Pareto-Improving Campaign Finance Policy

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This paper argues that campaign finance policy, in the form of contribution limits and matching public financing, can be Pareto improving even under very optimistic assumptions concerning the role of campaign advertising and the rationality of voters. The optimistic assumptions are that candidates use campaign contributions to convey truthful information to voters about their qualifications for office and that voters update their beliefs rationally on the basis of the information they have seen. The argument also assumes that campaign contributions are provided by interest groups and that candidates can offer to provide policy favors to attract higher contributions. (*JEL* D72, H40)

This paper argues that campaign finance policy, in the form of contribution limits and matching public financing, can be Pareto improving even under the most optimistic assumptions concerning the role of campaign advertising and the rationality of voters. The argument assumes that candidates use campaign contributions to convey *truthful information* to voters about their qualifications for office and voters update their beliefs *rationally* on the basis of the information they have seen. It also assumes that campaign contributions are provided by interest groups and that candidates can offer to provide policy favors for their interest groups to attract higher contributions.

The argument is developed in a simple model of electoral competition. There are two political parties representing opposing ideologies. Parties put forward candidates who represent their ideologies, but may have difficulty finding qualified candidates. Thus each party's candidate may be qualified or unqualified. Voters know a candidate's party affiliation but not whether he is qualified. Advertising allows a candidate to provide voters with this information. Such advertising can be advantageous for a qualified candidate because it may attract swing voters. Resources for campaign advertising are obtained by candidates from interest groups consisting of citizens of opposing ideologies. If elected, candidates are able to implement policy favors for their interest groups and, before the election, they can offer to implement such favors to extract larger contributions.

The starting point for the argument is the observation that the potential social benefit of contributions lies in giving qualified candidates an electoral advantage over unqualified opponents. With no contributions, there would be no mechanism for qualified candidates to get out the word to voters. Giving qualified candidates an electoral advantage potentially benefits *all* citizens, as it results in better leaders.

In order for campaign contributions to have this benefit, campaign advertising must be *effective* in that learning that a candidate is qualified will induce some fraction of swing voters to switch their votes from unadvertised candidates. The larger the fraction of voters who switch, the greater the effectiveness of campaign advertising and the greater the advantage such advertising brings to qualified candidates. However, when campaign contributions are unrestricted and candidates have a strong desire to hold office, campaign advertising will not be that effective. Voters will rationally be cynical

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about qualified candidates, anticipating that they will implement favors for their contributors if elected. This cynicism will reduce the likelihood of voters switching their votes and, despite the fact that resources are spent on advertising, qualified candidates will not have much of an electoral advantage over unqualified opponents.

When campaign contributions are limited, candidates' incentive to offer favors to extract more contributions is dampened. Voters now anticipate that advertised candidates will implement fewer favors than in the unrestricted case and this may increase the likelihood they will vote for them. This increase in the effectiveness of advertising means that limits, despite reducing the level of campaign advertising, need not reduce the likelihood that qualified candidates get elected. Moreover, if elected such candidates will implement lower levels of favors than in the unrestricted case. Thus, all regular citizens can be better off when contributions are limited. The only possible losers are contributors who receive lower levels of favors. But their expected gains from favors are dissipated by the contributions they make, meaning they are also better off. In this way, limiting contributions can create a Pareto improvement.

Even when this is not the case, a campaign finance policy that both imposes limits and provides publicly financed matching grants can always create a Pareto improvement. Limits reduce favors and raise the effectiveness of campaign spending, while public financing offsets the reduction in private contributions caused by limits. Since public funds are tax financed, as opposed to favor financed, this infusion of money has no negative consequences for the effectiveness of campaign spending. Effectively, public financing substitutes clean money for tainted money received in exchange for policy favors.

The organization of the remainder of the paper is as follows. Section I discusses the relationship of the paper to the growing literature on campaign finance regulation. Section II presents the model, and Section III analyzes equilibrium with unrestricted contributions. Campaign finance policy is studied in Section IV. Section V discusses some of the assumptions of the model and Section VI concludes with a summary of the argument.

I. Related Literature

The welfare economics of campaign finance regulation is attracting increasing attention from political economists. The topic is not only of considerable policy significance but also poses a number of intellectual challenges.[1] First, it is necessary to take a stand on how and why campaign spending impacts voter behavior and why contributors give to candidates—issues on which the empirical literature offers no clear guidance. Then, one faces the analytical challenge of incorporating the behavior of campaign contributors with that of political parties and voters in a framework tractable enough to permit welfare analysis.

The standard approach to the problem assumes that there are two types of voters: "informed" and "uninformed." Informed voters vote for parties/candidates based on their policy positions, while uninformed voters can be swayed by campaign advertising. Funds for advertising are provided by interest groups and depend upon the positions taken by the parties or their candidates. Parties then choose their candidates or positions taking into account their implications for contributions and, ultimately, votes.[2] While the assumption that campaign advertising influences "uninformed" voters may suggest that it provides information, this is misleading since a party's ability to attract the votes of uninformed voters is assumed to be independent of its or its opponent's policy position.

This approach concludes that contributions lead political parties to distort their platforms away from those that would maximize aggregate utility (see, for example, Grossman and Helpman, 2001). Parties bias their policy choices to attract money from interest groups and then use this money to attract the votes of the uninformed. Effectively, parties trade off the loss of informed votes resulting from the policy bias with the gains in uninformed votes

[1] See Rebecca Morton and Charles Cameron (1992) for an insightful review.

[2] See, for example, David Baron (1994), Gene Grossman and Elhanan Helpman (1996, 2001), and Timothy Besley and Coate (2002). Baron and Grossman and Helpman assume that parties just want to win and compete by choosing platforms. Besley and Coate assume, as does this paper, that parties are policy motivated and compete by selecting candidates.

purchased with the contributions. Banning contributions would prevent parties from distorting their policy choices and would therefore raise aggregate welfare.

Of course, this argument rests on the assumption that the "uninformed" voters do not have rational expectations as has been forcefully argued by Donald Wittman (2002). If they did, then they would realize that a party which was advertising must have distorted its policy platform to obtain the resources necessary to fund the advertising and a majority of them would switch their votes to the unadvertised party. Accordingly, advertising would actually lose parties votes and hence none would be undertaken in equilibrium! Banning contributions would be redundant.

More recent work has sought to provide a more satisfying foundation for policy advice by analyzing the problem under the assumption that voters update their beliefs rationally. Work of this form falls into two categories. First, there are those analyses that assume, as does this paper, that campaign advertising is *directly* informative (Scott Ashworth, 2003; Coate, 2003; Christian Schultz, 2003). The idea is that candidates can use advertising to provide voters with hard information about their policy positions, ideologies, or qualifications for office, thus permitting more informed choices.[3] Second, there are those who argue that campaign advertising may best be understood as providing information *indirectly* (Jan Potters et al., 1997; Andrea Prat, 2002a, b). The idea is that candidates have qualities that interest groups can observe more precisely than voters and the amount of campaign money a candidate collects signals these qualities to voters.

In Coate's (2003) model, political parties compete by selecting candidates whose ideologies lie in a one-dimensional space. Voters know a candidate's party affiliation but are not sure how extreme or moderate he is.[4] Advertising allows candidates to provide voters with information and it is financed by interest groups who give solely to advance the electoral prospects of like-minded candidates. The main result is that contribution limits, in addition to reducing campaign spending, raise the likelihood that parties select extremist candidates. This means that limits redistribute welfare from moderate voters to interest group members. The former lose out because elected leaders are less likely to be moderate. The latter gain because they spend less of their resources on campaign spending. A similar result would emerge from the model of this paper if candidates did not provide policy favors for their contributors. A contribution limit would reduce the likelihood that qualified candidates are elected, making all regular citizens worse off. The only possible beneficiaries would be interest group members who would spend less of their resources on campaign contributions.

Ashworth's (2003) analysis, written independently of this paper, reaches policy conclusions more consonant with those presented here. He assumes that voters face (exogenous) uncertainty concerning candidates' ideologies and that advertising allows candidates to provide information to voters. Advertising is financed by interest groups who have no interest in the ideology of the winning candidate, but do care about favors. As in this paper, candidates offer favors to extract contributions from their interest groups. In contrast to this paper, advertising expenditures are a discrete choice because there is a single voter and a fixed cost of informing him. Moreover, in the language of this paper, the direct benefits to candidates of holding office are infinitely large. While these assumptions yield different conclusions about the

[3] David Austen-Smith (1987) introduces directly informative advertising without the assumption of rational expectations. In his model, voters are assumed to have noisy perceptions of candidates' policy positions and campaign advertising sharpens these perceptions. Precisely how campaign advertising works is not explained, but an informational story is suggested. Michael Bailey (2002) develops an argument in support of campaign contributions under Austen-Smith's assumption. In Bailey's model, an incumbent and challenger sequentially choose positions in a multidimensional policy space. Campaign advertising can be selectively targeted to groups with different policy preferences and regular voters are assumed to be less informed about candidates' policies than special interest groups. This means that, without contributions, equilibrium policy choices will be biased away from average voters to those groups who are more informed because the latter are more responsive to policy promises. Bailey argues that contributions can discipline such behavior. A candidate whose opponent is biasing policy towards more informed voting blocs can use contributions to inform the uninformed of such behavior.

[4] In contrast to this paper, this uncertainty arises endogenously from randomization in parties' selection strategies.

nature of equilibrium with unrestricted contributions and the desirability of contribution limits, Ashworth shows that the voter would be strictly better off under a public financing system that funds the same set of candidates as in the laissez-faire.[5] This is because, as in this paper, favors undermine the effectiveness of campaign spending and so the same selection benefits can be obtained at a lower cost through taxation.

Prat (2002b) shows that, when advertising is indirectly informative, banning contributions may improve aggregate voter welfare. In his model, campaign contributions are good for voters in the sense that they provide information about competence, but bad in that they lead candidates to distort policy away from the median voter's ideal. Banning contributions can raise voters' aggregate welfare when the losses in terms of information about competence are smaller than the costs of policy distortion. This is different from our argument which stresses that there need be no such trade-off—banning contributions need not significantly impact the probability that competent candidates are elected. Moreover, while banning contributions might be desirable under the signalling view of campaign spending, its general implications for campaign finance policy are very different from those of this paper. For example, in a signalling model, offering candidates public financing would be a bad idea because it would just induce a pooling equilibrium and eliminate the sorting benefits of campaign spending.

II. The Model

A. *Overview*

The population consists of three groups of citizens—leftists, rightists, and swing voters. These groups differ in their ideology which is measured on a 0 to 1 scale. Leftists and rightists have ideologies 0 and 1, respectively. Swing voters have ideologies that are uniformly distributed on the interval $[m - \tau, m + \tau]$. Leftists and rightists constitute an equal fraction of the community, so that swing voters are the decisive group. Reflecting the fluid nature of these voters' attitudes, the ideology of the median swing voter is *ex ante* uncertain. Specifically, m is the realization of a random variable uniformly distributed on $[\frac{1}{2} - \varepsilon, \frac{1}{2} + \varepsilon]$, where ε is less than $\frac{1}{2} - \tau$.[6] The latter assumption guarantees that the ideologies of the swing voters are always between those of leftists and rightists.

The community must elect a representative. Candidates are put forward by two political parties: Party L—the leftist party, and Party R—the rightist party. Following the *citizen-candidate approach,* candidates are citizens and are characterized by their ideologies. Each party must select from the ranks of its membership, so that Party L always selects a leftist and Party R a rightist. However, candidates differ in their qualifications for office, denoted by q. They are either "qualified" ($q = 1$) or "unqualified" ($q = 0$). A qualified candidate, for example, may be one who has previously held elective office.[7] All citizens, including party members, prefer a qualified candidate. Thus parties will always select qualified candidates if they are available. The probability that each party can find a qualified candidate is σ.

Ignoring favors, a citizen with ideology i enjoys a monetary payoff from having a leader of ideology i' and qualifications q given by $\delta q - \beta|i - i'|$ where $|i - i'|$ is the *distance* from i to i'. The parameter δ measures the benefit of having a qualified candidate in office, while β measures the cost of having a leader with a different ideology. Leftists and rightists always prefer a candidate of their own ideology even if he is unqualified, implying that δ is less than β. Candidates have the same payoffs as citizens

[5] Ashworth's analysis allows for the possibility that one candidate (e.g., the incumbent) has a reputational advantage. Under his discrete choice assumption, if this advantage is sufficiently high, neither candidate advertises. In such circumstances, introducing public financing may actually be harmful and hence the caveat that the public system fund the same set of candidates as in the laissez-faire.

[6] The assumptions that swing voters are uniformly distributed over $[m - \tau, m + \tau]$ and that the ideology of the median swing voter is uniformly distributed over $[\frac{1}{2} - \varepsilon, \frac{1}{2} + \varepsilon]$ are not key to the argument. They are simply made to ensure that the probability of winning function derived below has a simple and tractable form.

[7] Broader interpretations of q are possible. It could measure any valence characteristic such as managerial competence, policy creativity, charisma, image, or looks. The significance of valence characteristics for candidate elections has been stressed by numerous authors. See Timothy Groseclose (2001) and Enriqueta Aragones and Thomas Palfrey (2002) for two interesting recent contributions.

except that the winning candidate enjoys a direct benefit of holding office r. This includes any salary and perks associated with the office as well as "ego rent."

Swing voters do not have perfect information about candidates, in the sense of not knowing whether each party's candidate is qualified. Such information could be acquired, but swing voters are not politically engaged and choose to remain "rationally ignorant." However, candidates can convey information concerning their qualifications via advertising. For example, they can inform voters about the prior elected offices they have held.[8] Swing voters cannot ignore such advertising because it is bundled with radio or television programming.

Campaign advertising is governed by the following rules. First, candidates can only advertise their own characteristics; i.e., whether they are qualified. This rules out negative advertising. Second, candidates can only advertise the truth. The idea is that candidates have records which reveal their qualifications and that candidates cannot lie about their records. These two assumptions imply that only qualified candidates can benefit from campaign advertising.[9] The advertising technology is such that if a candidate spends an amount C, his message reaches a fraction $\lambda(C) = C/(C + \alpha)$ of the population, where $\alpha > 0$.[10]

Candidates' advertising is financed by campaign contributions from interest groups. There are two such groups—a group of leftists that contributes to Party L's candidates and a group of rightists that contributes to Party R's. Each group constitutes a fraction γ of the population. Contributions are shared equally by group members and the interest groups behave so as to maximize the expected payoff of their representative members.

After he has been selected, each party's candidate, if qualified, requests a contribution from his interest group to get the word out to voters. The interest group agrees to a candidate's request if and only if it benefits it to do so. To obtain a larger contribution, a candidate may offer to implement policy favors. When a candidate provides a level of favors f each interest group member enjoys a monetary benefit $b(f)$ at the expense of a uniform monetary cost of f to every citizen. The function b is increasing, strictly concave, and satisfies $b(0) = 0$. In addition, it satisfies the conditions that $b'(0) \leq 1/\gamma$ and $b'(\delta) > 1$. The first condition implies that the aggregate benefits of the favors $\gamma b(f)$ are less than their aggregate cost f, while the second implies that interest group members' net benefit from favors $b(f) - f$ is increasing when f equals δ.

In terms of timing, it is assumed that candidates make their requests before they or their interest group knows the type of their opponent.[11] Needless to say, swing voters do not observe the interaction between candidates and interest groups and hence do not observe the favors a candidate has promised.

Parties choose the best candidate they can find. Qualified candidates approach their interest group and decide what contribution to request and how many favors to offer. Interest groups decide whether or not to accept candidates' offers. Partisans (i.e., leftists and rightists) always vote for the candidate put forward

[8] There is widespread evidence that higher campaign spending leads to greater candidate familiarity (see, for example, Gary Jacobson, 1997) and some evidence that it leads to greater familiarity with candidates' policy positions (see, for example, John Coleman and Paul Manna, 2000 and Kathleen Hall Jamieson, 2000). I am not aware of any studies directly investigating the relationship between campaign spending and voter knowledge of candidates' records (i.e., elected offices previously held, past accomplishments, etc.).

[9] This conclusion arises because there is only one possible difference between candidates and negative advertising is not permitted. However, the general conclusion that candidates with characteristics swing voters value should benefit more from advertising seems a natural implication of the informational perspective. Consistent with this, Jacobson (1989) shows that qualified candidates—defined as those who had previously held elective office—had higher levels of campaign spending and were more likely to win in U.S. House elections.

[10] Again, this specific functional form for the advertising technology is not key to the results and just helps produce a tractable probability of winning function.

[11] This assumption is made to simplify the argument. If interest groups know the type of the opposing party's candidate, they will be willing to contribute more to a candidate running against an unqualified than a qualified one. This is because the benefit to them of electing their own party's candidate is higher in the former case. This difference in contribution levels means that seeing an advertisement for a candidate provides information to voters about the likely type of his opponent. After all, a voter is more likely to see an advertisement for a candidate when he is running against an unqualified opponent. While it is perfectly possible to develop the argument taking this effect into account, it is an additional wrinkle that significantly complicates an already intricate analysis. Accordingly, the effect is assumed away here.

by the party representing their ideology. Swing voters, having possibly observed one or both candidates' advertisements, update their beliefs about candidates' qualifications and vote for the candidate who yields them the highest expected payoff.[12] All these behaviors are described in greater detail in the next subsection.

Throughout the analysis, we maintain the following additional assumptions on the parameter values.

ASSUMPTION 1: *(i)* $\tau \geq \varepsilon + \frac{\delta}{2\beta}$ *and (ii)* $\frac{\delta}{2\beta} \leq \varepsilon$.

The role of these will become apparent below.

B. *Details*

Behavior of swing voters.—Working backwards, we begin with the behavior of swing voters. Consider the position of a swing voter with ideology i at the time of voting. He may have seen advertisements from both, one, or neither candidate. Let (I_L, I_R) denote his information where $I_K = 1$ if he has seen an advertisement from Party K's candidate and $I_K = \varnothing$ if not. Let $\rho_K(I_L, I_R)$ denote his belief that Party K's candidate is qualified conditional on informational state (I_L, I_R). Since only qualified candidates advertise, both $\rho_L(1, I_R)$ and $\rho_R(I_L, 1)$ must equal 1. The beliefs $\rho_L(\varnothing, I_R)$ and $\rho_R(I_L, \varnothing)$ will be derived as part of the equilibrium. The voter will also have beliefs about the amount of favors that each party's candidate, if qualified, will provide to the interest group. Let $\tilde{f}_K(I_L, I_R)$ denote the amount of favors that he believes that Party K's candidate, if qualified, will implement. In equilibrium, these beliefs must be consistent with the strategies that qualified candidates are employing.

Using this notation, the voter's expected payoff from Party L's candidate being elected when he has information (I_L, I_R) is $\rho_L(I_L, I_R)(\delta - \tilde{f}_L(I_L, I_R)) - \beta i$, while that from Party R's candidate is $\rho_R(I_L, I_R)(\delta - \tilde{f}_R(I_L, I_R)) - \beta(1 - i)$. Letting $i^*(I_L, I_R)$ be the ideology of the indifferent voter, we have that

$$(1) \quad i^*(I_L, I_R) = \frac{1}{2} + \frac{\rho_L(I_L, I_R)(\delta - \tilde{f}_L(I_L, I_R)) - \rho_R(I_L, I_R)(\delta - \tilde{f}_R(I_L, I_R))}{2\beta}.$$

If i is less than $i^*(I_L, I_R)$, the swing voter will vote for Party L's candidate, while if i exceeds $i^*(I_L, I_R)$ he will vote for Party R's. In standard terminology, $i^*(I_L, I_R)$ is the *cut-point* for swing voters with information (I_L, I_R).

The assumption that swing voters' ideologies are uniformly distributed on $[m - \tau, m + \tau]$ implies that when the median swing voter has ideology m and $i^*(I_L, I_R)$ lies between $m - \tau$ and $m + \tau$, the fraction of swing voters in informational state (I_L, I_R) voting for Party L's candidate is $\frac{1}{2} + (i^*(I_L, I_R) - m)/2\tau$. Assumption 1(i) implies that $i^*(I_L, I_R)$ lies between $m - \tau$ and $m + \tau$ for all m when the two parties' qualified candidates are expected to implement the same level of favors.

Election probabilities.—With this understanding of voting behavior, the probability that

[12] Therefore, we are assuming "sincere" or "naive" voting. It should be noted that in an election with a finite number of voters with private information, such behavior may not be fully rational. In particular, a voter who has not observed advertisements from one or more candidate may sometimes be better off not voting for the candidate who yields him the highest expected payoff (Timothy Fedderson and Wolfgang Pesendorfer, 1996, 1997). To illustrate, suppose (contrary to the model) that swing voters knew that the median swing voter had ideology ½ and consider a voter with ideology slightly to the left of this. If this voter has only seen an advertisement from Party R's candidate, he may obtain a higher expected payoff from Party R's candidate. However, the only circumstances under which this voter's vote would be pivotal would be if Party L's candidate were also qualified (otherwise, Party R's candidate would obtain more votes) and in this case the voter would actually prefer Party L's candidate. Accordingly, he should actually vote for Party L's candidate. In our model, there are a continuum of voters and hence such considerations do not arise. Nonetheless, it would (in principle) be possible to assume a finite number of swing voters and carefully model the equilibrium of the voting game. I have not taken this approach for two reasons. First, it would substantially complicate the development of the argument. In particular, the relationship between election outcomes and campaign spending is likely to be too complex to permit a clean analysis of the contribution game. Second, a core assumption of the model is that the ideology of the median swing voter is *ex ante* uncertain and this not only complicates the task of characterizing the rational voting equilibrium but also undermines the forces that lead voters to vote against their payoff-maximizing candidate. Thus, in the above example, when the ideology of the median swing voter is uncertain, the voter's vote could be pivotal even when Party L's candidate is unqualified if the median voter's ideology is to his left. Accordingly, voting for Party R's candidate may indeed be the best strategy.

each party's candidate will win can be computed. Suppose first that the two candidates are qualified and that they receive contributions C_L and C_R. Then, when the median swing voter has ideology m, the fraction of swing voters voting for Party L's candidate is

$$(2)\quad \left(\frac{1}{2}+\frac{i^*(1,1)-m}{2\tau}\right)\lambda(C_L)\lambda(C_R)$$
$$+\left(\frac{1}{2}+\frac{i^*(1,\varnothing)-m}{2\tau}\right)\lambda(C_L)(1-\lambda(C_R))$$
$$+\left(\frac{1}{2}+\frac{i^*(\varnothing,1)-m}{2\tau}\right)(1-\lambda(C_L))\lambda(C_R)$$
$$+\left(\frac{1}{2}+\frac{i^*(\varnothing,\varnothing)-m}{2\tau}\right)(1-\lambda(C_L))(1-\lambda(C_R)).$$

The first term is those who have seen both candidates' advertisements; the second those who have seen only the advertisement of Party L's candidate; etc.

Party L's candidate will win if he gets at least half the swing voters' vote. From (2), this requires that m is less than $m^*(C_L, C_R)$ where

$$(3)\quad m^*(C_L, C_R) = i^*(1,1)\lambda(C_L)\lambda(C_R)$$
$$+\, i^*(1,\varnothing)\lambda(C_L)(1-\lambda(C_R))$$
$$+\, i^*(\varnothing,1)(1-\lambda(C_L))\lambda(C_R)$$
$$+\, i^*(\varnothing,\varnothing)(1-\lambda(C_L))(1-\lambda(C_R)).$$

Since m is uniformly distributed on $[½ - \varepsilon, ½ + \varepsilon]$, the probability that Party L's candidate wins is

$$(4)\quad \pi(C_L, C_R) = \begin{cases} 0 & \text{if } m^*(C_L, C_R) < \frac{1}{2} - \varepsilon \\ \frac{m^*(C_L, C_R) + \varepsilon - 1/2}{2\varepsilon} & \text{otherwise.} \\ 1 & \text{if } m^*(C_L, C_R) > \frac{1}{2} + \varepsilon \end{cases}$$

If only Party L's candidate is qualified, he wins with probability $\pi(C_L, 0)$. Similarly, if only Party R's candidate is qualified, the probability that Party L's candidate wins is $\pi(0, C_R)$. If both candidates are unqualified, then no contributions are given and Party L's candidate wins with probability $\pi(0, 0)$.

Campaign contributions.—We now turn to the contributions received by qualified candidates. Each qualified candidate, not knowing his opponent's type, must decide the level of favors to offer its interest group and how much to ask it for. Each interest group must decide whether to accept the request. If it does so, it hands over the contribution and the candidate, if elected, will implement the agreed level of favors. If it does not, then it makes no contribution. Neither candidates nor interest groups observe the type of the opposing party's candidate at the time of contributing.

Recalling that C_K denotes the contribution a qualified candidate of Party K receives from his interest group and f_K the amount of favors he promises, interest group L's expected payoff from accepting Party L's candidate's request is

$$(5)\quad \sigma[\pi(C_L, C_R)(\beta + b(f_L) - f_L + f_R) + \delta - f_R]$$
$$+ (1-\sigma)[\pi(C_L, 0)(\beta + \delta + b(f_L) - f_L)]$$
$$- \beta - \frac{C_L}{\gamma}.$$

If the interest group does not accept the request, it would make no contributions and obtain a payoff:

$$(6)\quad \sigma[\pi(0, C_R)(\beta + f_R) + \delta - f_R]$$
$$+ (1-\sigma)[\pi(0,0)(\beta + \delta)] - \beta.$$

Thus, in order for the interest group to accept the request, (5) must exceed (6). Similar remarks apply to interest group R.

When Party L's candidate's request is accepted, his expected payoff is:

$$(7)\quad \sigma[\pi(C_L, C_R)(r + \beta + f_R - f_L) + \delta - f_R]$$
$$+ (1-\sigma)\pi(C_L, 0)(r + \beta + \delta - f_L) - \beta.$$

Party L's candidate's request (C_L, f_L) maximizes his expected payoff subject to the constraint that the interest group will agree to it. Thus, (C_L, f_L) maximizes (7) subject to the constraint that (5) exceeds (6). Similarly, for the request made by Party R's candidate.

C. *Political Equilibrium*

A *political equilibrium* consists of (i) candidate requests $(C_K, f_K)_{K\in\{L,R\}}$; (ii) voter belief functions $(\rho_K(I_L, I_R), \tilde{f}_K(I_L, I_R))_{K\in\{L,R\}}$ describing swing voters' beliefs concerning the likelihood that candidates are qualified and the favors that qualified candidates will implement; and (iii) cut-points for the swing voters $(i^*(I_L, I_R))$ describing their voting behavior as a function of the information they have received in the campaign. Candidate strategies must be mutual best responses given voter behavior and the constraint of interest group acceptance. Voter beliefs must be consistent with candidates' strategies and voter behavior must be consistent with their beliefs.

The analysis will focus on political equilibria that are *symmetric* in the sense that candidates make the same request to their interest groups [i.e., $(C_L, f_L) = (C_R, f_R) = (C, f)$]. In such an equilibrium, if qualified candidates receive contributions ($C > 0$), Bayes' Rule implies that voters beliefs about unadvertised candidates must satisfy:

$$(8)\quad \rho_L(\emptyset, \emptyset) = \rho_R(\emptyset, \emptyset) = \rho_L(\emptyset, 1) = \rho_R(1, \emptyset) = \frac{\sigma[1-\lambda(C)]}{\sigma[1-\lambda(C)] + (1-\sigma)}.$$

Thus, the probability that voters assign to an unadvertised candidate being qualified is independent of both his party affiliation and the information they have received about his opponent. Moreover, voters beliefs about the favors that qualified candidates will implement must satisfy:

$$(9)\qquad \tilde{f}_L(I_L, I_R) = \tilde{f}_R(I_L, I_R) = f.$$

If qualified candidates do not advertise (so that $C = f = 0$) then matters are more complicated because the event of observing a candidate's advertisement does not arise along the equilibrium path. Thus, while Bayes' Rule implies that $\rho_L(\emptyset, \emptyset)$ and $\rho_R(\emptyset, \emptyset)$ must equal σ and that $\tilde{f}_L(\emptyset, \emptyset)$ and $\tilde{f}_R(\emptyset, \emptyset)$ must equal 0, it has no implications for $\rho_L(\emptyset, 1)$ and $\rho_R(1, \emptyset)$ or for $\tilde{f}_L(I_L, I_R)$ and $\tilde{f}_R(I_L, I_R)$ for any $(I_L, I_R) \neq (\emptyset, \emptyset)$. We will focus on equilibria that have the property that when $(C, f) = (0, 0)$, $\rho_L(\emptyset, 1)$ and $\rho_R(1, \emptyset)$ are σ and $\tilde{f}_L(I_L, I_R)$ and $\tilde{f}_R(I_L, I_R)$ are 0 for all (I_L, I_R).[13]

This assumption rules out equilibria with no advertising supported by the out-of-equilibrium beliefs that any candidate who advertises must have promised an amount of favors in excess of δ. It also implies that (8) and (9) hold even when $(C, f) = (0, 0)$. Thus, voters' beliefs about the likelihood that an unadvertised candidate is qualified may be summarized by a single variable ρ that must satisfy (8) in equilibrium. Moreover, their beliefs about favors are just given by f, so that it is not necessary to employ a separate notation to distinguish their beliefs from the actual levels promised.

Turning to voter behavior, (1), (8), and (9) imply that in a symmetric equilibrium, the cut-point for symmetrically informed swing voters is just ½ [i.e., $i^*(1, 1) = i^*(\emptyset, \emptyset) = ½$]. For asymmetrically informed voters, the cut-points are given by:

$$(10)\qquad i^*(1, \emptyset) = 1 - i^*(\emptyset, 1) = \frac{1}{2} + \frac{(1-\rho)(\delta - f)}{2\beta}.$$

Voting behavior may therefore be described by a single variable $\xi = i^*(1, 0) - ½$, measuring the size of the interval of swing voters who are induced to vote for a candidate by seeing him advertise and nothing from his opponent. This variable measures the *effectiveness* of campaign advertising in inducing swing voters to switch from their natural allegiances.

Using this notation, equation (3) may be written

$$(11)\quad m^*(C_L, C_R) = \tfrac{1}{2} + \xi(\lambda(C_L) - \lambda(C_R)).$$

[13] Henceforth, when we refer to a symmetric political equilibrium we will mean one where the beliefs satisfy this property. Note also that equilibria in which $C = f = 0$ and $\rho_L(\emptyset, 1)$ and $\rho_R(1, \emptyset)$ are not equal to σ or $\tilde{f}_L(I_L, I_R)$ and $\tilde{f}_R(I_L, I_R)$ are not equal to 0 for $(I_L, I_R) \neq (\emptyset, \emptyset)$ are not *sequential equilibria* (David Kreps and Robert Wilson, 1982).

Since Assumption 1(ii) implies that $m^*(C_L, C_R)$ must always lie between ½ − ε and ½ + ε, the probability of winning function is given by:

$$\pi(C_L, C_R) = \frac{1}{2} + \frac{\xi}{2\varepsilon}(\lambda(C_L) - \lambda(C_R)). \tag{12}$$

This simple and tractable form of the probability of winning function is a consequence of our assumptions concerning the distribution of swing voters' ideal points. The expression nicely illustrates how ξ determines the productivity of campaign spending. In what follows, we recognize the critical role of ξ by writing the probability of winning function as $\pi(C_L, C_R; \xi)$.

It follows from the above discussion that a symmetric political equilibrium may be completely described by four variables (C, f, ξ, ρ); C is the contribution given by interest groups to qualified candidates; f is the level of favors these candidates promise to interest groups to get their contributions; ξ is the effectiveness of advertising; and ρ is the probability voters assign to unadvertised candidates being qualified.

III. Equilibrium with Unrestricted Contributions

As the first step towards characterizing equilibrium, we study the offers that candidates will make to their interest groups, taking as given the effectiveness of campaign advertising ξ. Let $U(C_L, f_L, C, f; \xi)$ be the expected utility of Party L's candidate if he is qualified and offers his interest group (C_L, f_L) when his qualified opponent offers his group (C, f); that is,

(13)

$$U = \sigma[\pi(C_L, C; \xi)(r + \beta + f - f_L) + \delta - f] + (1 - \sigma)\pi(C_L, 0; \xi)(r + \beta + \delta - f_L) - \beta.$$

This is decreasing in f_L and increasing in C_L when advertising is effective.

Now let $G(C_L, f_L, C, f; \xi)$ denote the gain (gross of the contribution) to the leftist interest group from accepting the offer of Party L's candidate; that is,

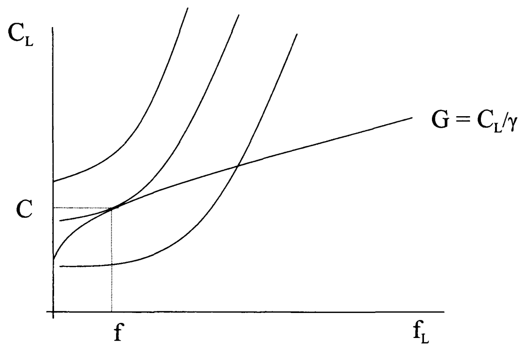

Figure 1. The Candidate's Problem

(14)

$$G = \sigma(\pi(C_L, C; \xi) - \pi(0, C; \xi))(\beta + f) + (1 - \sigma)(\pi(C_L, 0; \xi) - \tfrac{1}{2})(\beta + \delta) + (b(f_L) - f_L)(\sigma\pi(C_L, C; \xi) + (1 - \sigma)\pi(C_L, 0; \xi)).$$

Provided that advertising is effective, this gain is positive even when the interest group is promised no favors. This reflects the interest group's pure policy preference for a qualified candidate who shares its ideology. The gain is increasing in favors as long as b' exceeds 1 and increasing in the size of the contribution when advertising is effective.

Party L's candidate will optimally demand a contribution from his interest group sufficient to exhaust its gain from contributing. The level of favors will balance the gains of the interest group to the candidate's personal policy cost. In equilibrium, (C, f) must solve the problem:

$$\max_{(C_L, f_L) \in \Re_+^2} U(C_L, f_L, C, f; \xi) \quad \text{s.t. } G(C_L, f_L, C, f; \xi) \geq \frac{C_L}{\gamma}. \tag{15}$$

Figure 1 presents a diagrammatic analysis of problem (15). The family of convex curves represents the candidate's indifference map. The candidate dislikes favors and likes contributions, so that moving in a northwesterly direction increases the candidate's utility. The convexity of the indifference curves follows from the fact that the function $U(\cdot, \cdot, C, f; \xi)$ is quasi-concave. The concave curve is the set of (C_L, f_L) pairs with the property that the interest group's gain $G(C_L, f_L, C, f; \xi)$ exactly equals the per capita contribution C_L/γ. The constraint set for problem (15) is the set of pairs on or below this curve. As drawn, this is a convex set. This will necessarily be the case when ξ is small and will typically be true more generally.[14] In equilibrium, the optimal choice for the candidate will be $(C_L, f_L) = (C, f)$ as illustrated in Figure 1.

Turning to the effectiveness of campaign advertising, we know from (10) that, in equilibrium, ξ is given by:

$$\xi = \frac{(1-\rho)(\delta - f)}{2\beta}. \tag{16}$$

Effectiveness depends negatively on the level of favors and voters' beliefs concerning the likelihood that an unadvertised candidate is qualified. Using (8) and the functional form for λ, these beliefs are given by:

$$\rho = \frac{\sigma\alpha}{\alpha + C(1-\sigma)}. \tag{17}$$

Note that ρ is decreasing in C, reflecting the logic that when contributions are plentiful, not having observed a candidate advertise increases the likelihood that he is unqualified.

We may conclude that (C, f, ξ, ρ) is an equilibrium if and only if (i) (C, f) solves problem (15) given ξ and (ii) ξ and ρ satisfy equations (16) and (17). We can substitute the expression for ρ from (17) into the expression for ξ in (16) to obtain

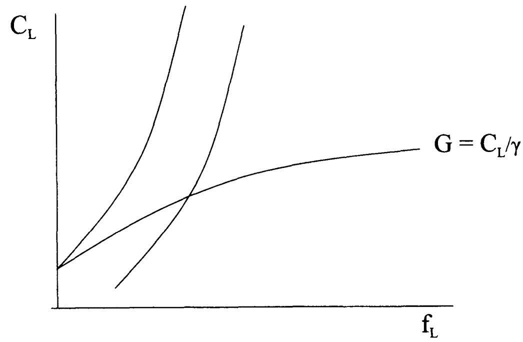

FIGURE 2. POSITION-INDUCED CONTRIBUTIONS

$$\xi = \frac{(1-\sigma)(\alpha + C)(\delta - f)}{2\beta(\alpha + C(1-\sigma))}. \tag{18}$$

An equilibrium can then be defined more compactly as a triple (C, f, ξ) such that (i) (C, f) solves problem (15) given ξ and (ii) ξ satisfies equation (18). The associated equilibrium beliefs may then be recovered from (17). Intuitively, equilibrium requires first that the offers qualified candidates make to interest groups must be optimal for them given the effectiveness of campaign advertising, and second that the effectiveness of advertising must be consistent with the amount of contributions qualified candidates receive and the favors they promise.

We impose an assumption that guarantees that equilibrium does involve candidates providing favors. This is:

ASSUMPTION 2: $\left(\frac{\gamma(\beta + (1-\sigma)\delta)}{2} + \alpha\right)^2 < \frac{(1-\sigma)\delta\alpha\gamma}{4\beta\varepsilon}\{(b'(0) - 1)r + \beta b'(0) + (1-\sigma)\delta b'(0)\}.$

Assumption 2 rules out the possibility illustrated in Figure 2, in which contributions are purely "position-induced." Effectively, it guarantees that the candidate's indifference curve is flatter than the contribution curve at zero favors. It will necessarily be satisfied for sufficiently high r and, for given r, is more likely to be satisfied the larger the size of the interest groups.

[14] The constraint set will be convex if the extra contributions that can be extracted from a given increase in favors decreases with the level of favors. There are two forces working in this direction. First, the marginal benefit of favors is decreasing. Second, the marginal impact of contributions on the probability of winning is decreasing in the level of contributions. Against this, we have that the marginal benefit of contributing is higher at a higher level of favors. In Coate (2002), I solve explicitly for the curve describing the boundary of the constraint set and find the conditions under which it is concave.

We now have:

PROPOSITION 1: *Suppose that Assumptions* 1 *and* 2 *are satisfied. Then, in any equilibrium* (C, f, ξ), *candidates offer to implement favors for their interest groups to extract larger contributions. The contributions they receive allow them to defeat unqualified opponents with a probability between* ½ *and* 1 [*i.e.,* $\pi(C, 0; \xi) \in (\frac{1}{2}, 1)$]. *The level of favors promised is less than the gain from having a qualified candidate* (*i.e.,* $f < \delta$).

Thus, with unrestricted contributions, qualified candidates will offer favors to extract more contributions from their supporters. The campaign advertising these contributions finance gives them an electoral advantage over their unqualified opponents. Campaign contributions therefore play the social role of raising the likelihood of qualified leaders. However, the favors qualified candidates implement reduce the benefits to noninterest group members from electing them. Moreover, any benefit of favors to interest group members is at least partially dissipated through their contributions. Indeed, it may well be the case that interest group members have a lower payoff in equilibrium than partisans who do not belong to interest groups.[15]

The problem with the unrestricted equilibrium is not so much that policy favors are made. This is just a transfer, albeit one which may involve some deadweight loss. Rather, *the fundamental problem is that favors make campaign advertising less effective.* This reduces the social benefit of any given level of campaign spending, in the sense that qualified candidates are less likely to defeat their unqualified opponents. Or, to put it another way, the cost of generating any given electoral advantage for qualified candidates is raised by the presence of favors.

This difficulty with laissez-faire emerges most clearly when the direct benefits from holding office are very large. Candidates are then desperate to obtain contributions and willing to promise large amounts of favors. But the level of favors must be less than the benefits of being qualified if campaign advertising is to be effective. Equilibrium must therefore involve a low level of advertising effectiveness to dampen candidates' propensity to offer favors. Thus, as the benefits from holding office become larger and larger, the effectiveness of campaign advertising becomes smaller and smaller.

PROPOSITION 2: *Suppose that Assumption* 1 *is satisfied and, for all r, let* $(C(r), f(r), \xi(r))$ *be the equilibrium* (*or an equilibrium*) *that would arise with unrestricted contributions when the direct benefits from holding office are r. Then,*

$$\lim_{r \to \infty} (C(r), f(r), \xi(r)) = \left(\frac{\gamma(b(\delta) - \delta)}{2}, \delta, 0\right).$$

Proposition 2 implies that the equilibrium probability that a qualified candidate defeats an unqualified one tends to ½ as the direct benefits from holding office become larger [i.e., $\lim_{r \to \infty} \pi(C(r), 0; \xi(r)) = \frac{1}{2}$]. However, the level of contributions remain positive, converging to the expected value to interest groups of the favors to be provided. Accordingly, *while resources are expended on campaign advertising, these resources do not make qualified candidates more likely to be elected.* This dramatically illustrates how the social benefit of campaign spending is undercut by favors.[16]

[15] The assumption that candidates make take-it-or-leave-it offers to their interest groups implies that interest group members are reduced to the utility level that they would have if their party's qualified candidate were to receive no contributions and were to provide no favors. Relative to partisans who are not interest group members, they obtain an expected gain of $\sigma f\{\sigma(1 - \pi) + \pi(1 - \sigma)\}$ in terms of lower favors and suffer an expected loss of $\sigma(\pi - \frac{1}{2})(\beta + (1 - \sigma)\delta)$ in terms of lower policy benefits, where π is the equilibrium probability that a qualified candidate defeats an unqualified one. Thus, interest group members are better off than noninterest group members only when $f\{\sigma(1 - \pi) + \pi(1 - \sigma)\}$ exceeds $(\pi - \frac{1}{2})(\beta + (1 - \sigma)\delta)$. When interest group members are worse off, the question as to why individuals would choose to belong to interest groups is natural. This question arises in any model of interest groups in which groups are providing purely "position-induced" contributions because, effectively, interest group members are providing a public good for like-minded citizens. The usual assumption is that there is some (unmodeled) private benefit of membership that offsets the net costs of the political activity (Mancur Olson, 1965). For example, joining a union may provide higher wages and superior job benefits even when the political benefits the union obtains for its members are offset by the contributions they make. Alternatively, joining an industry association may yield benefits in terms of information and coordination.

[16] There are parallels between Proposition 2 and a result obtained by Prat (2002a) in a model of indirectly informa-

IV. Campaign Finance Policy

We now consider the potential of campaign finance policy to improve citizens' welfare. We study policies that impose a limit l on the amount of money an interest group can contribute but provide matching public financing at rate s. Thus, if a candidate raises C in private contributions, he receives a matching grant of sC from public sources. This type of policy ensures that public funds only go to those candidates who have raised private contributions, thereby avoiding the waste associated with giving money to unqualified candidates. Public funding is financed by a head tax T levied on all citizens.

By analogous reasoning to that in Section III, an equilibrium under policy (l, s) is a triple (C, f, ξ) such that (C, f) solves the problem

$$\max_{(C_L, f_L)\in[0,l]\times\Re_+} U((1+s)C_L, f_L, (1+s)C, f; \xi) \quad (19)$$

$$\text{s.t. } G((1+s)C_L, f_L, (1+s)C, f; \xi) \geq \frac{C_L}{\gamma},$$

and

$$\xi = \frac{(1-\sigma)(\alpha + C(1+s))(\delta - f)}{2\beta(\alpha + C(1+s)(1-\sigma))}. \quad (20)$$

If the equilibrium is (C, f, ξ), the head tax must satisfy $T = 2\sigma sC$ to meet the expected costs of public financing. A policy (l, s) is a pure contribution limit policy if $s = 0$ and involves public financing when $s > 0$. We first study the potential of pure contribution limits and then consider the additional benefits that public financing can provide. Finally, we briefly discuss the problem of designing a campaign finance policy to maximize aggregate utility.

A. Contribution Limits

We begin with the following preliminary observation.

LEMMA 1: *Suppose that Assumptions* 1 *and* 2 *are satisfied and let* (C^*, f^*, ξ^*) *be an equilibrium with unrestricted contributions. Then, if* (C', f', ξ') *is an equilibrium under the policy* $(l', 0)$ *which satisfies* (*i*) $\pi(C^*, 0; \xi^*) \approx \pi(C', 0; \xi')$ *and* (*ii*) $f' < f^*$, (C', f', ξ') *Pareto-dominates* (C^*, f^*, ξ^*).

Thus if introducing a limit does not appreciably change the probability a qualified candidate defeats an unqualified one and reduces the level of favors, it will create a Pareto improvement. That these conditions imply that regular citizens are better off seems natural. That they imply that interest group members are better off is less obvious. The key is to note that the *equilibrium* payoff of interest group members is decreasing in f. Intuitively, this is because interest group members pay for their own favors up front with their contributions and must also share the burden of favors granted to the other interest group.

Combining Lemma 1 with Proposition 2, immediately yields:

PROPOSITION 3: *Suppose that Assumption* 1 *is satisfied and, for all r, let* $(C(r), f(r), \xi(r))$ *be the equilibrium* (*or an equilibrium*) *that would arise with unrestricted contributions when the direct benefits from holding office are r. Then, if r is sufficiently large,* $(C(r), f(r), \xi(r))$ *is Pareto dominated by the equilibrium that would emerge if contributions were simply banned* (*i.e., l were set equal to* 0).

If contributions were banned then no favors would be promised and the probability that a qualified candidate defeats an unqualified one is

tive advertising. In Prat's model the policy space is multidimensional and there are multiple interest groups, but these groups only contribute to the incumbent. Incumbent politicians differ in competence and choose policy positions to maximize their likelihood of winning. With some probability, voters will be perfectly informed of the incumbent's competence and policy position; otherwise they only observe the incumbent's campaign spending. This makes a competent incumbent more willing to trade policy for contributions and induces a separating equilibrium wherein only competent incumbents receive campaign contributions. From the viewpoint of this paper, the interesting thing is that when voters only observe the incumbent's campaign spending they must infer the degree to which the incumbent has biased policy in order to get contributions. The magnitude of this policy bias then determines the effectiveness of campaign spending. When the probability that voters are uninformed is large, the magnitude of the bias is almost sufficient to dissipate the benefits of competence and campaign spending is close to ineffective.

just ½. The result then follows from the fact that, with unrestricted contributions, as the benefits from holding office become infinitely large, the probability that a qualified candidate defeats an unqualified one approaches ½ while the level of favors remains strictly positive.

When the benefits from holding office are only moderate, *banning* contributions could lead to a significant reduction in the probability that qualified candidates win and hence the above argument does not apply. However, *limiting* contributions need not necessarily reduce the probability that qualified candidates win, in which case a similar logic would imply that limits could be Pareto improving. The idea is that limiting contributions reduces favors and thereby raises the effectiveness of advertising, so that even though there is less campaign spending, the probability that a qualified candidate defeats an unqualified one is maintained.[17]

Unfortunately, it is difficult to find simple sufficient conditions under which there exists a Pareto-improving contribution limit (other than that r be large enough).[18] The difficulty reflects the fact that not only must limiting contributions increase the effectiveness of campaign advertising but, in addition, the increase in the effectiveness of advertising must be sufficient to offset the reduction in the total amount of advertising following the limit. Even the former requirement is a little tricky because [as is clear from (18)] the effectiveness of advertising is determined not only by the level of favors but also the level of spending. Intuitively, lower levels of spending reduce advertising effectiveness, because not seeing an advertisement is less likely to mean that a candidate is unqualified.

The bottom line is that, while contribution limits can create Pareto improvements, they do have some drawbacks. By reducing spending, they reduce the fraction of the population who are exposed to advertising. In addition, they reduce the negative signal from being unadvertised which works against the increase in advertising effectiveness stemming from reduced favors. The existence of these drawbacks means that an unambiguous case for limits can only be made when the direct benefits from holding office are very large.

B. *Contribution Limits and Public Financing*

The drawback of contribution limits as a remedial policy, suggests the desirability of supplementing limits with public financing. Public funds could substitute for the reduction in private contributions caused by limits. Since public funds are tax financed, as opposed to favor financed, this infusion of money has no negative consequences for the effectiveness of campaign spending. Effectively, clean public money replaces tainted private money. This intuition is confirmed in our next result which establishes the general possibility of Pareto improvements when public financing is available.

PROPOSITION 4: *Suppose that Assumptions 1 and 2 are satisfied and let* (C^*, f^*, ξ^*) *be an equilibrium with unrestricted contributions. Then, there exists a campaign finance policy* (l', s') *and an equilibrium* (C', f', ξ') *under* (l', s') *such that* (C', f', ξ') *Pareto-dominates* (C^*, f^*, ξ^*).

To prove this result, we consider the class of policies (l, s) satisfying two requirements. First, interest groups are willing to contribute l to qualified candidates in exchange for no favors. Second, when they do so, the probability that a qualified candidate defeats an unqualified one is exactly the same as in the unrestricted equilibrium. Under any such policy, total campaign spending is lower than in the unrestricted case because the lack of favors makes campaign spending more effective. This implies that *aggregate utility* is greater than in the unrestricted equilibrium because the social benefits of candidate selection are obtained at a lower resource cost. However, this does not necessarily imply Pareto gains, because the way in which this spending is financed has changed. Under a policy in this class, interest group members are worse off than partisans who do not belong to interest groups because they bear a larger share of the costs of campaign advertising. They both

[17] This idea has been investigated by Thomas Stratmann (2002), who exploits variation in campaign finance laws across the United States, to test whether campaign expenditures are more productive in states that limit contributions. Interestingly, he finds that the answer is yes.

[18] A detailed analysis can be found in Coate (2002). Two numerical examples of the model are provided in which Pareto-improving contribution limits exist even when the direct benefits of holding office are relatively modest ($r = 2\beta$).

contribute l and pay the head tax necessary to finance public funding. As noted earlier, in the unrestricted equilibrium, interest group members may be better or worse off than regular citizens depending upon the level of favors.

When interest group members are worse off in the unrestricted equilibrium than noninterest group members, we can find a policy in our class that makes interest group members at least as well off and makes regular citizens strictly better off. The key is to note that by successively lowering l and raising s we can make the share of the spending borne by interest group members become as close as we like to that borne by regular citizens. Thus, since interest group members bear a greater share of more spending in the unrestricted equilibrium, it is possible to find a subsidy level s that makes them as well off as in the status quo. At such a subsidy level, regular citizens must be better off because aggregate utility is higher.

When interest group members are better off in the unrestricted equilibrium than noninterest group members, it may not be possible to find a policy in our class that compensates them. However, it turns out that in this case the level of favors in the unrestricted equilibrium must be sufficiently high that *all* citizens would be better off if contributions were simply banned.[19] The gains from reduced favors offset the losses associated with a smaller probability that the elected leader is qualified. Thus, it remains possible to find a Pareto-improving policy.

C. *Optimal Campaign Finance Policy*

While Proposition 4 establishes the possibility of finding a Pareto-improving policy, it does not give any guidance about how a regulatory authority might go about designing a campaign finance policy. In this regard, the following result is comforting:

PROPOSITION 5: *Suppose that Assumptions 1 and 2 are satisfied and let (C^*, f^*, ξ^*) be an equilibrium with unrestricted contributions. Then, if (l, s) is any campaign finance policy such that $l < C^*$ and $l(1 + s) = C^*$, there exists an equilibrium (C, f, ξ) under (l, s) such that aggregate utility is higher under (C, f, ξ) than under (C^*, f^*, ξ^*).*

Thus, if a regulatory authority were to simply introduce a campaign finance policy that limits private contributions below their laissez-faire level but preserves the level of spending via public financing, the policy has the potential of improving aggregate utility. This is because there exists an equilibrium under such a policy that involves both a lower level of favors and qualified candidates being elected with higher probability.

Finding the campaign finance policy that will lead to the maximal increase in aggregate utility requires a regulatory authority to have more information on the fundamentals. First, the policy (l, s) must be such as to completely eliminate favors. This requires that l be sufficiently small that interest groups will contribute it without being promised anything in return. Second, the aggregate level of campaign spending $l(1 + s)$ must appropriately balance social benefits and costs. Letting $\pi(l(1 + s))$ denote the probability that a qualified candidate defeats an unqualified opponent given spending $l(1 + s)$, this amounts to the requirement that

$$(21)\quad 2\sigma(1-\sigma)\pi'(l(1+s)) \times [\delta - \eta\beta\varepsilon 2(2\pi(l(1+s)) - 1)] = 2\sigma,$$

where η is the fraction of swing voters in the population. The left-hand side is the marginal social benefit of providing each party's qualified candidate with an additional unit of spending and the right-hand side is the marginal social cost. The marginal social cost is 2σ because each party puts forward a qualified candidate with probability σ. The marginal social benefit is multiplied by $2\sigma(1 - \sigma)$ because spending only has a social benefit when one party's candidate is qualified. If both candidates are qualified, spending is socially wasteful. When only one candidate is qualified, spending is socially beneficial to the extent that it raises the probability that this candidate wins and this is measured by the term $\pi'(l(1 + s))$. The benefits from raising this probability are given by the term in the square brackets. There are

[19] As noted in footnote 10, interest group members have a higher payoff than partisans who do not belong to interest groups if $f(\sigma + \pi(1 - 2\sigma))$ exceeds $(\pi - ½)(\beta + (1 - \sigma)\delta)$ where π is the probability that a qualified candidate defeats an unqualified one.

two offsetting effects. On the one hand, all citizens gain from having a more qualified leader and the extent of this gain is measured by δ. On the other hand, if the qualified candidate is more likely to win, the expected divergence between the ideology of the winning candidate and that of the median swing voter is increased. The extent of this loss is measured by $\eta\beta\varepsilon 2(2\pi - 1)$. Using (21), it can be shown that the optimal level of campaign spending is increasing in δ and decreasing in β, ε, and η. In addition, if η is less than $2/3$, the optimal level of campaign spending is also decreasing in σ.[20]

V. Discussion

The purpose of this section is to highlight some of the key assumptions of the model and briefly discuss how changing them would impact the argument. We begin with the assumption that the policy favors that candidates provide for their interest groups are perfectly targeted private transfers or exclusive services, as distinct from policy changes with broader beneficial consequences. To illustrate the distinction, a candidate may reward contributors associated with a particular industry with a special tax break for that industry or by, say, a general weakening of the enforcement of environmental regulations. The former policy only benefits the contributors, while the latter might benefit industrialists more generally. In the latter case, eliminating policy favors will clearly harm the noncontributing industrialists who would have benefited from the laxer environmental regulations without having to pay for them via contributions. Thus, campaign finance policy will be unlikely to be Pareto improving. Moreover, any noncontributing industrialists who were swing voters would not be turned off by the realization that a candidate had promised this type of favor—to the contrary, they would be more likely to vote for him! Thus, the negative impact of favors on the effectiveness of advertising would be dampened. Nonetheless, so long as the policy favors benefit only a relatively narrow group of citizens, the basic logic of the argument applies and campaign finance policy will have the potential to increase aggregate utility.[21]

A further assumption of the model is that the benefits of holding office are the same for all candidates. Since these benefits are partially determined by the ego-rents stemming from holding office, it is natural to expect them to vary across candidates. If candidates are heterogeneous in this respect, qualified candidates with higher r will raise more money and provide more favors, making them less attractive candidates from the viewpoint of swing voters. This, in turn, could mean that very large advertising campaigns might backfire. Voters who had seen multiple advertisements from both candidates might lean toward the candidate for whom they have seen a smaller number of ads in the belief that this candidate must have promised less favors.[22] This mechanism could serve to limit

[20] This, together with the derivation of (21), is demonstrated in the Appendix.

[21] While its development requires a slightly different model, the argument also applies in circumstances when candidates must take positions on issues and these positions are of interest to interest groups. To illustrate, consider the same model as in the paper with leftist and rightist candidates but suppose that candidates must also take a position on, say, gun control. Suppose further that rather than there being leftist and rightist interest groups, there is a single anti-gun control interest group. Then this interest group will be willing to offer qualified candidates money in exchange for moderation in their gun-control stances and such candidates will be willing to moderate their stances to the extent that advertising their qualifications is effective. Equilibrium will involve qualified candidates selecting more moderate gun-control stances than would be favored by swing voters and, in return, receiving contributions from the interest group. Equilibrium policy stances will therefore be biased towards the interest group as in the models reviewed in Section II. Whether or not they observe candidates' gun-control positions, swing voters will know that qualified candidates have compromised their positions on gun control to obtain the funds necessary to advertise and this will reduce the effectiveness of the advertising. Accordingly, the inefficiency identified in this paper will still exist.

[22] To make this more precise, imagine that qualified candidates come in two types so that $r \in \{r_0, r_1\}$ where $r_0 < r_1$. Suppose that the probability a qualified candidate has type r_1 is exogenous and assume that voters do not directly observe a qualified candidate's type. In equilibrium, the two types will promise different levels of favors (say, f_0 and f_1) and voters may make inferences about candidates' types on the basis of the number of ads they have seen. To incorporate the latter, suppose that it costs p to broadcast a single ad and that each ad is seen by some fraction λ of the population. Then, if a candidate sends n ads, the fraction of the population who have seen $x \in \{0, \dots, n\}$ ads is $\binom{n}{x}\lambda^x(1 - \lambda)^{n-x}$. A voter's information set (I_L, I_R) now includes the number of ads he has seen from each candidate and his

the amount of spending in an equilibrium with unrestricted contributions. However, even if candidate heterogeneity creates such a natural limit, as long as favors arise in equilibrium, the argument of the paper applies and campaign finance policy has the potential to improve welfare.

The model also assumes that candidates present interest groups with "take-it-or-leave-it" offers that allow them to extract all their surplus.[23] Thus, all the expected benefits that interest group members receive from favors are paid for up front by contributions. To the extent that interest groups share some of the bargaining power, they will obtain some net benefit from the favors which will be lost if campaign finance policy eliminates these favors. Thus, while campaign finance policy can still increase aggregate utility, the conclusion that it can always create a Pareto improvement may again need modification. That said, even when interest group members obtain some surplus from the favors they are given, they must still bear their share of the collective cost of granting other groups' favors and the benefits of removing these costs may exceed the loss of surplus from their favors.

The model abstracts from the possibility that candidates can finance themselves. However, a qualified candidate with private money would have an electoral advantage under our assumptions, since he could run advertisements informing voters that he was both qualified and self-financed. These advertisements would be more effective than those for an interest-group-financed candidate because voters would know that they were not financed by favors. Moreover, if all candidates were self-financed then introducing public financing would lead to no change in the effectiveness of advertising and hence no increase in aggregate surplus. Rather it would simply shift the cost of campaign finance from the candidates to citizens.

Finally, the model assumes that there are only two candidate types. While none of the logic of the argument depends upon this assumption, relaxing it does raises a number of interesting issues. One concerns the qualification level above which candidates advertise in the unrestricted equilibrium. Much depends upon the inference made by voters concerning the expected qualifications of an unadvertised candidate. If voters are pessimistic about such candidates, then candidates with only moderate qualifications will find advertising effective, while if they are optimistic the contrary will be true. Thus, multiple equilibria seem likely. Also of interest is the limit as the benefits of office become infinitely large. It seems likely that all candidate types other than the very lowest will advertise but that all their advertising will be close to ineffective. This requires that candidates with more qualifications promise more favors. In addition, multiple qualification levels create interesting design issues for campaign finance policy. The choice of contribution limit and public subsidy will impact the allocation of funds across different candidate types.

VI. Conclusion

When candidates use campaign contributions to finance advertising that conveys truthful information to voters about their qualifications for office, contributions have the potential social benefit of helping elect more qualified leaders. For contributions to have this benefit, voters who are informed that a candidate is qualified through campaign advertising must be induced to switch their votes from unadvertised candidates. The larger the fraction of informed voters who switch their votes, the greater the effectiveness of any given level of campaign spending. However, when contributions are unrestricted and candidates have a strong desire to hold office, voters will rationally be cynical about qualified candidates, anticipating that they will implement favors for their contributors when elected. This cynicism will reduce the likelihood of voters switching their votes, undermining the effectiveness of campaign spending. In

beliefs about the amount of favors a qualified candidate has promised will depend upon the number of ads he has seen. In equilibrium, if a voter has seen more ads from one party's candidate he will rationally infer that she is more likely to be power hungry (type r_1) and will implement a higher level of favors. This may lead him to prefer the candidate with less messages, making the effectiveness of advertising a declining function of the amount of spending. This in turn will dampen the incentives of power-hungry candidates to raise large amounts of funds.

[23] This distinguishes it from the common-agency lobbying model of B. Douglas Bernheim and Michael Whinston (1986) and Grossman and Helpman (1994) that makes the opposite assumption.

the limit, as candidates' desire to hold office becomes infinitely strong, campaign spending will be completely ineffective generating no electoral advantage for qualified candidates.

This inefficiency gives campaign finance policy the potential to improve citizens' welfare. When candidates' desire to hold office is very strong, simply banning contributions will generate a Pareto improvement. Banning will not significantly reduce the likelihood that leaders are qualified, but will eliminate favors. This benefits even interest groups because their expected gains from favors are dissipated by the contributions they make to get them. When candidates' desire to hold office is weaker, *banning* contributions may be undesirable because campaign spending will be effective. However, *limiting* contributions can be Pareto improving. Limits can reduce the level of favors qualified candidates provide, without reducing the probability that qualified candidates are elected. The latter is possible because the reduction in favors created by limits can generate an increase in the *effectiveness* of spending which compensates for the reduction in the *level* of spending. Even when limiting contributions fails, a campaign finance policy that combines limits and publicly financed matching grants can always create a Pareto improvement. Limits reduce favors and raise the effectiveness of campaign spending, while public financing offsets the reduction in private contributions caused by limits.

Appendix

The proofs will make use of the following Fact, whose (mechanical) proof is omitted. Define the function:

$$\Psi(C_L, f_L, C, f; \xi) = \frac{-\partial U/\partial f_L}{\partial U/\partial C_L} - \frac{\partial G/\partial f_L}{\frac{1}{\gamma} - \partial G/\partial C_L}. \tag{A1}$$

This is simply the difference between the candidate's and interest group's marginal rate of substitution between contributions and favors. Then we have:

Fact: Suppose that $f \leq \delta$ and that $G(C, f, C, f; \xi) \leq \frac{C}{\gamma}$. Then, $\Psi(C, f, C, f; \xi) \geq 0$ if and only if

$$C \geq \sqrt{\frac{\xi\alpha\gamma}{2\varepsilon}\{(b'(f) - 1)r + \beta b'(f) + b(f) + (1 - \sigma)(\delta - f)b'(f)\}} - \alpha.$$

PROOF OF PROPOSITION 1:

Let (C, f, ξ) be an equilibrium. By definition, we know that (C, f) must solve the problem

$$\max_{(C_L, f_L) \in \Re^2_+} U(C_L, f_L, C, f; \xi) \text{ s.t. } G(C_L, f_L, C, f; \xi) \geq \frac{C_L}{\gamma}$$

and that (C, f, ξ) satisfies (18). To prove the proposition, we need to establish that f lies in the interval $(0, \delta)$. It will then follow that $C > 0$ and that $\pi(C, 0; \xi) \in (\frac{1}{2}, 1)$.

Observe first that it must be the case that $\xi > 0$. If not, then $\xi = 0$ which implies that $(C, f) = (0, 0)$ and hence, from (18), that $0 = \frac{(1 - \sigma)\delta}{2\beta}$—a contradiction. It follows that

$$G(C, f, C, f; \xi) = C/\gamma. \tag{A2}$$

If not, then the candidate could ask for a slightly larger contribution and make himself better off.

Since $\xi > 0$, we know from (18) that $f < \delta$. Thus, it remains to show that $f > 0$. Since $U(\cdot, C, f; \xi)$ and $G(\cdot, C, f; \xi)$ are differentiable at (C, f), there exists $\mu \geq 0$ such that

$$\text{(A3)} \qquad \frac{\partial U}{\partial C_L} - \mu\left(\frac{1}{\gamma} - \frac{\partial G}{\partial C_L}\right) \leq 0 \; (= \text{if } C > 0)$$

$$\text{(A4)} \qquad \text{and} \quad \frac{\partial U}{\partial f_L} + \mu \frac{\partial G}{\partial f_L} \leq 0 \; (= \text{if } f > 0).$$

Suppose that f were to equal 0. Then, equation (A4) implies that $\mu \leq \frac{-\partial U/\partial f_L}{\partial G/\partial f_L}$ and (A3) implies that $\mu\left(\frac{1}{\gamma} - \frac{\partial G}{\partial C_L}\right) \geq \frac{\partial U}{\partial C_L}$. Since $\xi > 0$, $\frac{\partial U}{\partial C_L} > 0$ and hence $\frac{1}{\gamma} - \frac{\partial G}{\partial C_L} > 0$. Thus, these two inequalities imply that

$$\frac{-\partial U/\partial f_L}{\partial G/\partial f_L} \geq \frac{\partial U/\partial C_L}{\frac{1}{\gamma} - \frac{\partial G}{\partial C_L}}$$

or, equivalently given (A1), $\Psi(C, 0, C, 0; \xi) \geq 0$.

By the Fact, this means that

$$C \geq \sqrt{\frac{\xi\alpha\gamma}{2\varepsilon}\{(b'(0) - 1)r + \beta b'(0) + (1 - \sigma)\delta b'(0)\}} - \alpha.$$

We know from (A2) that

$$\frac{C}{\gamma} = G(C, 0, C, 0; \xi) = \left(\pi(C, 0; \xi) - \frac{1}{2}\right)(\beta + (1 - \sigma)\delta) < \frac{1}{2}(\beta + (1 - \sigma)\delta),$$

so that $C < \frac{\gamma}{2}(\beta + (1 - \sigma)\delta)$. In addition, since $f = 0$, it follows from (17) that $\xi \geq \frac{(1 - \sigma)\delta}{2\beta}$. Thus, it must be the case that

$$\frac{\gamma}{2}(\beta + (1 - \sigma)\delta) > \sqrt{\frac{(1 - \sigma)\delta\alpha\gamma}{4\beta\varepsilon}\{(b'(0) - 1)r + \beta b'(0) + (1 - \sigma)\delta b'(0)\}} - \alpha.$$

This is inconsistent with Assumption 2, and hence f must be greater than 0.

Note here for future reference that (C, f, ξ) must satisfy the equation

$$\text{(A5)} \qquad \Psi(C, f, C, f; \xi) = 0.$$

To see this, note that since $f > 0$, equation (A4) implies that $\mu = \frac{-\partial U/\partial f_L}{\partial G/\partial f_L}$. Moreover, it follows from (A2) that $f > 0$ implies that $C > 0$. This means that equation (A3) implies that $\mu = \frac{\partial U/\partial C_L}{\frac{1}{\gamma} - \frac{\partial G}{\partial C_L}}$.

Thus

$$\frac{-\partial U/\partial f_L}{\partial G/\partial f_L} = \frac{\partial U/\partial C_L}{\dfrac{1}{\gamma} - \dfrac{\partial G}{\partial C_L}},$$

which implies (A5). It follows that (C, f, ξ) satisfies (A2), (A5), and (18). This provides three equations in the three unknowns and enables the computation of equilibrium by numerical methods.[24]

PROOF OF PROPOSITION 2:

We prove the result via a sequence of three claims.

Claim 1: Let (C, f, ξ) be an equilibrium, then $C < \bar{C}$ where

$$\bar{C} = \frac{\gamma}{2}(\beta + \delta) + \gamma(b(\delta) - \delta)\left(1 - \frac{\sigma}{2}\right).$$

PROOF:

As shown in the proof of Proposition 1 it must be the case that $\xi > 0$ and that (C, f, ξ) satisfies equation (A2). Since $\xi > 0$, we know that $f < \delta$. It follows that $b(f) - f < b(\delta) - \delta$, because (by assumption) $b'(\delta) > 1$ and b is concave. Using this and (A2), we have that

$$\begin{aligned} \frac{C}{\gamma} &= G(C, f, C, f; \xi) \\ &= \left(\pi(C,0;\xi) - \frac{1}{2}\right)(\beta + \sigma f + (1 - \sigma)\delta) \\ &\quad + (b(f) - f)\left(\frac{\sigma}{2} + (1 - \sigma)\pi(C,0;\xi)\right) \\ &\leq \frac{1}{2}(\beta + \delta) + (b(\delta) - \delta)\left(1 - \frac{\sigma}{2}\right). \end{aligned}$$

Multiplying through by γ yields the result.

Claim 2: $\lim_{r \to \infty} \xi(r) = 0$.

PROOF:

We need to show that for all $\tau > 0$, there exists r_τ such that if $r \geq r_\tau$ it is the case that $\xi(r) \leq \tau$. Let τ be given. Let r_τ be any value of r satisfying both Assumption 2 and the inequality

$$\bar{C} < \sqrt{\frac{\tau\alpha\gamma}{2\varepsilon}\{(b'(\delta) - 1)r_\tau + \beta b'(\delta)\}} - \alpha.$$

[24] If (C, f, ξ) satisfies these three equations then it will be an equilibrium provided that equations (A2) and (A5) are sufficient to imply that (C, f) solves problem (15). Provided that the constraint set in Figure 1 is convex, they will be sufficient. As noted above, the constraint set will necessarily be convex when ξ is small and will typically be convex more generally. Thus, if (C, f, ξ) satisfies the three equations it will typically be an equilibrium. The issue of the existence of equilibrium therefore boils down to the existence of a triple (C, f, ξ) satisfying the three equations. Sufficient conditions for the existence of such a solution are developed in Coate (2002).

Clearly, such an r_τ exists. Now let $r \geq r_\tau$. As shown in the proof of Proposition 1, we know that

$$\Psi(C(r), f(r), C(r), f(r); \xi(r)) = 0,$$

which, by the Fact, implies that

$$C(r) \geq \sqrt{\frac{\xi(r)\alpha\gamma}{2\varepsilon}\{(b'(f(r)) - 1)r + \beta b'(f(r)) + b(f(r)) + (1 - \sigma)(\delta - f(r))b'(f(r))\}} - \alpha.$$

Suppose that $\xi(r) > \tau$. Then because $b'' < 0$,

$$C(r) \geq \sqrt{\frac{\xi(r)\alpha\gamma}{2\varepsilon}\{(b'(f(r)) - 1)r + \beta b'(f(r)) + b(f(r)) + (1 - \sigma)(\delta - f(r))b'(f(r))\}} - \alpha$$

$$> \sqrt{\frac{\tau\alpha\gamma}{2\varepsilon}\{(b'(\delta) - 1)r + \beta b'(\delta)\}} - \alpha > \bar{C}.$$

By Claim 1, this is a contradiction and hence it must be the case that $\xi(r) \leq \tau$.

Claim 3: There exists $\hat{\xi} > 0$ such that for all $\xi \in (0, \hat{\xi})$ the pair of equations (18) and (A2) have a unique solution $(C^*(\xi), f^*(\xi))$ in the domain $\Re_+ \times [0, \delta]$. Moreover, the functions $C^*(\cdot)$ and $f^*(\cdot)$ are continuous on $(0, \hat{\xi})$ and

$$\lim_{\xi \searrow 0} (C^*(\xi), f^*(\xi)) = \left(\frac{\gamma(b(\delta) - \delta)}{2}, \delta\right).$$

PROOF:

This claim may be established graphically by computing the loci of (C, f) combinations satisfying equations (18) and (A2) for given ξ. Consider first equation (18). Let $C_o(f; \xi)$ be the level of contributions that qualified candidates must receive to generate an effectiveness of advertising ξ when qualified candidates provide an amount of favors f. When it is defined, C_o satisfies

$$\xi = \frac{(1 - \sigma)(\alpha + C_o)(\delta - f)}{2\beta(\alpha + C_o(1 - \sigma))}.$$

Solving this for C_o, we obtain

$$C_o(f; \xi) = \frac{\alpha[2\beta\xi - (1 - \sigma)(\delta - f)]}{(1 - \sigma)[\delta - f - 2\beta\xi]}.$$

Thus, for given ξ, $C_o(f; \xi)$ is well defined for f values between $\max\left\{0, \delta - \dfrac{2\beta\xi}{1 - \sigma}\right\}$, and $\delta - 2\beta\xi$. On this interval, $C_o(\cdot\,; \xi)$ is increasing at an increasing rate, approaching infinity as the level of favors approaches the upper limit of the interval.

Now consider equation (A2). Let $C_i(f; \xi)$ be the level of contributions that would make interest groups indifferent between accepting candidates' offers when the level of favors promised is f and the effectiveness of advertising is ξ. Formally, C_i is implicitly defined by the equality:

$$G(C_i, f, C_i, f; \xi) = \frac{C_i}{\gamma}.$$

Note that there may be two nonnegative solutions to this equation when $f = 0$. One solution is always $C = 0$, since the gain from giving no contributions in exchange for no favors is obviously zero. But there will be a positive solution if $\partial G(0, 0, 0, 0; \xi)/\partial C > 1/\gamma$. We will let $C_i(0; \xi)$ be the positive solution when it exists.

It is possible to explicitly solve for $C_i(f; \xi)$. We have that

$$C_i(f; \xi) = \frac{a(f, \xi) + \sqrt{a(f, \xi)^2 + 16e(f, \xi)}}{8},$$

where:

$$a(f, \xi) = 2\gamma\left\{\frac{\xi}{\varepsilon}(\beta + \sigma f + (1 - \sigma)\delta) + \left(1 + \frac{\xi}{\varepsilon}(1 - \sigma)\right)(b(f) - f)\right\} - 4\alpha,$$

and

$$e(f, \xi) = 2\gamma\alpha(b(f) - f).$$

Note that C_i is increasing in f and bounded above on $[0, \delta]$. Since

$$C_i(f; 0) = \frac{\gamma(b(f) - f)}{2},$$

it follows that $C_i(\cdot\,; \xi)$ is strictly concave on $[0, \delta]$ for sufficiently small ξ.

Given ξ, $(C, f) \in \Re_+ \times [0, \delta]$ is a solution of the pair of equations (18) and (A2) if and only if $f \in \left[\max\left\{0, \delta - \frac{2\beta\xi}{1 - \sigma}\right\}, \delta - 2\beta\xi\right)$, $C = C_o(f, 0)$ and $C_i(f, \xi) = C_o(f, \xi)$. We know that $C_o(f, \xi)$ must become larger than $C_i(f, \xi)$ as f approaches $\delta - 2\beta\xi$. Thus, by continuity, there exists a solution if $C_o(f, \xi)$ is smaller than $C_i(f, \xi)$ at $f = \max\left\{0, \delta - \frac{2\beta\xi}{1 - \sigma}\right\}$. Moreover, if $C_i(\cdot\,, \xi)$ is strictly concave, then this solution must be unique.

For ξ sufficiently small, $C_o(f, \xi)$ is indeed smaller than $C_i(f, \xi)$ at $f = \max\left\{0, \delta - \frac{2\beta\xi}{1 - \sigma}\right\}$. To see this, note that for ξ sufficiently small, we have that $\max\left\{0, \delta - \frac{2\beta\xi}{1 - \sigma}\right\} = \delta - \frac{2\beta\xi}{1 - \sigma}$ and $C_i\left(\delta - \frac{2\beta\xi}{1 - \sigma}; \xi\right)$ is positive, while $C_o\left(\delta - \frac{2\beta\xi}{1 - \sigma}; \xi\right) = 0$. Moreover, as noted above, for ξ sufficiently small, $C_i(\cdot\,; \xi)$ is strictly concave on $[0, \delta]$. It follows that for sufficiently small ξ the pair of equations (18) and (A2) have a unique solution $(C^*(\xi), f^*(\xi))$ in the domain $\Re_+ \times [0, \delta]$. The situation is illustrated in Figure A1. That these solutions are continuous in ξ follows from the Implicit Function Theorem. Further, we know that $\delta - \frac{2\beta\xi}{1 - \sigma} < f^*(\xi) < \delta - 2\beta\xi$, so that $\lim_{\xi\searrow 0} f^*(\xi) = \delta$. Finally, since $C^*(\xi) = C_i(f^*(\xi); \xi)$,

$$\begin{aligned}\lim_{\xi\searrow 0} C^*(\xi) &= C_i(\lim_{\xi\searrow 0} f^*(\xi), \lim_{\xi\searrow 0} \xi) \\ &= \frac{\gamma(b(\delta) - \delta)}{2}.\end{aligned}$$

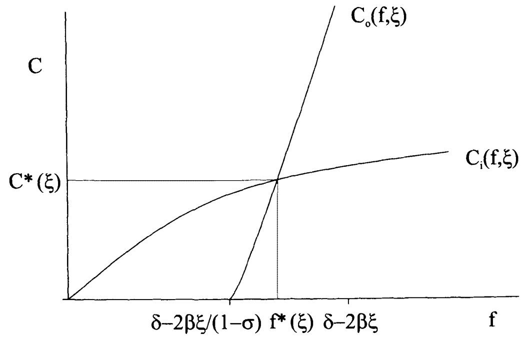

FIGURE A1. CLAIM 3

As established in the proof of Proposition 1, we know that $(C(r), f(r), \xi(r))$ satisfies (18) and (A2). It follows from Claims 2 and 3 that $\lim_{r\to\infty} C(r) = \lim_{\xi\searrow 0} C^*(\xi)$ and $\lim_{r\to\infty} f(r) = \lim_{\xi\searrow 0} f^*(\xi)$. From the proof of Claim 3 we know that $\lim_{\xi\searrow 0} C^*(\xi) = \frac{\gamma(b(\delta)-\delta)}{2}$ and that $\lim_{\xi\searrow 0} f^*(\xi) = \delta$. The result now follows.

PROOF OF LEMMA 1:

We begin by writing down the equilibrium payoffs of the various types of citizens. For future reference, it will be useful to do this for an arbitrary equilibrium (C, f, ξ) under some policy (l, s). The payoff expressions will also apply to an equilibrium with unrestricted contributions, since in that case $(l, s) = (\infty, 0)$.

Given symmetry, we can divide the population into just three types: partisans (i.e., leftists and rightists), interest group members, and swing voters. A partisan receives an expected payoff

$$[\sigma^2 + 2\sigma(1-\sigma)\pi](\delta - f) - \frac{\beta}{2} - 2\sigma s C, \tag{A6}$$

where π is the probability that a qualified candidate defeats an unqualified opponent; i.e., $\pi = \pi(C(1+s), 0; \xi)$. The first term in this expression reflects the expected gain from electing a qualified candidate; the second reflects the expected ideological loss; and the third is the tax necessary to fund the public matching grant.

Interest group members provide campaign contributions to qualified candidates on their side of the ideological divide and also get policy favors enacted when their qualified candidate wins. The expected payoff of an interest group member is therefore

$$[\sigma^2 + 2\sigma(1-\sigma)\pi]\left(\delta - f + \frac{b(f)}{2}\right) - \frac{\beta}{2} - \frac{\sigma C}{\gamma} - 2\sigma s C. \tag{A7}$$

The fact that $b(f)$ is divided by two reflects the fact that the interest group only gets its favors implemented if its qualified candidate is elected.

For swing voters, matters are more complicated because of the uncertainty concerning their ideologies. We treat swing voters as *ex ante* identical so that, for a given draw of m, each is equally likely to have any ideology on $[m - \tau, m + \tau]$. Under this assumption, the payoff of each swing voter is just the payoff of the average swing voter. When computing this payoff, account must be taken of the correlation between which party's candidate wins and the ideology of the average swing voter. The expected payoff of a swing voter can be shown to equal[25]

(A8)

$$[\sigma^2 + 2\sigma(1-\sigma)\pi](\delta - f) - \beta\left(\frac{1}{2} - \varepsilon\left\{\frac{\sigma^2 + (1-\sigma)^2}{2} + 2\sigma(1-\sigma)2\pi(1-\pi)\right\}\right) - 2\sigma sC.$$

Comparing this with (A6), note that the expected ideological loss (the second term) is less than that for partisans precisely because the ideology of the winning candidate is responsive to the location of the median swing voter.

We can now prove the Lemma. That partisans and swing voters will be strictly better off under the equilibrium (C', f', ξ') than under (C^*, f^*, ξ^*) if $\pi(C^*, 0; \xi^*) \approx \pi(C', 0; \xi')$ and $f^* > f'$ follows directly from (A6) and (A8). Thus, we need only deal with interest group members. We know that (A2) holds at the unrestricted equilibrium and we can use this to express the expected payoff of an interest group member as:

(A9) $$\delta\left[\sigma^2 + \frac{\sigma(1-\sigma)}{2} + (1-\sigma)\sigma\pi^*\right] - f^*\sigma\pi^* - \frac{\beta}{2}[1 - \sigma + 2\sigma\pi^*],$$

where $\pi^* = \pi(C^*, 0; \xi^*)$. Under the equilibrium (C', f', ξ'), it is clear from (19) that $G(C', f', C', f'; \xi') \geq C'/\gamma$ and hence the expected payoff of an interest group member is at least

(A10) $$\delta\left[\sigma^2 + \frac{\sigma(1-\sigma)}{2} + (1-\sigma)\sigma\pi'\right] - f'\sigma\pi' - \frac{\beta}{2}[1 - \sigma + 2\sigma\pi'],$$

where $\pi' = \pi(C', 0; \xi')$. Since $\pi' \simeq \pi^*$ and $f' < f^*$, (A10) exceeds (A9) and hence interest group members will also be better off.

PROOF OF PROPOSITION 4:

Let S denote the set of policies (l, s) satisfying the following two properties. First, (l, s) is such that if interest groups contribute l to qualified candidates in exchange for no favors, the probability that a qualified candidate defeats an unqualified one is the same as in the unrestricted equilibrium (C^*, f^*, ξ^*); i.e., $\pi(l(1+s), 0; \xi') = \pi^*$ where $\xi' = \dfrac{(1-\sigma)(\alpha + l(1+s))\delta}{2\beta(\alpha + (1-\sigma)l(1+s))}$. Using (12) and (18), this requires that

(A11) $$l(1+s) = \frac{\alpha C^*(\delta - f^*)}{(\delta\alpha + (1-\sigma)C^* f^*)}.$$

Second, (l, s) is such that interest groups are willing to contribute l without the promise of favors. This requires that $G(l, 0, l, 0; \xi') \geq l/\gamma$ or, equivalently, from (14) that

(A12) $$l \leq \gamma(\pi^* - \tfrac{1}{2})(\beta + (1-\sigma)\delta).$$

[25] A detailed derivation of this payoff is provided in Coate (2002).

By construction, for any policy $(l, s) \in \Omega$, $(C, f, \xi) = (l, 0, \xi')$ is an equilibrium under (l, s).

The set S may be described in a somewhat more compact way as follows. Let

$$\bar{l} = \min\left\{\gamma\left(\pi^* - \frac{1}{2}\right)(\beta + (1 - \sigma)\delta); \frac{\alpha C^*(\delta - f^*)}{(\delta\alpha + (1 - \sigma)C^* f^*)}\right\}$$

and for all $l \in (0, \bar{l}]$, let $\tilde{s}(l)$ solve (A11). Then, it is clear that $(s, l) \in S$ if and only if $l \in (0, \bar{l}]$ and $s = \tilde{s}(l)$. Now, for all $l \in (0, \bar{l}]$, let $W_P(l)$, $W_S(l)$, and $W_I(l)$ denote, respectively, the expected utilities of partisans, swing voters, and interest group members under the equilibrium $(l, 0, \xi')$ that corresponds to the policy $(l, \tilde{s}(l))$. In addition, let W_P^*, W_S^*, and W_I^* denote the expected utilities of the three groups in the unrestricted equilibrium (C^*, f^*, ξ^*). Finally, let $W(l)$ and W^* denote the corresponding aggregate utilities.

Three general points should be noted. First, $W_P(l)$ exceeds W_P^* if and only if $W_S(l)$ exceeds W_S^*. This follows from the payoff expressions (A6) and (A8), since the probability that a qualified candidate defeats an unqualified one is the same in the two equilibria. Second, $W_P(l)$ always exceeds $W_I(l)$ because interest group members bear a higher share of the costs of campaign spending than do regular citizens. However, the shares become more equal as l decreases so that $W_P'(l) > 0$ and $W_I'(l) < 0$ and the difference between the payoffs vanishes in the limit; i.e., $\lim_{l \searrow 0}\{W_P(l) - W_I(l)\} = 0$. Third, $W(l)$ is independent of l and exceeds W^*. To see this, note from (A6), (A7), and (A8), that if the fraction of swing voters in the population is η, aggregate utility in the unrestricted equilibrium is

$$W^* = [\sigma^2 + 2\sigma(1 - \sigma)\pi^*](\delta - f^*) - \frac{\beta}{2} + 2\gamma\left\{[\sigma^2 + 2\sigma(1 - \sigma)\pi^*]\frac{b(f^*)}{2} - \frac{\sigma C^*}{\gamma}\right\}$$

$$+ \eta\beta\varepsilon\left\{\frac{\sigma^2 + (1 - \sigma)^2}{2} + 2\sigma(1 - \sigma)2\pi^*(1 - \pi^*)\right\},$$

where $\pi^* = \pi(C^*, 0; \xi^*)$. Similarly, in the equilibrium corresponding to $(l, \tilde{s}(l))$, aggregate utility is

$$W(l) = [\sigma^2 + 2\sigma(1 - \sigma)\pi^*]\delta - \frac{\beta}{2} - 2\sigma l(1 + \tilde{s}(l))$$

$$+ \eta\beta\varepsilon\left\{\frac{\sigma^2 + (1 - \sigma)^2}{2} + 2\sigma(1 - \sigma)2\pi^*(1 - \pi^*)\right\}.$$

This is independent of l by virtue of (A11). Subtracting the former from the latter, yields

$$W(l) - W^* = -2\sigma l(1 + \tilde{s}(l)) + 2\sigma C^* + [\sigma^2 + 2\sigma(1 - \sigma)\pi^*](f^* - \gamma b(f^*)).$$

This is positive, since (A11) implies that $l(1 + \tilde{s}(l)) < C^*$ and, from the properties of $b, f^* \geq \gamma b(f^*)$.

To progress further, we must distinguish two cases depending upon whether interest group members are better or worse off than partisans in the unrestricted equilibrium. It is clear from (A6) and (A9) that W_P^* exceeds W_I^* if and only if

$$(\text{A13}) \qquad (\pi^* - \tfrac{1}{2})(\beta + (1 - \sigma)\delta) > f^*(\sigma + \pi^*(1 - 2\sigma)).$$

Thus, whether interest group members are worse off in the unrestricted equilibrium depends upon the level of favors.

Case 1: W_P^* exceeds W_I^*. In this case, we claim that there exists some $l' \in (0, \bar{l}]$, such that $(l', 0, \xi')$ Pareto-dominates (C^*, f^*, ξ^*). Suppose first that there exists $\tilde{l}$ such that interest group members have exactly the same payoff under $(\tilde{l}, 0, \xi')$ as in the unrestricted equilibrium. Then, the facts that (i) $W(\tilde{l})$ exceeds W^* and (ii) $W_P(\tilde{l})$ exceeds W_P^* if and only if $W_S(\tilde{l})$ exceeds W_S^*, imply that both partisans and swing voters are strictly better off under $(\tilde{l}, 0, \xi')$. The claim is then established by letting $l' = \tilde{l}$.

If there does not exist $\tilde{l}$ such that $W_I(\tilde{l})$ equals W_I^*, then it turns out that $(\bar{l}, 0, \xi')$ Pareto-dominates (C^*, f^*, ξ^*). Note first that $W_I(\bar{l})$ exceeds W_I^*. To see this, note that for sufficiently small l, $W_I(l) \geq W_I^*$. For if this were not the case then the facts that (i) $W_P(l)$ exceeds W_P^* if and only if $W_S(l)$ exceeds W_S^* and (ii) $\lim_{l \searrow 0}\{W_P(l) - W_I(l)\} = 0$ imply that for sufficiently small l, $W(l)$ is smaller than W^*—a contradiction. Thus, if $W_I(\bar{l}) \leq W_I^*$, then by continuity there would exist $\tilde{l}$ such that $W_I(\tilde{l}) = W_I^*$.

It is also the case that $W_P(\bar{l})$ exceeds W_P^*. This is immediate if $\bar{l} = \dfrac{\alpha C^*(\delta - f^*)}{(\delta\alpha + (1-\sigma)C^* f^*)}$, since then $\bar{s}(\bar{l}) = 0$ and partisans pay no taxes. Suppose then that $\bar{l} = \gamma\left(\pi^* - \frac{1}{2}\right)(\beta + (1-\sigma)\delta)$. Then, to prove that $W_P(\bar{l})$ exceeds W_P^*, we need to show that: $\left[\frac{\sigma}{2} + (1-\sigma)\pi^*\right]f^* > \bar{s}(\bar{l})\bar{l}$. Substituting in the expression for $\bar{s}(\bar{l})\bar{l}$, this becomes

$$\left[\frac{\sigma}{2} + (1-\sigma)\pi^*\right]f^* + \gamma\left(\pi^* - \frac{1}{2}\right)(\beta + (1-\sigma)\delta) > \frac{\alpha C^*(\delta - f^*)}{(\delta\alpha + (1-\sigma)C^* f^*)}.$$

From (A2), we know that

$$C^* = \gamma\left(\pi^* - \frac{1}{2}\right)(\beta + (1-\sigma)\delta) + \gamma b(f^*)\left(\frac{\sigma}{2} + (1-\sigma)\pi^*\right) - \gamma f^*(\sigma + (1-2\sigma)\pi^*).$$

Thus, by (A13) and the fact that $\gamma b(f^*) \leq f^*$, we have that $C^* < f^*\left(\frac{\sigma}{2} + (1-\sigma)\pi^*\right)$. This implies the desired inequality.

Since $W_P(\bar{l})$ exceeds W_P^*, it must also be the case that $W_S(\bar{l})$ exceeds W_S^*. Thus, all three groups of citizens are better off under $(\bar{l}, 0, \xi')$ than under (C^*, f^*, ξ^*).

Case 2: W_P^* is less than W_I^*. In this case, it may not be possible to find policies in S that make interest group members better off than in the unrestricted equilibrium. However, under these conditions, the level of favors in the unrestricted equilibrium is so high that banning contributions generates a Pareto improvement. Thus, let $(l', s') = (0, 0)$. Under this policy, there is a unique equilibrium in which $(C', f', \xi') = \left(0, 0, \frac{(1-\sigma)\delta}{2\beta}\right)$. Given equations (A6)–(A9), to establish that all types of citizens will be better off than in the unrestricted equilibrium, it is sufficient to show that

$$[\sigma^2 + \sigma(1-\sigma)]\delta > [\sigma^2 + 2\sigma(1-\sigma)\pi^*](\delta - f^*).$$

This is equivalent to

$$\left[\frac{\sigma}{2} + (1-\sigma)\pi^*\right]f^* > (1-\sigma)\left(\pi^* - \frac{1}{2}\right)\delta.$$

Given that (A13) does not hold, it is enough to show that

$$\left[\frac{\sigma}{2} + (1 - \sigma)\pi^*\right] \frac{(\pi^* - 1/2)(\beta + (1 - \sigma)\delta)}{(\sigma + \pi^*(1 - 2\sigma))} > (1 - \sigma)\left(\pi^* - \frac{1}{2}\right)\delta,$$

which follows from the fact that

$$\left[\frac{\sigma}{2} + (1 - \sigma)\pi^*\right] > (\sigma + \pi^*(1 - 2\sigma)).$$

PROOF OF PROPOSITION 5:

Let

$$\xi(f) = \frac{(1 - \sigma)(\alpha + C^*)(\delta - f)}{2\beta(\alpha + C^*(1 - \sigma))}. \tag{A14}$$

Then, it is straightforward to verify that there exists an equilibrium under the policy (l, s) such that the interest group contributes l in exchange for a level of favors $\hat{f}$ where $G(C^*, \hat{f}, C^*, \hat{f}; \xi(\hat{f})) = l/\gamma$ and the effectiveness of advertising is $\xi(\hat{f})$. Since $\xi'(f) < 0$ and $l < C^*$ the equilibrium level of favors $\hat{f}$ is strictly less than the laissez-faire level f^*.

Now define the functions

$$\pi(f) = \frac{1}{2} + \frac{\xi(f)}{2\varepsilon}\lambda(C^*), \tag{A15}$$

and

$$W(f) = [\sigma^2 + 2\sigma(1 - \sigma)\pi(f)](\delta - f) - \frac{\beta}{2} + 2\gamma\left\{[\sigma^2 + 2\sigma(1 - \sigma)\pi(f)]\frac{b(f)}{2} - \frac{\sigma C^*}{\gamma}\right\}$$
$$+ \eta\beta\varepsilon\left\{\frac{\sigma^2 + (1 - \sigma)^2}{2} + 2\sigma(1 - \sigma)2\pi(f)(1 - \pi(f))\right\}.$$

Then, using the payoff expressions derived in Lemma 1, it may be verified that aggregate utility in the laissez-faire equilibrium is $W(f^*)$ and aggregate utility under the equilibrium $(l, \hat{f}, \xi(\hat{f}))$ is $W(\hat{f})$. Since $\hat{f}$ is less than f^*, the proposition can be established by showing that W is decreasing over the relevant domain.

Differentiating, we have that

$$W'(f) = 2\sigma(1 - \sigma)\pi'(f)(\delta + \gamma b(f) - f) + [\sigma^2 + 2\sigma(1 - \sigma)\pi(f)](\gamma b'(f) - 1)$$
$$- \eta\beta\varepsilon\{2\sigma(1 - \sigma)2(2\pi(f) - 1)\}\pi'(f).$$

Since $\gamma b'(f) < 1$ and $\pi'(f) < 0$ it suffices to show that $(\delta + \gamma b(f) - f) > \eta\beta\varepsilon 2(2\pi(f) - 1)$ or, equivalently, using (A14) and (A15) that

$$(\delta + \gamma b(f) - f) > \eta\frac{(1 - \sigma)C^*(\delta - f)}{(\alpha + C^*(1 - \sigma))}.$$

This follows from the fact that the left-hand side exceeds $\delta - f$ while the right-hand side is less than $\delta - f$.

Properties of the Optimal Campaign Finance Policy.—Aggregate utility at an equilibrium in which qualified candidates each obtain $l(1 + s)$ and provide no favors is

$$W(l(1 + s)) = [\sigma^2 + 2\sigma(1 - \sigma)\pi(l(1 + s))]\delta - \frac{\beta}{2} - 2\sigma l(1 + s)$$
$$+ \eta\beta\varepsilon\left\{\frac{\sigma^2 + (1 - \sigma)^2}{2} + 2\sigma(1 - \sigma)2\pi(l(1 + s))(1 - \pi(l(1 + s)))\right\},$$

where

$$\text{(A16)} \qquad \pi(l(1 + s)) = \frac{1}{2} + \frac{\xi}{2\varepsilon}\lambda(l(1 + s)) = \frac{1}{2} + \frac{(1 - \sigma)l(1 + s)\delta}{4\beta\varepsilon(\alpha + l(1 + s)(1 - \sigma))}.$$

Accordingly, the level of campaign spending that maximizes aggregate utility satisfies the first-order condition

$$2\sigma(1 - \sigma)\pi'(l(1 + s))[\delta - \eta\beta\varepsilon 2(2\pi(l(1 + s)) - 1)] = 2\sigma,$$

which is (21). Using (A16), this implies that

$$\alpha(1 - \sigma)^2\delta^2\left(\frac{\alpha + l(1 + s)(1 - \sigma)(1 - \eta)}{4\beta\varepsilon(\alpha + l(1 + s)(1 - \sigma))^3}\right) = 1.$$

Thus, the spending level that maximizes aggregate utility satisfies

$$\frac{\alpha(1 - \sigma)^2 + (1 - \eta)(1 - \sigma)^3 l(1 + s)}{(\alpha + l(1 + s)(1 - \sigma))^3} = \frac{4\beta\varepsilon}{\delta^2\alpha}.$$

The left-hand side is decreasing in the spending level $l(1 + s)$ and hence the optimal level is decreasing in β and ε and increasing in δ. In addition, the left-hand side is decreasing in η implying that the optimal level is decreasing in η. The left-hand side is also decreasing in σ if η is less than $2/3$, so that under this condition the optimal level is decreasing in σ.

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