordable). $y^* = \frac{1}{2k_i}[\tilde{c}k_c - q] \geq 0$ iff $k_c \geq \frac{q}{\tilde{c}}$ which lies in the interior of the interval defined by case (ii).

It remains to check that a mix of contributions and info is preferred to both exclusive contributions and to exclusive info. The latter must be true since otherwise $y^* = 0$ were optimal. Comparing the former we obtain $E\Pi_L^{IC}(y) \geq E\Pi_L^I(y), \forall y$ and $\forall k_c$, with a strict inequality in case (i) and (ii). The strict inequality comes from

$$E\Pi_L^{IC}(y) - E\Pi_L^I(y) > 0 \Leftrightarrow qyA + (1-y)B > 0$$

$$\text{where } A = \max\left\{0, 1 - k_c\left(\frac{1}{R} - 1\right)\right\} \text{ and } B = \max\left\{0, 1 - k_c\left(\frac{q}{R} - 1\right)\right\}.$$

We have that $A > 0 \implies B > 0$ and therefore $E\Pi_L^{IC}(y) - E\Pi_L^I(y) > 0$ for case (i).

For case (ii) $A = 0$ and $B > 0$ again implying the desired inequality. \blacksquare

A.3. Manipulation of Information

We derive now Example 4.2. When deciding on the amount of information to buy, the lobby faces the following objective function:

$$\begin{aligned} E\Pi(q, k_c, k_i, c^*, x) &= x(1-q)E\Pi(0, k_c, c^*) \\ &+ (1-x(1-q))E\Pi(q(x), k_c, c^*) - k_i x^2 = \\ &x(1-q) + (1-x(1-q))(1-2\sqrt{q(x)k_c} + k_c) - k_i x^2. \end{aligned}$$

We compute the f.o.c, and find that:

$$\frac{\partial E\Pi(q, k_c, k_i, c^*, x)}{\partial x} = (1 - q) \left(\sqrt{q(x) k_c} - k_c \right) - 2k_i x$$

First, it is easy to show that:

$$\frac{\partial E\Pi(q, k_c, k_i, c^*, x)}{\partial x} \Big|_{x=0} = (1 - q) \left(\sqrt{q k_c} - k_c \right) > 0 \iff q > k_c,$$

and this holds by assumption.

Hence, if the objective function is concave, then $x^* = \min \{x^{**}, 1\}$, with x^{**} s.t.

$$(1 - q) \left(\sqrt{q(x^{**}) k_c} - k_c \right) = 2k_i x^{**}. \quad (\text{A.1})$$

In order to check the concavity, we compute the s.o.c.

$$\frac{\partial^2 E\Pi(q, k_c, k_i, c^*, x)}{\partial x \partial x} = \frac{(1 - q)^2 \sqrt{q k_c}}{2} (1 - x(1 - q))^{-\frac{3}{2}} - 2k_i. \quad (\text{A.2})$$

If we have that, for $x = 1$ $\frac{\partial^2 E\Pi(q, k_c, k_i, c^*, x)}{\partial x \partial x} < 0$, then the function is globally concave.

$$\frac{\partial^2 E\Pi(q, k_c, k_i, c^*, x)}{\partial x \partial x} \Big|_{x=1} < 0 \iff k_i > \frac{(1 - q)^2 \sqrt{k_c}}{4q}.$$

Take this as an assumption.

Hence, assuming interior solution (i.e., $x^* < 1$), we can compute $\frac{\partial x^*}{\partial k_c}$ by totally

differentiating the f.o.c. This yields:

$$\begin{aligned} \frac{\partial x^*}{\partial k_c} &= -(1-q) \frac{\sqrt{q(x^*)} \frac{1}{2\sqrt{k_c}} - 1}{\text{s.o.c}} > 0 \iff \\ k_c &< \frac{q(x^*)}{4}. \end{aligned}$$

This means that, in principle we can have complementarity and substitutability, however, we have to be careful here, because x^* appears in the inequality and it is a function of k_c .

Now, we define the probability that the politician takes an incorrect decision:

$$\zeta_L = (1 - x^*(1 - q)) \left[\left(1 - \sqrt{q(x^*)k_c}\right)q + \sqrt{q(x^*)k_c}(1 - q) \right]. \quad (\text{A.3})$$

We have computed the example using equations (A.1) and (A.3) and checked that the s.o.c. (A.2) is negative.