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Campaign Advertising and Voter Welfare

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This paper investigates the role of campaign advertising and the opportunity of legal restrictions on it. An electoral race is modelled as a signalling game with three classes of players: many voters, two candidates, and one interest group. The group has non-verifiable insider information on the candidates' quality and, on the basis of this information, offers a contribution to each candidate in exchange for a favourable policy position. Candidates spend the contributions they receive on non-directly informative advertising. This paper shows that: (1) a separating equilibrium exists in which the group contributes to a candidate only if the insider information about that candidate is positive; (2) although voters are fully rational, a ban on campaign advertising can be welfare-improving; and (3) split contributions may arise in equilibrium (and, if they arise too often, they are detrimental to voters).

1. INTRODUCTION

In electoral competitions throughout the world money is playing an increasingly important role.[1] In the last U.S. Senate election the average candidate made campaign expenditures of $4·5 million. Most developed countries have passed legislation to restrict campaign spending, campaign giving, or both. However, the existing regulation is generally deemed insufficient. This is true especially in the U.S., where the public opinion has been clamouring for years for stricter controls on campaign money.

To evaluate the opportunity of various forms of regulation, we need a model of voting with campaign advertising. Although there exists a sizeable literature on campaign contributions and interest group politics (see Morton and Cameron (1992) for a survey), in none of the existing models is advertising microfounded. Typically, it is assumed that electors—or a fraction of electors—cast their vote according to an "advertising influence function", which is a mapping from campaign expenditures into vote shares. The influence function is exogenously given, not derived from assumptions on the primitives of the models. However, we cannot make welfare comparisons if we do not know how advertising affects the utility of voters. Thus, the goal of this paper is twofold. First, we develop a microfounded model of campaign advertising. Second, we use the model we have developed to evaluate alternative regulatory regimes.[2]

In order to be plausible, a microfounded model must be consistent with two stylized facts observed in campaign advertising. First, *advertising is paid for by groups whose objectives differ from the median voter's objectives*. Campaign contributions come from groups of voters whose preferences are often at odds with the preferences of the majority of voters.[3] For instance, in the U.S., agricultural interest groups are habitual donors. Their preferred policies—agricultural subsidies and other forms of protection to farmers—cause well documented welfare losses.

1. For a recent cross-country survey of campaign spending and campaign regulation, see *The Economist* (1997).
2. Indeed, the need for a microfounded model of campaign spending is perceived in the field. See Morton and Cameron (1992, p. 85), Baron (1994, p. 45) and Laffont and Tirole (1993, p. 634).
3. A survey of campaign giving patterns can be found in Schlozman and Tierney (1986, Chapter 10).

Lopez and Pagoulatos (1996) conduct a study on trade barriers in the U.S. food and tobacco industry. They find that welfare losses can be up to 12·50% of domestic consumption and are positively associated with campaign contributions from agricultural interest groups. Second, *advertising does not appear to convey hard information.* Casual observation suggests that campaign advertising contains little direct information. Political ads are not credible. In the U.S., the First Amendment protects campaign advertising as free speech. Voters have no legal recourse against a candidate who broadcasts ads with misleading statements or misrepresentation of reality (such a strong protection does not apply to commercial advertising).[4]

To construct a model of campaign spending, we need a theory of advertising. The industrial organization literature has developed three: (1) advertising enters the utility function of voters (Dixit and Norman (1978), Becker and Murphy (1993)); (2) advertising provides information in a direct way (see Tirole (1988, Chapter 2) for a survey); and (3) advertising provides information in an indirect way (*e.g.* Milgrom and Roberts (1986)). In this paper, we use the third theory. Viewers are influenced by advertising not because of the message it transmits but because of the amount of money that has been spent on it. The advertiser has some information which would be of use to viewers, but she cannot communicate it in a credible way. However, if the advertiser spends enough money on costly signalling, viewers are able to infer the information in an indirect way.[5]

The model can be sketched as follows. There are three classes of players: many voters, one interest group, and two candidates. Voters judge candidates on two dimensions: policy and *valence* (non-policy personal qualities like ability, leadership, and integrity). All voters agree on the valence dimension, but have heterogeneous preferences about policy. The interest group caters to the policy dimension of a subset of voters, but is not directly interested in the valence of candidates. The ideal policy of the median group member differs from the ideal policy of the median voter. Candidates maximize their chance of being elected.

The valence of a candidate is unknown, but there are imperfect signals about it. Some of these signals are public (candidates' records, TV debates, etc.) and some are observed by the interest group but not by voters (rumours, first-hand experience, etc.). The insider signals are non-verifiable. After observing the insider signals, the group makes each candidate an offer that consists of a monetary contribution to be spent on non-directly informative advertising and a policy to be implemented if the candidate is elected. Candidates accept or reject the group's offer. Each voter then observes the public signals, the policy choice, and the amount spent on advertising by each of the two candidates and casts a vote for one of the two candidates.

The main results of the model are:

(1) *There exists a separating equilibrium in which the interest group contributes to a candidate if and only if the insider signal about that candidate is positive.* In exchange for a contribution, the group obtains from the candidate a policy position that is favourable to the group and detrimental to the median voter. The crucial point is that the group sees its contribution as an investment with stochastic return: it gets the favourable policy only if the candidate is elected. The more likely the candidate is to win, the more money the group

4. An open question is how effective campaign spending is in practice. A field experiment by Ansolabehere and Iyengar (1996) suggests that a person who views an ad in favour of a candidate is significantly more likely to vote for that candidate. However, empirical work linking campaign spending of a candidate with his vote share yields mixed results. Levitt (1993) finds no significant effect on candidates to the U.S. House of Representatives, while Gerber (1998) finds a positive effect for the Senate.

5. The first type of model is not suitable for welfare comparisons unless one can make specific assumptions on how exactly advertising modifies the consumers' utility function (this point is made in Fisher and McGowan (1979)). The second type of model is certainly viable. Indeed Austen-Smith (1987) has developed a model in which voters are influenced by advertising because it provides direct information about candidates' positions. However, as we have argued above, direct information transmission does not seem to be the main component of advertising.

is willing to give. The group uses the insider signal as a predictor of the public signal, and hence of the probability of victory. A group is willing to make a higher contribution if the insider signal is positive. This guarantees that the insider signal is credibly revealed to voters through the amount of campaign advertising.

(2) *Under certain conditions, a ban on campaign advertising strictly increases the expected utility of the median voter*. Campaign contributions bring an informational benefit (more information about valence) and a policy cost (a deviation from the median voter's preferred policy). When the insider signal is informative, the interest group has an implicit threat against a "good" candidate (one with a high insider signal). If the good candidate rejects the policy offer, voters will not know about the positive insider signal. The good candidate is willing to accept any policy offer that increases his probability of being elected, which can be seen as his participation constraint. If the interest group has extreme preferences, it will make sure that the participation constraint is binding. But a binding participation constraint means that informational benefit is zero because the probability of election of a good candidate who is known to be a good candidate is the same as the probability of election of a good candidate who is not known to be good. However, the policy cost is still present, and the median voter is strictly better off if campaign contributions are forbidden. It is important to stress that the negative welfare effect is not due to the possibility that advertising is a waste of real resources. The wasteful aspect of electoral ads is not taken into account in our definition of welfare (this would be one extra reason for a ban). The negative effect is due only to the policy bias that campaign finance brings about.

(3) *Split contributions* (*the group contributing to both candidates in the same race*) *may arise in equilibrium, and if they arise often enough they are detrimental to the median voter*. There are two kinds of separating equilibria. In the kind discussed in point 1, the group contributes to a candidate only if the insider signal about that candidate is *strictly* better than the signal about the other candidate, and hence the group never contributes to both candidates in the same race. In the other kind of separating equilibrium, if the group has no insider information about the candidates, it offers money to both candidates and both candidates accept. If one candidate rejects the offer, he will be perceived as bad and the other candidate will be perceived as good. This situation is particularly negative for voters: they receive useless information and they have to choose between two candidates who cater to the interest group. Indeed, if the probability that the group has no insider information is high enough, then the voters' *ex ante* welfare would certainly be higher in the separating equilibrium with no split contributions discussed in point 1. As the group makes a split contribution if and only if it has no insider information, we reach the following conclusion: if the probability that split contributions occur in equilibrium is high, then a prohibition on split giving is likely to be welfare improving.

The problem is formulated in a general way. In particular, the probability distributions of signals are left in a generic form. Results are shown to be robust to modifications in the assumption that voters observe policy choices perfectly.

This paper is inspired by two strands of literature that are somewhat distant from each other: the political economy literature on campaign contributions and the industrial organization literature on advertising with rational consumers. In common with the first strand (see, among others, Baron (1989, 1994), Morton and Cameron (1992), Grossman and Helpman (1996)), we model an electoral race as a game with three classes of players: voters, candidates, and interest groups. We adopt most of the definitions and the assumptions that are standard in the literature on campaign contributions, with three important differences: (1) all voters are rational; (2) candidates are judged on valence as well as policy; and (3) some non-verifiable signals about valence are only available to insiders.[6] The second strand includes Milgrom and Roberts (1986), Kihlstrom and Riordan (1984), Hertzendorf (1993) and Bagwell and Ramey (1994), and others. In common with them, we assume that what matters in advertising is the amount spent rather than the content. However, while a firm can finance its advertising directly, a politician needs to first obtain money from other sources. The lobby thus plays indirectly the role of third-party certification.

Two other papers study models in which campaign advertising is non-directly informative. In Potters, Sloof and van Winden (1997), a candidate of high type benefits more from being elected (or finds advertising less expensive) than a low type. On the contrary, we take the agnostic viewpoint that candidates of different types benefit equally from election and face the same cost of advertising. Gerber (1996) argues that campaign advertising conveys information because it reveals the insider signals of groups. Thus, the rationale is similar to our model. However, in the separating equilibrium described by Gerber, both a group with a good candidate and a group with a bad candidate are indifferent between contributing or not contributing, and a separating equilibrium exists only when exogenous reasons guarantee that groups with good candidates contribute and groups with bad candidates do not (we discuss this problem in Section 3 after Proposition 1).[7]

Two recent papers do not tackle campaign advertising but are closely related to the present work. Grossman and Helpman (1999) study political endorsements with rational voters.[8] Lohmann (1997) analyses a model of retrospective voting in which a minority of voters is (endogenously) better informed than the majority. Both papers as well as the present one show that in equilibrium candidates choose policy positions that are biased away from the median voter. This policy bias occurs despite the fact that voters can, at least partially, observe policy positions. The reason is that a minority of voters enjoy an informational advantage and use it to extract rent from candidates in the form of favourable policies.

The plan of the paper is as follows. Section 2 introduces the model. Section 3 shows the existence of a separating equilibrium and discusses its properties. Section 4 studies the welfare effects of a ban on advertising. Section 5 shows the existence of a separating equilibrium with split contributions and its welfare implications. Section 6 looks at what happens when voters do not observe policy choices. Section 7 concludes.

2. MODEL

An even number of voters indexed with $i \in I$ must elect one of two candidates, indexed with $j \in \{1, 2\}$. The possibility of abstention is disregarded.[9]

Each candidate is represented along two dimensions: his policy position and his valence. The policy dimension can be interpreted either as ideological view (position on the left–right line) or as policy stance (*e.g.* position on the issue of subsidies to milk producers), and is chosen by the candidate. The valence dimension captures a set of innate characteristics of the candidate that are unambiguously good for voters.

Voter i is described by his preferred policy $p_i \in \Re$, which is weakly increasing in i, with m being the policy preferred by the median voter. Let $e \in \{1, 2\}$ denote the candidate who wins the election, $p_j \in \Re$ the policy chosen by candidate j, and $\theta \in \Re$ the valence differential between

6. The use of a non-policy dimension is not new in the literature on elections with incomplete information. See for instance Cukierman (1991).

7. There are two additional differences between the present model on one side and Potters *et al.* (1997) and Gerber (1996) on the other. First, the present model is embedded in the usual spatial competition model, while the other two rely on *ad hoc* assumptions. Second, the present model reaches general conclusions about voter welfare.

8. In the present work, cheap-talk endorsements are never credible. This is because the insider signal is on valence and the group derives no direct utility from valence.

9. No assumption is needed on the distribution of voters. In particular, they could be identical.

the two candidates. The utility of Voter i is

$$u_i(e,\theta,p_1,p_2)=\begin{cases}\theta-u(p_i-p_1) & \text{if } e=1\\ -u(p_i-p_2) & \text{if } e=2\end{cases}$$

where $u(\cdot)$ is continuous, symmetric, and strictly increasing in $|p_i-p_e|$.[10]

Voters observe policy positions p_1 and p_2 perfectly. However, they cannot observe θ directly. The prior distribution on valence is common to all the players and is represented by the probability density function $\phi(\theta)$. Two signals about the valence differential are received sequentially. First, the interest group (and the two candidates) observes a signal y which can be thought of as impressions, word-of-mouth, unproven allegations, etc. For tractability, we assume that $y\in\{-1,0,1\}$, where -1 is a signal in favour of candidate 2 or against candidate 1, 1 is a signal in favour of candidate 1 or against 2, and 0 denotes the lack of signal or two offsetting signals. The insider signal is non-verifiable. Later in the electoral race, all players observe a public signal z with full support on $\Re$ that derives from the candidate's performance during the campaign (*e.g.* pre-electoral TV debates). More complex signal sequences could be accommodated. For instance, there could be a public signal x that precedes y, and captures the incumbent advantage. The results of this paper depend uniquely on the assumption that the last public signal is received after the first insider signal.[11]

The probability that y is realized given θ is $h(y|\theta)$. The density function and cumulative distribution of z given θ are, respectively, $f(z|\theta)$, and $F(z|\theta)$. Both signals have full support. We make:

Assumption 1. *The signals y and z are mutually independent given θ and satisfy the monotone likelihood ratio property (MLRP) with respect to θ.*[12]

The assumption implies that an increase in either signal translates into an increase in the expected value of the valence differential. Let $\hat{\theta}(y,z)=E(\theta|y,z)$. Applying Milgrom (1981, Proposition 2), if y and z satisfy MLRP, then $\hat{\theta}(y,z)$ is strictly increasing in y and z.

For analytical tractability, we assume symmetry around zero, so that the two candidates are *ex ante* identical:

Assumption 2.

(*i*) *For every θ, $\phi(\theta)=\phi(-\theta)$.*
(*ii*) *For every θ and y, $h(y|\theta)=h(-y|-\theta)$.*

10. The fact that θ is attributed to candidate 1 rather than to candidate 2 is without consequence. All the results of the paper would hold as stated if we assumed that

$$u_i(e,\theta,p_1,p_2)=\begin{cases}-u(p_i-p_1) & \text{if } e=1\\ -\theta-u(p_i-p_2) & \text{if } e=2\end{cases}$$

or

$$u_i(e,\theta,p_1,p_2)=\begin{cases}\frac{1}{2}\theta-u(p_i-p_1) & \text{if } e=1\\ -\frac{1}{2}\theta-u(p_i-p_2) & \text{if } e=2.\end{cases}$$

The crucial simplification is that u_i is separable in valence and policy.

11. The assumption that candidates as well observe y is made to simplify exposition. It avoids assigning beliefs to candidates. The equilibria discussed in the paper would correspond to equilibria of the game in which candidates do not observe y.

12. The signal y satisfies MLRP with respect to θ if, for every $y'>y$ and $\theta'>\theta$,

$$\frac{h(y'|\theta')}{h(y'|\theta)}>\frac{h(y|\theta')}{h(y|\theta)}.$$

An analogous definition applies to z and θ.

(iii) *For every* θ *and* z, $f(z|\theta) = f(-z|-\theta)$.

The assumption that the interest group uses non-verifiable insider information that is not available to voters seems realistic. Schlozman and Tierney (1986, Chapter 10) describe how Washington lobbies decide whether and how much they should contribute to a candidate. Before deciding, a typical interest group would collect all kinds of intelligence—formally and informally—about the prospective beneficiary. If the group is considering a large contribution, the candidate will usually meet face to face with a group representative. Moreover, lobbyists have frequent opportunities to exchange non-verifiable information (political gossip) with government officials, journalists, and other insiders.[13]

The only goal of a candidate is to win the election. He derives no direct utility from policy or valence. While his valence is given, candidate j chooses his policy position p_j. Policy choices are publicly observable (Section 6 examines the case in which they are not).

An interest group leader acts as the representative of a subset of the voters regarding the policy dimension. The subset has mass μ and median member $g > m$. The group leader, G, maximizes the policy component of the utility of the median group member. The interest group is therefore not directly interested in the valence of candidates.[14] G can make contributions to candidates 1 and 2, denoted respectively with A_1 and A_2. The group's payoff is assumed to be separable in contributions and policy. The payoff to G if e is elected is $-\mu u(g - p_e) - A_1 - A_2$.

The interest group announces to the two candidates a desired policy p^*, and, for $j = 1, 2$, G offers a campaign contribution A_j^*. A candidate does not know what amount has been offered to the other candidate. The dealings between the group and the candidates are not public: voters do not observe p^*, A_1^*, or A_2^*. If candidate j chooses policy p^*, he receives a campaign contribution $A_j = A_j^*$. If he chooses a policy different from p^*, he receives $A_j = 0$. Contributions can only be used for non-directly informative campaign advertising.[15,16]

To summarize, the electoral game is defined by $\langle \{p_i\}_{i \in I}, g, \mu, f, h, u, \phi \rangle$ and the timing is:

Game 1. *The game consists of five stages:*

(1) *Nature chooses* θ.

13. For instance, the director of the National Education Association describes the information gathering process that precedes campaign giving as follows: "Local committees interview each candidate. For every candidate who had an interview, we provide all the information we can assemble: voting records, records of our meeting with them, and any other intelligence we can muster. The committees make recommendation to their state boards; the state board either confirms the recommendation or sends it back. The recommendations then come to the national NEA-PAC. It's a *very* structured process" (Schlozman and Tierney, 1986, p. 227). It is, however, not entirely clear how much of this information collected is about valence, and not about policy or other variables. In this paper, we focus the attention on valence.

More in general, see Grossman and Helpman (2001) for an extensive economic survey on special interest politics.

14. If the group represents a subset of voters, one may think it should care about both policy and valence. However, there are two reasons to believe that the group should be more concerned about policy. The first is that there can exist an agency problem between the group members and the group leader. Suppose that, while outcomes on the policy dimension can be contracted upon, outcomes on the valence dimension are hard to measure and to verify. Then, the group leader only has an incentive to perform on the policy line. The second reason has to do with the free-riding problem. If voters have identical preferences over valence but disagree over policy, one can expect that subsets of policy-homogeneous voters will have more incentives to pool resources to influence policy rather than to enhance valence. See also the Conclusion for a discussion of how results would be modified if the interest group also cared about valence.

15. This model assumes that a candidate can credibly commit to implement p^* if elected. It is mostly an open question—outside the scope of this paper—why the candidate should live up to its pre-electoral promises to interest groups (see however Austen-Smith (1995) for self-enforcing agreements in which the candidate credibly promises his group "access" to the policy-making process in exchange for a contribution).

16. Another implicit assumption is that the policy asked by G is the same for the two candidates. More in general G could ask for p_1^* and p_2^*. This assumption is made for analytical convenience but does not appear to affect results significantly.

(2) *G observes* y *and selects* p^*, A_1^*, *and* A_2^*.
(3) *Candidate* $j \in \{1, 2\}$ *observes* y *and* (p^*, A_j^*) *and selects* p_j. *If* $p_j = p^*$, *then* $A_j = A_j^*$. *Else,* $A_j = 0$.
(4) *Voters observe* p_1, p_2, A_1, A_2, *and* z. *For* $i \in I$, *Voter* i *votes for either* 1 *or* 2. *Let* e *denote the candidate that receives more votes and let* $-e$ *denote the other candidate.*
(5) θ *is revealed. Voter* i *receives* $u_i(e, \theta, p_1, p_2)$. e *receives* 1 *and* $-e$ *receives* 0. G *receives* $-\mu u(g - p_e) - A_1 - A_2$.

3. EQUILIBRIUM

This section constructs a separating equilibrium of Game 1 in which the interest group gives money only to good candidates and advertising reveals valence to voters. The equilibrium concept we use is perfect Bayesian. Voters form a belief on the insider signal y based on what they know at the moment of the vote. We impose the restriction that all voters have the same belief—a natural assumption given that they have the same information. In general, the belief is represented as a probability distribution on $\{-1, 0, 1\}$ given p_1, p_2, A_1, A_2, and z. However, we shall show that there exists a perfect Bayesian equilibrium with beliefs of the form $\beta(p_1, p_2, A_1, A_2) \in \{-1, 0, 1\}$. In general, voter beliefs should be a distribution function on y given all the variables that voters observe: *i.e.* p_1, p_2, A_1, A_2, and z. However, the beliefs considered here (in- and out-of-equilibrium) are degenerate because they do not depend on z and because they put probability 1 on a particular y. Obviously, an equilibrium with this restricted form of beliefs is also a perfect Bayesian equilibrium with unrestricted beliefs. In what follows, the argument of β is omitted. Given β, Voter i prefers candidate 1 if

$$\hat{\theta}(\beta, z) - u(p_i - p_1) + u(p_i - p_2) \geq 0.$$

If all voters vote for the candidate they prefer, then the candidate that is preferred by the median voter gets elected:[17]

Lemma 1. *With belief* β, *if voters play undominated strategies, candidate* 1 *is elected if and only if* $\hat{\theta}(\beta, z) - u(m - p_1) + u(m - p_2) \geq 0$.

Before stating the main results, some notation must be introduced. Let $\bar{z}(\beta, p_1, p_2)$ denote the unique value of z for which $\hat{\theta}(\beta, z) + u(m - p_1) - u(m - p_2) = 0$. Candidate 1 is elected if $z \geq \bar{z}(\beta, p_1, p_2)$ and candidate 2 is elected if $z < \bar{z}(\beta, p_1, p_2)$. Thus, candidate 1 minimizes $\bar{z}$ and 2 maximizes $\bar{z}$. Note that, by symmetry, for every p, $\bar{z}(0, p, p) = 0$, and

$$\forall \beta, \forall p_1, \forall p_2 \qquad \bar{z}(\beta, p_1, p_2) = -\bar{z}(-\beta, p_2, p_1).$$

If both candidates choose m, G's payoff is certainly $-\mu u(g - m)$, which we normalize at zero. Let

$$\Pi(y, p) = -\mu \Pr[z \geq \bar{z}(1, p, m)|y] u(g - p). \tag{1}$$

$\Pi(y, p)$ is the expected payoff, disregarding the cost of campaign contributions, of the interest group if candidate 1 chooses p, candidate 2 chooses m, the realization of the insider signal is y, and voters believe that the insider signal is 1. Given the symmetry between candidates, it is easy to see that $\Pi(y, p) = -\mu \Pr[z < \bar{z}(-1, m, p)| - y] u(g - p)$. Thus, $\Pi(y, p)$ is also the net expected payoff if candidate 1 chooses m, candidate 2 chooses p, the realization of the insider

17. As the random variable z is continuously distributed, the event that the median voter is indifferent between the two candidates has measure zero. Hence, looking at strict or weak inequalities is inconsequential. In what follows, for notational simplicity, it is assumed that in case of indifference candidate 1 wins.

signal is $-y$, and voters believe that the insider signal is -1. By analogy, let the expected payoff of G when both candidates choose p be $\Pi(\text{both}, p) = -\mu u(g - p)$.

Proposition 1. *Let $\bar{p}$ be the highest p such that $\bar{z}(1, p, m) \leq 0$ and let $p_{\max} = \arg\max_p \Pi(1, p) - \Pi(0, p)$. The following is a perfect Bayesian equilibrium of Game 1:*

(*i*) *Voters' beliefs:*

$$\beta = \begin{cases} 1 & \text{if } A_1 \geq \Pi(0, p_1) \text{ and } A_2 < \Pi(0, p_2) \\ -1 & \text{if } A_1 < \Pi(0, p_1) \text{ and } A_2 \geq \Pi(0, p_2) \\ 0 & \text{otherwise.} \end{cases}$$

(*ii*) *Voters' choice: $e_i = 1$ if and only if $\hat{\theta}(\beta, z) - u(p_i - p_1) + u(p_i - p_2) \geq 0$.*

(*iii*) *Group's offer: for $y \in \{-1, 0, 1\}$, $p^* = \min(p_{\max}, \bar{p})$ and:*

(*a*) *If $y = -1$, $A_1^* = 0$ and $A_2^* = \Pi(0, p^*)$;*
(*b*) *If $y = 0$, $A_1^* = A_2^* = 0$;*
(*c*) *If $y = 1$, $A_1^* = \Pi(0, p^*)$ and $A_2^* = 0$.*

(*iv*) *Candidates' policy choice: for $j = 1, 2$, $p_j = p^*$ if $A_j^* \geq \Pi(0, p)$ and $p^* \leq \bar{p}$. Else, $p_j = m$.*

Let us discuss Proposition 1 by examining the equilibrium behaviour of voters, candidates, and the interest group one at a time.

Voters' beliefs depend on advertising levels. If one of the candidates spends more than the threshold $\Pi(0, p_j)$ and the other does not, then voters associate the high spender with a positive insider signal. If both candidates are below the threshold or both are above it, then voters believe that $y = 0$. We will see shortly that this belief is correct in equilibrium. Given this belief, each voter votes for the candidate that would give him the higher utility if elected.

Each candidate, when faced with an offer (p^*, A_j^*), accepts if two conditions are met. First, A_j^* must be high enough to make voters believe that he is a good candidate. Second, p^* must be low enough that the candidate's chance of being elected if he selects p^* and voters believe that he is good is not lower than his chance of being elected when he selects $p_j = 0$ and voters believe he is average. Given that $\bar{z}(0, m, m) = 0$, the second condition is written as $\bar{z}(1, p, m) \leq 0$, or $p^* \leq \bar{p}$.

The interest group can be in two situations: $y \in \{-1, 1\}$ and $y = 0$. In the first case, the best thing is to make an offer of at least $\Pi(0, p^*)$ to the good candidate. The net expected payoff is $\Pi(1, p^*) - \Pi(0, p^*)$ and p^* is chosen to maximize the net profit subject to the constraint that $p^* \leq \bar{p}$. Offering money to both candidates would be suboptimal because the additional benefit of having the bad candidate on the group's side is not worth the extra $\Pi(0, p^*)$ that the group should pay. In the second case, the threshold $\Pi(0, p^*)$ makes the group exactly indifferent between buying one of the two candidates or not making an offer. Instead, the strategy of buying both is strictly worse.

The existence of a separating equilibrium is guaranteed by the fact (established in the proof) that

$$\text{for every } p^* > m \qquad \Pi(1, p^*) > \Pi(0, p^*). \tag{2}$$

The interest group uses y to forecast z. Given θ, signals y and z are independent. However, from the point of view of the lobby, θ is unknown and, because y and z are unconditionally positively correlated, y can be used to predict z. If the interest group receives a high insider signal about one candidate, she expects that the candidate will produce a higher public signal later on. Hence, a candidate with a high insider signal is, *ceteris paribus*, more likely to be elected than a candidate with a low insider signal. Then, it is always possible to find a threshold contribution $\Pi(1, p^*) > A^* \geq \Pi(0, p^*)$ such that the group is willing to pay that sum only to a good candidate.

Some remarks are in order:

(1) If we assumed that z is noninformative, then Condition (2) would hold as an equality. Suppose that voters receive no signal and that a separating equilibrium arises. Voters rely uniquely on y in forming their beliefs about candidates. If they believe $y = 1$ and $p^* \leq \bar{p}$, then candidate 1 is elected for sure, independently of y. Thus, the group's payoff is independent of y. A separating equilibrium does exist but, for any y, the interest group is exactly indifferent between contributing and not contributing.

(2) Signalling games are plagued by multiple equilibria. The present game makes no exception and one can find several other perfect Bayesian equilibria besides the one in Proposition 1. In particular, there exists a pooling equilibrium in which voters' beliefs do not depend on advertising and, therefore, candidate 1 has no reason to advertise. In that equilibrium candidate 1 chooses the median voter's ideal policy and rejects any offer from G. Refinements, such as the Intuitive Criterion of Cho and Kreps (1987), do not apply because this is not a classic sender–receiver game but has three classes of agents, and the sender (G) does not interact directly with the receiver (voters). There are also other fully revealing equilibria and partially revealing equilibria. Section 5 discusses another interesting separating equilibrium.

There also exist separating equilibria in which information revelation occurs at an infinitesimal cost. Voters believe that $y = 1$ if and only if $A_1 \geq \Pi(0, p)$ and $A_2 < \Pi(0, p)$ and $p < P$, where P is an arbitrary positive number greater than m. The equilibrium is then the same as the one in Proposition 1 except that G selects $p^* = \min\{P, p_{\max}, \bar{p}\}$. By letting $P \to m^+$, we get information revelation at a very low policy cost. However, there are two reasons why this equilibrium is not convincing. First, it is based on unplausible out-of-equilibrium beliefs on the part of voters. If voters observe a p_1 such that $P < p_1 = \min\{p_{\max}, \bar{p}\}$ and $A_1 \geq \Pi(0, p_1)$ and $A_2 = 0$, they should still conclude that such a behaviour could only come from an interest group who has observed y. This objection is similar in spirit to the Intuitive Criterion, but, as we saw above, it cannot be formalized. The second reason is that this equilibrium, being based on beliefs that are discontinuous in p, relies heavily on the observability of p. Indeed, in the model with unobservable p presented in Section 6, such an equilibrium would not exist, while a separating equilibrium similar to the one in Proposition 1 still exists.

(3) One may wonder if there could be a semi-separating equilibrium in which, if $y \neq 0$, G makes an infinitesimal contribution to the good candidate and a zero-contribution to the bad candidate, while, if $y = 0$, G makes an infinitesimal offer to one of the candidates at random. This equilibrium could be seen as an endorsement *à la* Grossman and Helpman (1999). If G could commit to contribute to exactly one candidate, such equilibrium would indeed exist. However, this possibility is excluded in the present model by the assumption that offers are secret. If candidates accepted infinitesimal offers, G would have an incentive to make offers to both. The only way to ensure that G does not make two contributions is putting a threshold below which advertising is not credible.

4. EFFECT OF A BAN

Suppose now that contributions are prohibited by the law. Then, we have

Game 2. *Same as Game* 1 *except that* $A_1 = A_2 = 0$.

The ban on campaign giving puts the interest group out of business. Now, G has nothing to offer to candidates and therefore it plays no role. Clearly, this new game has a pooling equilibrium in which candidates choose the median voter's ideal policy. Candidate 1 is elected if and only if $z \geq 0$.

This pooling equilibrium is not the only perfect Bayesian equilibrium of Game 2. In particular there are separating equilibria *à la* Rogoff (1990) in which the policy position of a candidate signals his type. Candidates with a high insider signal choose a more extreme policy. However, it can be shown that the pooling equilibrium discussed above achieves the highest utility for the median voter. In what follows, we assume that, under a ban, the pooling equilibrium arises.

We now look at the effect of a ban on advertising on the median voter. Let $(p_1(y,z), p_2(y,z), e(y,z))$ denote respectively the policies chosen by candidates and the identity of the winner in the separating equilibrium of Proposition 1 given y and z. The *ex post* utility of the median voter in the separating equilibrium is

$$w_S(\theta, y, z) = u_m(e(y,z), \theta, p_1(y,z), p_2(y,z)).$$

The *ex post* utility of the median voter in the pooling equilibrium is $w_P(\theta, z) = u_m(\hat{e}(z), \theta, m, m)$, where $\hat{e}(z) = 1$ if and only if $z \geq 0$. Let $\bar{w}_S$ and $\bar{w}_P$ denote the respective *ex ante* utilities, obtained by taking expectations of w_S and w_P over θ, y, and z.

The *ex ante* utility of the median voter has two interpretations. From a normative viewpoint, if voters are distributed symmetrically around the median voter, then maximizing the *ex ante* utility of the median voter is equivalent to maximizing the Utilitarian social welfare. If lobby members are voters (and not for instance foreign citizens), the direct utility that they derive from policy and valence is counted in this definition of welfare. On the other hand, the disutility that lobby members incur because of the cost of campaign contributions—which G presumably collects from members' dues—is not counted. Hence, the case against campaign advertising does *not* hinge on the argument that campaign advertising is a waste of real resources.

From a positive viewpoint, the *ex ante* utility of the median voter answers the question: if we add a prior stage to the game in which voters choose whether or not campaign contributions should be allowed, what would the outcome of this referendum be?

The main result on welfare is:

Proposition 2. *Suppose that u is convex and twice differentiable, and that* $\lim_{x\to\infty} \frac{u'(x)}{u(x)} = \infty$. *Then, there exists a $\bar{g} \in \Re$ such that, if $g \geq \bar{g}$, then: (i) for any θ, y, and z, $w_S(\theta, y, z) \leq w_P(\theta, z)$; and (ii) $\bar{w}_S < \bar{w}_P$.*

Proof. We first show that, if in the separating equilibrium $p^* = \bar{p}$, then $w_S(\theta, y, z) \leq w_P(\theta, z)$. In the pooling equilibrium, candidate 1 is elected if $z \geq 0$. If $y = 0$, in a separating equilibrium candidate 1 is elected if $z \geq 0$. If $y = 1$, in a separating equilibrium, candidate 1 selects $\bar{p}$ and is elected if $z \geq \bar{z}(1, \bar{p}, m)$, which by the definition of $\bar{p}$ is equivalent to $z \geq 0$. If $y = -1$, the analogous argument shows that 1 is elected if $z \geq 0$. Thus, for every θ, y, and z, the winning candidate e is the same in both equilibria and $w_S(\theta, y, z) \leq w_P(\theta, z)$ if and only if median voter's utility from policy is greater or equal in the pooling equilibrium. In the pooling equilibrium, $u(p_e - m) = u(0)$ always. In the separating equilibrium, if $y = 0$, then $u(p_e - m) = u(0)$, while, if $y \neq 0$, then $u(p_e - m) \in \{u(0), u(\bar{p} - m)\}$. As $u(\bar{p} - m) < u(0)$, we have shown that $w_S(\theta, y, z) \leq w_P(\theta, z)$.

Next, it is proven that, for any u such that $\lim_{x\to\infty} \frac{u'(x)}{u(x)} = \infty$, there exists a $\bar{g} \in \Re$ such that, if $g \geq \bar{g}$, in the separating equilibrium $p^* = \bar{p}$. From the fact that $p^* = \min\{p_{\max}, \bar{p}\}$, a sufficient condition for $p^* = \bar{p}$ is

$$\frac{\partial}{\partial p}(\Pi(1, p) - \Pi(0, p)) > 0 \qquad \text{for all } p \leq \bar{p},$$

which, letting $\lambda(p) \equiv \Pr[z \leq \bar{z}(1, p, m)|1] - \Pr[z \leq \bar{z}(1, p, m)|0]$ and using the definition of Π, rewrites as

$$\frac{u'(g-p)}{u(g-p)} > \frac{\lambda'(p)}{\lambda(p)} \qquad \text{for } p \leq \bar{p}.$$

As the right side of the last inequality is independent of g and the left side grows unboundedly as $g \to \infty$, there exists a $\bar{g} \in \Re$ such that, if $g \geq \bar{g}$, the inequality holds for $p = \bar{p}$, and *a fortiori* for all $p < \bar{p}$.

Part (i) is thus proven. For Part (ii), notice that, with positive probability $y \neq 0$ and $p_e \neq m$, in which case the *ex post* utility is strictly lower in a separating equilibrium. ||

The presence of campaign contributions brings the median voter an informational benefit (he knows more about valence) and a policy bias cost (all good candidates sell out to G). Proposition 2 says that, if g is far enough from m, the informational benefit is lower than the policy bias cost. This is true—weakly—*ex post* for any realization of the random variables, and—strictly—*ex ante*.

To see why advertising reduces voter welfare, suppose that in the separating equilibrium the "candidate participation constraint" $p^* \leq \bar{p}$ is binding and take $y = 1$. In the pooling equilibrium, both candidates choose m and candidate 1 is elected if $z \geq 0$. In the separating equilibrium, the interest group makes an offer to candidate 1 with the property that $\bar{z}(1, \bar{p}, m) = \bar{z}(0, m, m) = \bar{z}(-1, m, \bar{p}) = 0$. Again, candidate 1 is elected if $z \geq 0$. As the identity of the winner is the same in the two equilibria, advertising brings no informational advantage. However, there is a policy bias cost and the median voter is worse off. This point becomes obvious on the cutoff $z = 0$. In the separating equilibrium, the median voter faces a bad candidate with m and a good candidate with $\bar{p}$, who provides the same expected utility of an average candidate with m: $\hat{\theta}(1, 0) - u(m - \bar{p}) = -u(0)$. It is as if the median voter had to choose between two bad candidates with m. Instead, in the pooling equilibrium there are two "average" candidates with m, which is certainly better.

A similar argument can be made for $y = -1$. Obviously, if $y = 0$, then the separating equilibrium is identical to the pooling equilibrium. Thus, when $p^* = \bar{p}$, the median voter is on average strictly worse off. The potential informational benefit of contributions comes from an increase in the probability of electing a high-valence candidate. If the participation constraint is binding, there is no increase. The median voter is left with only the policy cost of all the good candidates selling out.

The technical condition $\lim_{x \to \infty} \frac{u'(x)}{u(x)} = \infty$ says that in the limit the relative damage of a marginal deviation from the ideal policy is increasing with the distance from the ideal policy and goes to infinity. This guarantees that, as the group becomes more rightist, the policy that the group asks from a good candidate becomes more extreme as well up to a point $\bar{g}$ when the participation constraint is binding.[18]

18. A utility function that fits this condition is $u(p_i - p_e) = -e^{(p_i - p_e)^2}$. By De l'Hôpital, the condition is equivalent to $\lim_{x \to \infty} \frac{u''(x)}{u'(x)} = \infty$, which says that the absolute risk aversion tends to infinity when x tends to infinity. As x here can be seen as the opposite of wealth, this has a parallel with the condition that the absolute risk aversion of an agent goes to infinity as the agent's wealth goes to zero.

5. SPLIT CONTRIBUTIONS

In the separating equilibrium discussed earlier it is never the case that both candidates receive money. This is at odds with the observation that sometimes the same lobby makes donations to more than one candidate in the same race. This phenomenon, which is well documented in the U.S., is referred to as *split contributions*.

In this section it will be shown that Game 1 has another separating equilibrium besides the one in Proposition 1, in which, when $y = 0$, both candidates receive money and deviate from the median voter's preferred policy.

Proposition 3. *Let* $\alpha(p) = \Pi(both, p) - \Pi(1, p)$ *and let* $p'_{\max} = \arg\max_p 2\Pi(1, p) - \Pi(both, p)$. *The following is a perfect Bayesian equilibrium of Game* 1:

(*i*) *Voters' beliefs:*

$$\beta = \begin{cases} 1 & \text{if } A_1 \geq \alpha(p_1) \text{ and } A_2 < \alpha(p_2) \\ -1 & \text{if } A_1 < \alpha(p_1) \text{ and } A_2 \geq \alpha(p_2) \\ 0 & \text{otherwise.} \end{cases}$$

(*ii*) *Voters' choice:* $e_i = 1$ *if and only if* $\hat{\theta}(\beta, z) - u(p_i - p_1) + u(p_i - p_2) \geq 0$.

(*iii*) *Group's offer: for* $y \in \{-1, 0, 1\}$, $p^* = \min(p'_{\max}, \bar{p})$ *and:*

- (*a*) *If* $y = -1$, $A_1^* = 0$ *and* $A_2^* = \alpha(p^*)$;
- (*b*) *If* $y = 0$, $A_1^* = A_2^* = \alpha(p^*)$;
- (*c*) *If* $y = 1$, $A_1^* = \alpha(p^*)$ *and* $A_2^* = 0$.

(*iv*) *Candidates' policy choice: for* $j = 1, 2$, $p_j = p^*$ *if* $A_j^* \geq \alpha(p^*)$ *and* $p^* \leq \bar{p}$. *Else,* $p_j = m$.

This separating equilibrium (which will be called the *split contribution equilibrium*) is similar to the separating equilibrium of Proposition 1 (the *no-split contribution equilibrium*), with an important difference. The threshold advertising level needed to influence voters' beliefs is lower: for every $p > m$, $\alpha(p) < \Pi(0, p)$. When $y = 0$, the interest group is now willing to make campaign contributions and is willing to make them to *both* candidates. When both candidates receive money, voters realize that the group has no insider information and set their belief at $\hat{\theta}(0, z)$. When offered money above $\alpha(p)$ and a policy below $\bar{p}$, it is always in the candidate's interest to accept the offer, independently of whether $y = 0$ or $y = 1$. If $y = 0$ and the candidate refuses, the opponent will receive money and voters will believe that $y = 1$. If $y = 1$ and the candidate refuses, then voters will believe $y = 0$. The fact that the participation constraint of the candidate is the same for every y is a consequence of the symmetry of the model. The effect on the cutoff of accepting when $y = 1$ is $\bar{z}(1, p^*, m) - \bar{z}(0, m, m)$, and is equal to the effect of accepting when $y = 0$, that is, $\bar{z}(0, p^*, p^*) - \bar{z}(-1, m, p^*)$. They are both equivalent to $\bar{z}(1, p^*, m)$.

It is worth spelling out the following:

Corollary 1. *In the split contribution equilibrium, if* $y = 0$, *G offers a contribution to both candidates, both candidates accept, and* $\min(p'_{\max}, \bar{p})$ *is implemented for sure.*

This situation is bad for voters because when $y = 0$ they face two candidates who sold out and they get the same information they would have received if neither of the two candidates had advertised. Indeed, it is immediate to see that, if the participation constraint $p^* \leq \bar{p}$ is binding, the median voter is worse off in the split contribution equilibrium than in the no-split contribution equilibrium. However, this result is of limited interest because in that case campaign contributions should be banned altogether.

More insight on the usefulness of banning split contributions can be gained by doing comparative statics on the probability that $y = 0$. In order to state the proposition in a simple parametric way, we use a slightly restricted version of the general signal structure. Assume that the probability of observing an uninformative insider signal is independent of θ. Assumptions 1 and 2 are still satisfied and the distribution of the insider signal can be written as follows:

$$h(y|\theta) = \begin{cases} (1-q)\tilde{h}(\theta) & \text{if } y = 1 \\ q & \text{if } y = 0 \\ (1-q)(1-\tilde{h}(\theta)) & \text{if } y = -1 \end{cases}$$

where $q \in (0, 1)$ and $\tilde{h}(\theta)$ is increasing in θ. The higher q, the lower the precision of signal y. The primitives of the game are then q and $\Gamma \equiv \langle \{p_i\}_{i\in I}, g, \mu, f, \tilde{h}, u, \phi \rangle$. We can then state:[19]

Proposition 4. *For every* Γ, *there exists a* $\bar{q} \in (0, 1)$ *such that if* $q \geq \bar{q}$, *then the* ex ante *voter welfare is higher in the no-split contribution equilibrium than in the split contribution equilibrium.*

One cannot exclude that $p'_{\max} < p_{\max}$. It depends on the particular functional forms chosen. For low q's it is possible that the median voter is better off in the split contribution equilibrium. However, if q is high enough, then voters are likely to find themselves in the negative situation of Corollary 1.

The important point about Proposition 4 is that it draws a welfare conclusion from an observable variable. In the split contribution equilibrium, q is also the probability that both candidates receive money. If that probability—which is in principle observable—is high enough, then the median voter is better off in the no-split contribution equilibrium. The more often split giving occurs, the more likely it is that split giving is detrimental to the median voter.

Is the split contribution equilibrium more or less plausible than the no-split contribution one? As it was argued in the previous section, existing refinements for signalling games do not apply to the present model. However, G prefers the split contribution equilibrium. If $y = 0$, G is clearly better off. If $y \neq 0$, for any $p \in [m, \bar{p}]$, $\alpha(p) < \Pi(0, p)$. Thus, in the split contribution equilibrium, G could obtain the policy $\min\{p_{\max}, \bar{p}\}$ that it obtains in the other equilibrium but it would pay less. In a modified version of the game, there could be a preliminary stage in which the group makes a (non-binding) announcement regarding its contribution policy. Then, we should expect G to announce a split giving policy along the lines of Proposition 3, and we should expect voters to believe the announcement and adjust their beliefs accordingly. But, of course, the strongest argument in favour of the plausibility of the split contribution equilibrium is that split giving is observed in practice.

6. WHEN POLICY IS NOT OBSERVABLE

So far, we have assumed that voters observe policy perfectly. We now consider the other extreme case, in which policy is unobservable. Thus we modify stage 4 of Game 1 by assuming that voters observe only A_1, A_2, and z. The rest of the game is exactly as before.

There is, however, one problem with a model with unobservable policy and office-seeking candidates. Unless the candidate receives a monetary offer from the interest group, he is perfectly

19. Changes in q are irrelevant to the comparison between the no-split contribution equilibrium and the pooling equilibrium (the proof of Proposition 4 shows that $\Pi(1, p)$, $\Pi(0, p)$, $p_{\max}$, $p'_{\max}$, and $\bar{p}$ do not depend on q). There exists a region where the best thing is leaving contributions legal but banning split giving.

indifferent among policy positions. To sidestep this indeterminacy, assume that candidates pursue two goals: election and the maximization of the median voter's welfare. But the second goal is infinitely less important than the first. Thus, the *ex post* utility of candidate j is 0 if he is not elected and $1 - k(p_j - m)^2$ if he is elected, where k is a strictly positive parameter. The main result of this section deals with the case in which k tends to zero.[20]

Proposition 5. *Let $k \to 0^+$. If $g < \bar{p}$, then there exist a perfect Bayesian equilibrium analogous to the no-split contribution equilibrium and one analogous to the split contribution equilibrium. The difference between the equilibria with unobservable policy and those in the previous sections is that now $p^* = g$.*

If $g > \bar{p}$, then there exists no separating equilibrium which is symmetric with respect to candidates.[21]

With unobservable policy, G takes all the advantage she can from the candidate by asking for her ideal policy g. Voters realize that a candidate who spends money is going to implement g. Thus, even if voters do not observe p_j, they can anticipate it perfectly. If candidate j advertises, voters correctly believe that $p_j = g$. If instead he does not advertise, voters believe that $p_j = m$ (because of the infinitesimal concern for policy).

The next question is whether a candidate should accept G's offer. If he does, voters perceive him as high quality but they also understand that he 'sold out' (let us focus on the no-split equilibrium; the other one is based on similar reasoning). If g is not too high, the benefit of being perceived as high quality offsets the damage of selling out. If g is high, the reverse is true. The cutoff is exactly the participation constraint $\bar{p}$ as defined in Section 3. This is intuitive because at $g = \bar{p}$, the candidate is indifferent between being perceived as average but clean and being perceived as good but corrupt. If $g < \bar{p}$, there exists a separating equilibrium, while with a higher g the equilibrium disappears because any deal with G makes the candidate worse off.

The case $g > \bar{p}$ corresponds to a political system with a very extreme interest group. The median voter punishes anyone who associates with such extremists. An example is the tobacco industry in the U.S., whose ideal policies seem to be hated by the median voter. A candidate who is caught receiving tobacco money is stygmatized by the media and by his opponents. Thus, in the recent election cycles many candidates have made a point of not accepting contributions from tobacco interests.

On the welfare side, prohibiting campaign contributions has no effect if $g > \bar{p}$. If instead $g < \bar{p}$, a result similar to Proposition 2 can easily be proven. When $g \to \bar{p}^-$, the argument used in the proof of Proposition 2 applies, and the *ex post* utility of the median voter is always higher in a pooling equilibrium. Hence, there are three cases according to whether g is low, medium, or high. In the first, campaign finance is beneficial. In the second, it is detrimental. In the third, it is indifferent (because contributions do not occur anyway). With respect to split giving, it is immediate to see that voters are always worse off in the split contribution equilibrium (the possibility that $p_{\max} < p'_{\max}$ is not there anymore). Hence, a ban on split giving is always good for voters.

20. The assumption that the candidate cares directly about the median voter's welfare may be motivated by the fact that he has policy preferences or an (unmodelled) concern for re-election.

21. By symmetric equilibrium, we mean an equilibrium in which switching the labels of the candidates and substituting $-y$ instead of y and $-z$ instead of z does not change the beliefs of voters or the strategy of the lobby (all the equilibria discussed in the paper satisfy this definition). Depending on the distributional assumptions we make there may exist asymmetric separating equilibria when $g > \bar{p}$. However, it is obvious that for every separating equilibrium there exists a threshold such that, if g is to the right of the threshold, the equilibrium disappears.

7. CONCLUSION

This paper is a first step towards microfounding political advertising and evaluating alternative regulatory regimes. Campaign finance is a complex phenomenon. Many aspects that have been left out by this paper may, in the future, be addressed within a similar framework.

The model has assumed that only one interest group is active. It would be important to extend the model to several groups in competition with each other. This could be done in a common agency framework (see for instance Grossman and Helpman (1996)).[22]

The model has assumed that the amount spent on advertising is perfectly observable by all voters. In a more realistic framework (like Hertzendorf (1993)), advertising expenditures translate into a probability distribution over the number of TV ads each voter will watch.

In this model voters have heterogeneous preferences but they are assumed to have homogeneous information: z is the same for all voters. The model could be extended to differentiated information, which would provide a link with the literature on information aggregation in elections (*e.g.* Lohmann (1994) or Feddersen and Pesendorfer (1997)).

Another debatable assumption made here is that the interest group is indifferent to valence. If the interest group cares about valence but only in a limited way, it is easy to see that there still exists a separating equilibrium in which the insider signal is revealed by the amount of contributions. Separation occurs *a fortiori* because the group is even more willing to contribute money to a good candidate.[23] Of course, this would not stop the interest group from viewing candidates as investments with an uncertain return, as they have done in this model. The valence motive would complement the "betting" motive. If the interest group is extremely interested in valence, then revelation may occur without the need of contributions: the group can credibly communicate its signals to voters (through endorsements as in Grossman and Helpman (1999))

In this model a ban on advertising produces the same effect as a ban on contributions. In practice, there are important differences. First, while advertising restrictions can be enforced, the experience of several countries shows that restrictions on campaign contributions are often disregarded or dodged. Second, contributions can be spent in a variety of ways, which give different signals to different voters. Thus, a ban on advertising does not necessarily make contributions useless to candidates. Third, campaign advertising is an expression of political opinion. Thus, restrictions on it can be seen as restrictions on free expression and may be unconstitutional. The first argument supports restrictions on advertising, the last two arguments point in favour of restrictions on contributions. More detailed models should be developed with the goal of comparing the effects of the two types of restrictions.[24]

Some candidates are wealthy individuals who finance their campaigns with personal funds, like Berlusconi in Italy and Perot and Forbes in the U.S. It would be interesting to extend the

22. Some results in that direction can be found in Prat (2000), who combines a simplified version of the present model (only one candidate can receive money and specific functional forms are assumed) with common agency to analyse the case with a very large number of lobbies. The result that a ban can be optimal is confirmed.

23. To see this mathematically, assume that the group's utility function is

$$\begin{cases} k\theta - \mu u(g - p_1) & \text{if } e = 1 \\ -\mu u(g - p_2) & \text{if } e = 2, \end{cases}$$

where k is a small positive number. Let

$$\Pi(y, p) = \Pr[z \geq \bar{z}(1, p, m)|y](kE(\theta|y) - \mu u(g - p)).$$

Then, it is easy to see that the single-crossing properties of Π needed to ensure the separating equilibrium in Proposition 1 hold *a fortiori* because $kE(\theta|y)$ is increasing in y.

24. The U.S. has chosen the road of regulating contributions but letting candidates spend freely. European countries, instead, tend to focus on spending. For instance, in Britain individual candidates are not allowed to run TV ads.

present model to include the possibility that candidates use not only lobbies' contributions but also their own money. How would the signalling role of campaign expenditures change?

APPENDIX. PROOFS

Proof of Proposition 1

A preliminary result is useful:

Lemma A2. *In Game* 1: *(i) If $p > m$, $\Pi(both, p) > \Pi(1, p) > \Pi(0, p) > \Pi(-1, p)$; (ii) If $m < p \leq \bar{p}$, then $\Pi(1, p) + \Pi(-1, p) \geq \Pi(both, p)$; (iii) If $m < p \leq \bar{p}$, then $2\Pi(0, p) \geq \Pi(both, p)$.*

Proof. The first inequality of (i) is obvious. The other three inequalities in (i) are due to MLRP and the definition of Π.

The inequality in (ii) is equivalent to

$$\Pr[z \geq \bar{z}(1, p, m)|1] + \Pr[z \geq \bar{z}(1, p, m)| - 1] \geq 1.$$

If $p \leq \bar{p}$, then $\bar{z}(1, p, m) \leq 0$. By symmetry, $\Pr[z \geq 0| - 1] = \Pr[z < 0|1]$. Hence,

$$\begin{aligned}\Pr[z \geq \bar{z}(1, p, m)|1] + \Pr[z \geq \bar{z}(1, p, m)| - 1] &\geq \Pr[z \geq 0|1] + \Pr[z \geq 0| - 1] \\ &= \Pr[z \geq 0|1] + \Pr[z < 0|1] = 1,\end{aligned}$$

which proves (ii).

Part (iii) is equivalent to $2\Pr[z \geq \bar{z}(1, p, m)|0] \geq 1$, which is true because $p \leq \bar{p}$ implies $\bar{z}(1, p, m) \leq 0$ and hence $\Pr[z \geq \bar{z}(1, p, m)|0] \geq \frac{1}{2}$. ||

We can now prove Proposition 1:

(i) It is immediate to check that (i) is consistent with the strategies in (iii) and (iv).
(ii) See Lemma 1.
(iii) Step 1: fix $p^* \in (m, \bar{p}]$. Then, the following is a best-response contribution for G:

(a) If $y = -1$, $A_1^* = 0$ and $A_2^* = \Pi(0, p^*)$;
(b) If $y = 0$, $A_1^* = A_2^* = 0$;
(c) If $y = 1$, $A_1^* = \Pi(0, p^*)$ and $A_2^* = 0$.

Proof of Step 1: Given (iv), G can restrict w.l.o.g. her attention to $(A_1^*, A_2^*) \in \{0, \Pi(0, p^*)\}^2$. Hence, for a given y, there are four strategies: (a) $A_1^* = A_2^* = 0$; (b) $A_1^* = \Pi(0, p^*)$, $A_2^* = 0$; (c) $A_1^* = 0$, $A_2^* = \Pi(0, p^*)$; and (d) $A_1^* = A_2^* = \Pi(0, p^*)$.

Let π denote the net expected payoff of G—that is $\Pi - A_1 - A_2$. If $y = 1$, the net expected payoff for each of the four strategies above is

$$\begin{aligned}\pi_a &= 0;\\ \pi_b &= \Pi(1, p^*) - \Pi(0, p^*);\\ \pi_c &= \Pi(-1, p^*) - \Pi(0, p^*);\\ \pi_d &= \Pi(\text{both}, p^*) - 2\Pi(0, p^*).\end{aligned}$$

From Lemma A2, $\pi_b > 0$, $\pi_c < 0$, and $\pi_d \leq 0$. Hence, (b) is a best response when $y = 1$. Next, if $y = 0$, we have

$$\begin{aligned}\pi_a &= 0;\\ \pi_b &= \Pi(0, p^*) - \Pi(0, p^*) = 0;\\ \pi_c &= \Pi(0, p^*) - \Pi(0, p^*) = 0;\\ \pi_d &= \Pi(\text{both}, p^*) - 2\Pi(0, p^*) \leq 0.\end{aligned}$$

Hence, (a) is a best response when $y = 0$. The case $y = -1$ is symmetric to $y = 1$ and is omitted.

Step 2: Given Step 1, the optimal p^* is $\min(p_{\max}, \bar{p})$.

Proof of Step 2: If $y = 1$, if $p \geq m$, arg $\max_p \Pi(1, p) - \Pi(0, p)$ subject to $p \leq \bar{p}$ is equal to $\min(p_{\max}, \bar{p})$. Obviously, $p < m$ is a dominated strategy. If $y = 0$, the choice of p^* is irrelevant. The case $y = -1$ is identical to $y = 1$.

(iv) Let us focus on candidate 1. The analysis for candidate 2 is symmetric. Given (i), it is a best response for 1 to reject any $A_1^* < \Pi(0, p)$. If 1 receives an offer (p^*, A_1^*) with $A_1^* \geq \Pi(0, p)$, (iii) guarantees that the other candidate does not receive an offer. If 1 accepts the offer, by (i), voters believe $y = 1$. If he rejects, they believe $y = 0$. Hence, it is a best response to accept it if $\bar{z}(1, p^*, m) \leq \bar{z}(0, m, m) = 0$, that is, when $p^* \leq \bar{p}$.

Proof of Proposition 3

(The definition of perfect Bayesian equilibrium is the same as that used in the proof of Proposition 3 and is found in the additional material for referees.) Parts (i) and (ii) are easily verified. For (iii), we first verify that, given any $p^* \in (m, \bar{p}]$, a best-response contribution for G is as in (iii)(a)–(c). Given (iv), G can restrict attention to $(A_1^*, A_2^*) \in \{0, \alpha(p^*)\}^2$ Hence, for a given y, there are four strategies: (a) $A_1^* = A_2^* = 0$; (b) $A_1^* = \alpha(p^*)$, $A_2^* = 0$; (c) $A_1^* = 0$, $A_2^* = \alpha(p^*)$; and (d) $A_1^* = A_2^* = \alpha(p^*)$.

If $y = 1$, the net profits for each of the four strategies above are

$$\begin{aligned}
\pi_a &= 0;\\
\pi_b &= 2\Pi(1, p^*) - \Pi(\text{both}, p);\\
\pi_c &= \Pi(-1, p^*) - \Pi(\text{both}, p) + \Pi(1, p^*);\\
\pi_d &= 2\Pi(1, p^*) - \Pi(\text{both}, p).
\end{aligned}$$

From Lemma A2, $\pi_b = \pi_d > \pi_c > 0$. Hence, (b) is a best response. Next, if $y = 0$,

$$\begin{aligned}
\pi_a &= 0;\\
\pi_b &= \Pi(0, p^*) - \Pi(\text{both}, p) + \Pi(1, p^*);\\
\pi_c &= \Pi(0, p^*) - \Pi(\text{both}, p) + \Pi(1, p^*);\\
\pi_d &= 2\Pi(1, p^*) - \Pi(\text{both}, p).
\end{aligned}$$

Again by Lemma A2, $\pi_d > \pi_b = \pi_c > 0$, so that (d) is a best response when $y = 0$. The case $y = -1$ is symmetric to $y = 1$ and is omitted. It is then immediate to see that the optimal policy offer is $p^* = \min(p'_{\max}, \bar{p})$.

For (iv), let us focus on candidate 1. The analysis for candidate 2 is symmetric. Given (i), it is a best response for 1 to reject any $A_1^* < \alpha(p^*)$. If $y = 1$ and 1 receives an offer (p^*, A_1^*) with $A_1^* \geq \alpha(p^*)$, then accepting yields $\bar{z}(1, p^*, m)$ while rejecting yields $\bar{z}(0, m, m) = 0$. Hence, 1 accepts if and only if $p^* \leq \bar{p}$. If $y = 0$ and 1 receives an offer (p^*, A_1^*) with $A_1^* \geq \alpha(p^*)$, then accepting yields $\bar{z}(0, p^*, p^*) = 0$ while rejecting yields $\bar{z}(-1, m, p^*) = -\bar{z}(1, p^*, m)$. Hence, 1 accepts if $0 \leq -\bar{z}(1, p^*, m)$, that is—again—$p^* \leq \bar{p}$.

Proof of Proposition 4

Let $w_S(\theta, y, z)$ and $w_{SS}(\theta, y, z)$ be the *ex post* utility of the median voter respectively in the no-split contribution equilibrium and in the split contribution equilibrium.

Claim: Given Γ, $w_S(\theta, y, z)$ and $w_{SS}(\theta, y, z)$ do not depend on q.

Proof of the claim: By Bayes' theorem,

$$\hat{\theta}(1, z) = \frac{\int_\Theta \theta\phi(\theta) f(z|\theta) h(1|\theta) d\theta}{\int_\Theta \phi(\theta) f(z|\theta) h(1|\theta) d\theta} = \frac{\int_\Theta \theta\phi(\theta) f(z|\theta) \tilde{h}(\theta) d\theta}{\int_\Theta \phi(\theta) f(z|\theta) \tilde{h}(\theta) d\theta},$$

and hence $\hat{\theta}(1, z)$ does not depend on q. This implies that $\bar{z}(1, p, m)$ does not depend on q. Now note that

$$\Pi(1, p) = \frac{\int_\Theta (1 - F(\bar{z}(1, p, m)|\theta))\phi(\theta) h(1|\theta) d\theta}{\int_\Theta \phi(\theta) h(1|y) d\theta} = \frac{\int_\Theta (1 - F(\bar{z}(1, p, m)|\theta))\phi(\theta) \tilde{h}(\theta) d\theta}{\int_\Theta \phi(\theta) \tilde{h}(\theta) d\theta}.$$

Hence, also $\Pi(1, p)$ does not depend on q. An analogous reasoning shows that $\Pi(0, p)$ does not depend on q. Obviously, $\Pi(\text{both}, p)$ does not depend on q. Knowing this, it is immediate to see that $p_{\max}$, $p'_{\max}$, and $\bar{p}$ do not depend on q. As $\bar{z}(1, p, m)$ does not depend on q, the identity of the winner does not depend on q. As the winner's policy is independent of q as well, the claim is proven.

The expected utility of the median voter in the two equilibria is (using the fact that the cases $y = 1$ and $y = -1$ are symmetric):

$$\bar{w}_S = \int_\Theta \int_\Re (q w_S(\theta, 0, z) + (1-q) w_S(\theta, 1, z))\phi(\theta) f(z|\theta) dz d\theta;$$

$$\bar{w}_{SS} = \int_\Theta \int_\Re (q w_{SS}(\theta, 0, z) + (1-q) w_{SS}(\theta, 1, z))\phi(\theta) f(z|\theta) dz d\theta.$$

From Corollary 1, we see that $w_S(\theta, 0, z) > w_{SS}(\theta, 0, z)$ for all z and θ because the identity of the winner is the same in both equilibria but policy is worse in SS. By the Claim, it must be that $\lim_{q \to 1} \bar{w}_S > \lim_{q \to 1} \bar{w}_{SS}$.

Proof of Proposition 5

In the previous section voters had beliefs only on valence. Now that even policy is unobserved, voters' beliefs relate to both valence and policy. Let γ_j indicate beliefs on the policy adopted by candidate j (as for β, beliefs are degenerate because they put probability 1 on a particular policy). β still denotes the belief on y.

The following is the analogous of the no-split contribution equilibrium:

(i) Voters' beliefs:

$$\begin{array}{ll} \beta = 1, \gamma_1 = g, \gamma_2 = m, & \text{if } A_1 \geq \Pi(0, g) \text{ and } A_2 < \Pi(0, g) \\ \beta = -1, \gamma_1 = m, \gamma_2 = g, & \text{if } A_1 < \Pi(0, g) \text{ and } A_2 \geq \Pi(0, g) \\ \beta = 0, \gamma_1 = \gamma_2 = g, & \text{if } A_1 \geq \Pi(0, g) \text{ and } A_2 \geq \Pi(0, g) \\ \beta = 0, \gamma_1 = \gamma_2 = m, & \text{otherwise.} \end{array}$$

(ii) Voters' choice: $e_i = 1$ if and only if $\hat{\theta}(\beta, z) - u(p_i - \gamma_1) + u(p_i - \gamma_2) \geq 0$.

(iii) Group's offer: for $y \in \{-1, 0, 1\}$, $p^* = g$ and:

(a) If $y = -1$, $A_1^* = 0$ and $A_2^* = \Pi(0, p^*)$;
(b) If $y = 0$, $A_1^* = A_2^* = 0$;
(c) If $y = 1$, $A_1^* = \Pi(0, p^*)$ and $A_2^* = 0$.

(iv) Candidates' policy choice: for $j = 1, 2$, $p_j = p^*$ if $A_j^* \geq \Pi(0, g)$. Else, $p_j = m$.

Parts (i), (ii), and (iv) are verified in a fashion similar to Proposition 1. For part (iii), as (iv) does not impose any condition on p^*, it is always optimal for G to set $p^* = G$. Without loss of generality, G selects one of these four strategies: (a) $A_1^* = A_2^* = 0$, (b) $A_1^* = \Pi(0, g)$, $A_2^* = 0$, (c) $A_1^* = 0$, $A_2^* = \Pi(0, g)$, and (d) $A_1^* = A_2^* = \Pi(0, g)$. By using Lemma A2 it is easy to see that (a) is optimal when $y = 0$, (b) is optimal when $y = 1$, and (c) is optimal when $y = -1$.

The following is the analogous of the split contribution equilibrium:

(i) Voters' beliefs:

$$\begin{array}{ll} \beta = 1, \gamma_1 = g, \gamma_2 = m, & \text{if } A_1 \geq \alpha(g) \text{ and } A_2 < \alpha(g) \\ \beta = -1, \gamma_1 = m, \gamma_2 = g, & \text{if } A_1 < \alpha(g) \text{ and } A_2 \geq \alpha(g) \\ \beta = 0, \gamma_1 = \gamma_2 = g, & \text{if } A_1 \geq \alpha(g) \text{ and } A_2 \geq \alpha(g) \\ \beta = 0, \gamma_1 = \gamma_2 = m, & \text{otherwise.} \end{array}$$

(ii) Voters' choice: $e_i = 1$ if and only if $\hat{\theta}(\beta, z) - u(p_i - \gamma_1) + u(p_i - \gamma_2) \geq 0$.

(iii) Group's offer: for $y \in \{-1, 0, 1\}$, $p^* = g$ and:

(a) If $y = -1$, $A_1^* = 0$ and $A_2^* = \alpha(g)$;
(b) If $y = 0$, $A_1^* = A_2^* = \alpha(g)$;
(c) If $y = 1$, $A_1^* = \alpha(g)$ and $A_2^* = 0$.

(iv) Candidates' policy choice: for $j = 1, 2$, $p_j = p^*$ if $A_j^* \geq \alpha(g)$. Else, $p_j = m$.

If $g > \bar{p}$, suppose for contradiction that a separating equilibrium exists. As candidates have an infinitesimal concern for policy, G always sets $p^* \to g$. On the other hand, a candidate who does not receive money chooses $p_j = m$. Thus, in a separating equilibrium, on the equilibrium path, $\gamma_j = g$ if $A_j > 0$ and $\gamma_j = m$ if $A_j = 0$. A symmetric separating equilibrium can take two forms depending on whether split contributions occur when $y = 0$. With split contributions, if $y = 0$, the cutoff is $\bar{z}(0, g, g) = 0$. If candidate 1 rejects the lobby's offer, the cutoff becomes $\bar{z}(-1, m, g)$, which, because $g > \bar{p}$, is strictly negative. Hence, candidate 1 is better off rejecting and this is not an equilibrium. Without split contributions, if $y = 1$ the cutoff is $\bar{z}(1, g, m) < 0$. Candidate 1 is better off rejecting because he would obtain a cutoff $\bar{z}(0, m, m) = 0$, and this is not an equilibrium either.

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