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POWER-HUNGRY CANDIDATES, POLICY FAVORS, AND PARETO IMPROVING CAMPAIGN FINANCE POLICY

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ABSTRACT

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 that 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 the context of a simple model of political competition with campaign contributions and informative advertising.

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1 Introduction

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 are power-hungry, campaign advertising will not be that effective. Voters will rationally be cynical 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 will be dissipated by the contributions they make, meaning they may also be better off. In this way, limiting contributions may create a Pareto improvement.

Even when this is not the case, a campaign finance policy which 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. The next section presents the model. Section 3 analyzes equilibrium with unrestricted contributions. Campaign finance policy is studied in Section 4. Section 5 discusses the relationship of the paper to the growing literature on campaign finance regulation. Section 6 concludes with a summary of the argument and some suggestions for further research.

2 The Model

2.1 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 $[\mu - \tau, \mu + \tau]$. 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, μ is the realization of a random variable uniformly distributed on $[\frac{1}{2} - \varepsilon, \frac{1}{2} + \varepsilon]$, where ε is less than $\frac{1}{2} - \tau$.[1] 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

[1] The assumptions that swing voters are uniformly distributed over $[\mu - \tau, \mu + \tau]$ 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.

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.[2] 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.

Assuming that he does not implement 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. It is assumed that leftists and rightists always prefer a candidate of their own ideology even if he is unqualified which implies that δ is less than β. Candidates have the same payoffs as citizens except that the winning candidate enjoys an *ego-rent* r. This measures how *power-hungry* candidates are.

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.[3] 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.

[2] 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 Aragones and Palfrey (2000) and Groseclose (2001) for two interesting recent contributions.

[3] There is widespread evidence that higher campaign spending leads to greater candidate familiarity (see, for example, Jacobson (1997)) and some evidence that it leads to greater familiarity with candidates' policy positions (see, for example, Coleman and Manna (2000) and 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).

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.[4] 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 $\alpha > 0$.[5]

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 each 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

[4] 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.

[5] 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.

interest group knows the type of their opponent.[6] 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 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.[7] All these behaviors are described in greater detail in the sequel.

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.

[6] 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 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.

[7] We are therefore assuming "sincere" or "naive" voting. It is by now well known that in an election with a finite number of voters with private information, such behavior may not be fully rational. In particular, rational voters may choose to ignore their own private information on account of the "swing voter's curse" (Fedderson and Pesendorfer (1996)). In our model, there are a continuum of voters and hence such considerations do not arise. However, it would, of course, 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 main reasons. First, a key assumption of the model is that there is aggregate uncertainty concerning the distribution of voter preferences. Specifically, the location of the median swing voter is unknown. In environments with aggregate uncertainty, the forces that lead voters to rationally ignore their private information are muted (Fedderson and Pesendorfer (1997)). Thus, given significant aggregate uncertainty, sincere voting may be a reasonable approximation of equilibrium behavior. Second, taking this approach 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 clean analysis of the contribution game.

2.2 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 $I_K = \emptyset$ 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 $\rho_L(\emptyset, I_R)$ and $\rho_R(I_L, \emptyset)$ will be derived as part of the equilibrium.

The swing voter will also have beliefs about the amount of favors that each party's candidate, if qualified, will provide to the interest group. In equilibrium, the amount of favors that voters think that candidates will implement must equal the amount that they actually will. Accordingly, we will not employ a separate notation to distinguish voters' beliefs from the actual levels promised. We let f_K denote the amount of favors that Party K's candidate, if qualified, will provide to the interest group.

Using this notation, the voter's expected payoff from Party L's candidate being elected when he has information (I_L, I_R) is $\rho_L(I_L, I_R)(\delta - f_L) - \beta i$, while that from Party R's candidate is $\rho_R(I_L, I_R)(\delta - f_R) - \beta(1 - i)$. Letting $i^*(I_L, I_R)$ be the ideology of the voter with information (I_L, I_R) who is just indifferent between the two parties' candidates, we have that

$$i^*(I_L, I_R) = \frac{1}{2} + \frac{\rho_L(I_L, I_R)(\delta - f_L) - \rho_R(I_L, I_R)(\delta - f_R)}{2\beta}. \qquad (1)$$

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

Election probabilities: With this understanding of voting behavior, the probability that 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 μ, the fraction of swing voters voting for Party L's candidate is

$$\begin{aligned}&(\frac{1}{2}+\frac{i^*(1,1)-\mu}{2\tau})\lambda(C_L)\lambda(C_R)+(\frac{1}{2}+\frac{i^*(1,\emptyset)-\mu}{2\tau})\lambda(C_L)(1-\lambda(C_R))\\&+(\frac{1}{2}+\frac{i^*(\emptyset,1)-\mu}{2\tau})(1-\lambda(C_L))\lambda(C_R)+(\frac{1}{2}+\frac{i^*(\emptyset,\emptyset)-\mu}{2\tau})(1-\lambda(C_L))(1-\lambda(C_R)).\quad(2)\end{aligned}$$

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 μ is less than $\mu^*(C_L, C_R)$ where

$$\begin{aligned}\mu^*(C_L,C_R) &= i^*(1,1)\lambda(C_L)\lambda(C_R)+i^*(1,\emptyset)\lambda(C_L)(1-\lambda(C_R))\\&\quad+i^*(\emptyset,1)(1-\lambda(C_L))\lambda(C_R)+i^*(\emptyset,\emptyset)(1-\lambda(C_L))(1-\lambda(C_R)).\quad(3)\end{aligned}$$

Since μ is uniformly distributed on $[\frac{1}{2}-\varepsilon, \frac{1}{2}+\varepsilon]$, the probability that Party L's candidate wins is

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

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 can 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

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

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

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

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:

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

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 Party R's candidate.

2.3 Political equilibrium

A *political equilibrium* consists of (i) candidate requests $((C_L, f_L), (C_R, f_R))$; (ii) voter belief functions $(\rho_L(I_L, I_R), \rho_R(I_L, I_R))$ describing swing voters' beliefs concerning the likelihood that candidates are qualified; 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 $C > 0$, *Bayes Rule* implies that voters beliefs about unadvertised candidates must satisfy:

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

Thus, the probability that voters assign to an unadvertised candidate being qualified is independent of both his party affiliation and the information they have recieved about his opponent. If $C = 0$ then *Bayes Rule* implies that $\rho_L(\emptyset, \emptyset)$ and $\rho_R(\emptyset, \emptyset)$ must equal σ but has no implications for $\rho_L(\emptyset, 1)$ and $\rho_R(1, \emptyset)$. This is because the event of observing any candidate's advertisement does not arise along the equilibrium path when $C = 0$. Since it seems unreasonable to suppose anything else, we focus only on symmetric equilibria that have the property that $\rho_L(\emptyset, 1)$ and $\rho_R(1, \emptyset)$ are σ when $C = 0$.[8] This assumption implies that (8) holds even when $C = 0$. Voters' beliefs may therefore be summarized by a single variable ρ interpreted simply as the probability that voters assign to an unadvertised candidate being qualified. This must satisfy (8) in equilibrium.

Turning to voter behavior, (1) and (8) imply that in a symmetric equilibrium, the cut-point

[8] 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 $C = 0$ and $\rho_L(\emptyset, 1)$ and $\rho_R(1, \emptyset)$ are not equal to σ are not *sequential equilibria* (Kreps and Wilson (1982)).

for symmetrically informed swing voters is just $\frac{1}{2}$ (i.e., $i^*(1,1) = i^*(\emptyset,\emptyset) = \frac{1}{2}$). For asymmetrically informed voters, the cut points are given by:

$$i^*(1,\emptyset) = 1 - i^*(\emptyset,1) = \frac{1}{2} + \frac{(1-\rho)(\delta - f)}{2\beta}. \quad (9)$$

Voting behavior may therefore be described by the single variable $\xi = i^*(1,0) - \frac{1}{2}$. This variable measures 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. It therefore measures the *effectiveness* of campaign advertising in inducing swing voters to switch from their natural allegiances. In particular, when ξ is zero, campaign advertising is completely ineffective.

Using this notation, equation (3) may be written

$$\mu^*(C_L, C_R) = \frac{1}{2} + \xi(\lambda(C_L) - \lambda(C_R)). \quad (10)$$

Since Assumption 1(ii) implies that $\mu^*(C_L, C_R)$ must always lie between $\frac{1}{2} - \varepsilon$ and $\frac{1}{2} + \varepsilon$, the probability of winning function is given by:

$$\pi(C_L, C_R) = \frac{1}{2} + \frac{\xi}{2\varepsilon}(\lambda(C_L) - \lambda(C_R)). \quad (11)$$

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 the sequel, 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.

3 Equilibrium with Unrestricted Contributions

This section discusses the equilibrium that would arise with no restrictions on the amount interest groups can contribute to candidates. It first provides a general characterization of equilibrium. It then shows what happens in the limit as candidates become increasingly power-hungry.

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,

$$U = \sigma[\pi(C_L, C; \xi)(r + \beta + f - f_L) + \delta - f] + (1 - \sigma)\pi(C_L, 0; \xi)(r + \beta + \delta - f_L) - \beta. \quad (12)$$

Note that 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,

$$\begin{aligned} G &= \sigma(\pi(C_L, C; \xi) - \pi(0, C; \xi))(\beta + f) + (1 - \sigma)(\pi(C_L, 0; \xi) - \frac{1}{2})(\beta + \delta) \\ &\quad + (b(f_L) - f_L)(\sigma\pi(C_L, C; \xi) + (1 - \sigma)\pi(C_L, 0; \xi)). \quad (13) \end{aligned}$$

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:

$$\max_{(C_L, f_L) \in \Re^2_+} U(C_L, f_L, C, f; \xi) \ s.t. \ G(C_L, f_L, C, f; \xi) \geq \frac{C_L}{\gamma}. \quad (14)$$

Figure 1 presents a diagrammatic analysis of problem (14). The family of convex curves represents the candidate's indifference map. The candidate dislikes favors and likes contributions, so that moving in a north-westerly direction increases the candidate's utility. The convexity of the indifference curves follows from the fact that the function $U(.,.,C,f;\xi)$ 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 $\frac{C_L}{\gamma}$. The constraint set for problem (14) 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.[9] 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 (9) that, in equilibrium, ξ is given by:

$$\xi = \frac{(1-\rho)(\delta - f)}{2\beta}. \qquad (15)$$

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:

$$\rho = \frac{\sigma\alpha}{\alpha + C(1-\sigma)}. \qquad (16)$$

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 (14) given ξ and (ii) ξ and ρ satisfy equations (15) and (16). We can substitute the expression for ρ

[9] 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 the earlier version of this paper "Power-hungry Candidates, Policy Favors, and Pareto Improving Campaign Contribution Limits" (available at http://people.cornell.edu/pages/sc163/cfrs11.pdf) I solve explicitly for the curve describing the boundary of the constraint set and find the conditions under which it is concave.

from (16) into the expression for ξ in (15) to obtain

$$\xi = \frac{(1-\sigma)(\alpha + C)(\delta - f)}{2\beta(\alpha + C(1-\sigma))}. \quad (17)$$

An equilibrium can then be defined more compactly as a triple (C, f, ξ) such that (i) (C, f) solves problem (14) given ξ and (ii) ξ satisfies equation (17). The associated equilibrium beliefs may then be recovered from (16). 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: $(\frac{\gamma(\beta+(1-\sigma)\delta)}{2} + \alpha)^2 < \frac{(1-\sigma)\delta\alpha\gamma}{4\beta\varepsilon}\{(b'(0) - 1)r + \beta b'(0) + (1-\sigma)\delta b'(0)\}$.

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 and the greater is the marginal value of favors to interest group members.

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* $\frac{1}{2}$ *and* 1 (i.e., $\pi(C, 0; \xi) \in (1/2, 1)$). *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 non-interest 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.[10]

The problem with the unrestricted equilibrium is not so much that policy favors are made. This is just a transfer, allbeit 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 candidates are very power-hungry. They 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 candidates become more and more power-hungry, the effectiveness of campaign advertising becomes smaller and smaller. More precisely, we have that:

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 ego-rents are r. Then,*

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

[10] In the proof of Proposition 4, it is shown that interest group members have a lower payoff than partisans who do not belong to interest groups if $f(\sigma + \pi(1-2\sigma))$ is less than $(\pi - 1/2)(\beta + (1-\sigma)\delta)$ where π is the probability that a qualified candidate defeats an unqualified one.

Proposition 2 implies that the equilibrium probability that a qualified candidate defeats an unqualified one tends to 1/2 as candidates become more power-hungry (i.e., $\lim_{r\to\infty} \pi(C(r), 0; \xi(r)) = 1/2$). 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.

4 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 an amount C from private sources, he receives a matching grant of sC from public sources. Public funding is financed by a head tax T levied on all citizens.

By analagous reasoning to that in Section 3, an equilibrium under policy (l, s) is a triple (C, f, ξ) such that (C, f) solves the problem

$$\max_{(C_L, f_L)\in[0,l]\times\Re_+} U((1+s)C_L, f_L, (1+s)C, f; \xi) \text{ s.t. } G((1+s)C_L, f_L, (1+s)C, f; \xi) \geq \frac{C_L}{\gamma}, \quad (18)$$

and

$$\xi = \frac{(1-\sigma)(\alpha + C(1+s))(\delta - f)}{2\beta(\alpha + C(1+s)(1-\sigma))}. \quad (19)$$

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.

4.1 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 enables us to establish:

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 ego-rents are* r. *Then, if candidates are sufficiently power-hungry (i.e.,* 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*).*

To understand this result, note that if contributions were banned then no favors would be promised and the probability that a qualified candidate defeats an unqualified one is just $1/2$. The result now follows from the fact that, with unrestricted contributions, as candidates become more power-hungry, the probability that a qualified candidate defeats an unqualified one approaches $1/2$ while the level of favors remains strictly positive.

When candidates are only moderately power-hungry, *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.

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).[11] 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 (17)) 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 candidates are very power-hungry.

4.2 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

[11] A detailed analysis can be found in the earlier version of this paper "Power-hungry Candidates, Policy Favors, and Pareto Improving Campaign Contribution Limits" which is available at http://people.cornell.edu/pages/sc163/cfrs11.pdf. This version also provides two numerical examples of the model in which Pareto improving contribution limits exist even when candidates are only mildly power hungry ($r = 2\beta$).

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 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 social 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 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 non interest 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 non-interest 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.[12] 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.

5 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.[13] 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 pro-

[12] 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 $(\pi - 1/2)(\beta + (1 - \sigma)\delta)$ where π is the probability that a qualified candidate defeats an unqualified one.

[13] See Morton and Cameron (1992) for an insightful review.

vided 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.[14] The assumption that campaign advertising influences "uninformed" voters may suggest that it provides information. However, this is misleading since the approach assumes that a party's ability to attract the votes of uninformed voters is independent of its or its opponent's policy position.

The standard approach suggests 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 purchased with the contributions. Banning contributions would prevent parties 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 Wittman (2002). If they did, then they would realize that a party who 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 (Ashworth (2002), Coate (2003), and

[14] See, for example, Baron (1994), Besley and Coate (2002), and Grossman and Helpman (1996), (2001). 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.

Schultz (2001)). 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.[15] Second, there are those who argue that campaign advertising may best be understood as providing information *indirectly* (Potters, Sloof, and Van Winden (1997), Prat (2002a) and (2002b)). 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.

The policy conclusions emerging from the analysis of models with directly informative advertising depend critically on whether contributions are *position* or *service* induced.[16] Coate (2003) assumes that policy motivated 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.[17] 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 contribution limits redistribute welfare from moderate voters to interest group members.[18] The former lose

[15] 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. 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 multi-dimensional 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.

[16] There is considerable debate about this question in the United States. See Groseclose, Milyo, and Primo (2000) for an interesting discussion.

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

[18] A similar conclusion would emerge from the model of this paper under the assumption that candidates cannot provide policy favors for their contributors. A contribution limit would reduce the probability that qualified candidates are elected, making all regular citizens worse off. The only possible beneficiaries would be interest group members who spend less of their resources on campaign contributions.

out because elected leaders are less likely to be moderate. The latter gain because they spend less of their resources on campaign spending.

Policy conclusions more consonant with those of this paper emerge from the independent work of Ashworth (2002). 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 and (in the language of this paper) candidates are infinitely power-hungry.[19] Ashworth shows that voters would be strictly better off under a public financing system that funds the same set of candidates as in the laissez-faire.[20] This is because, as in this paper, favors undermine the productivity of campaign spending and so the same selection benefits can be obtained at a lower cost through taxation.[21]

When advertising is indirectly informative, banning contributions may improve aggregate voter welfare as argued by Prat (2002a) and (2002b). Prat (2002a) considers a world in which two office-seeking candidates, who may differ in competence, compete by staking out positions in a one dimensional policy space. A single interest group with non-median policy preferences offers contributions to candidates in exchange for them moving their platforms towards its preferred policy position. Candidates the interest group believes to be more competent are offered larger

[19] Ashworth assumes that there is a single decisive voter and that there is a fixed cost of reaching him. In equilibrium, the level of favors provided by a candidate to his interest group equals this cost divided by the probability the candidate wins. The fixed cost assumption means that advertising is still effective in equilibrium despite candidates being infinitely power hungry. Once a candidate has raised enough to cover the fixed cost, there is no gain from promising additional favors.

[20] While Ashworth is not specific about the mechanism that would deliver this result, it seems likely that a public matching grant would work. However, because interest groups have no ideological preferences, it would not be possible to totally eliminate favors using this policy.

[21] While Ashworth's analysis identifies the same basic inefficiency as does this paper, there are numerous differences in the modelling approaches. More substantively, while this paper focuses on the welfare economic analysis of alternative campaign finance policies, Ashworth focuses more on the implications of candidate asymmetries for equilibrium advertising expenditures. In particular, he shows that when one candidate (say, the incumbent) has a significantly better reputation than the other, neither candidate will have an incentive to advertise.

contributions because they are more likely to win. This is because voters observe a noisy signal of competence and hence, ceteris paribus, are more likely to vote for the more competent candidate. In equilibrium, therefore, the more a candidate advertises, the higher is his competence. 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.[22] 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.

Prat (2002b) considers a multi-dimensional policy space and multiple interest groups, but assumes these groups only contribute to the incumbent. Incumbent politicians again 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.[23] 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 his 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. In these circumstances, banning contributions improves median voter welfare because it has little

[22] While Prat does not consider the distributional consequences of banning contributions, it seems likely that in his model banning is either Pareto inefficient or redistributes from citizens on the side of the interest group to those on the other side of the political spectrum.

[23] This differs from Prat (2002a) who assumes that voters always observe candidates' policy positions.

impact on the probability that competent candidates are elected, while removing policy bias. This result has a very similar flavor to our Proposition 2.

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. 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. Limits would also seem likely to induce a pooling equilibrium and hence would be undesirable. Thus, it appears difficult to rationalize common arguments for campaign finance reform with the signalling view of campaign spending.

The general lesson emerging from the literature (this paper included) is that the desirability of campaign finance regulation very much depends on what one assumes about the rationality of voters, the motives of interest groups, the objectives of candidates, the function of advertising, etc. While this is somewhat unsatisfying, the literature will hopefully yield a clearer understanding of exactly what the critical assumptions are as it matures. This will help sharpen the focus of the debate by identifying the key empirical questions that must be resolved before the nature of optimal regulation can be discerned. The literature may also suggest implications of different assumptions that can be taken to the data. One implication of the assumptions of service-induced contributions and rational voters suggested by this paper is that contribution limits might raise the effectiveness of campaign advertising.[24] This idea has been investigated by Stratmann (2002) who exploits variation in campaign finance laws across the U.S. states, to test whether campaign expenditures are more productive in states that limit contributions. Interestingly, he finds that the answer is yes.

[24] A significant strand of the empirical campiagn finance literature is devoted to assessing the effectiveness of campaign advertising in delivering votes (see, for example, Abramowitz (1988), Green and Krasno (1988), Jacobson (1980), (1985), Levitt (1994), and Palfrey and Erikson (2000)). The theoretical literature to which this paper contributes provides insights into the determinants of this effectiveness.

6 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. But 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 productivity of any given level of campaign spending. However, when contributions are unrestricted and candidates are power-hungry, 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 productivity of campaign spending. In the limit, when candidates are very power-hungry, campaign spending will be completely unproductive generating no electoral advantage for qualified candidates.

This inefficiency gives campaign finance policy the potential to improve citizens' welfare. When candidates are very power-hungry, 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 are less power-hungry, *banning* contributions may be undesirable because campaign spending will be productive. 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 *productivity* 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 productivity of campaign spending, while public financing offsets the reduction in private contributions caused by limits.

While the underlying logic seems quite general, the argument has been formally developed in an undeniably simple model. It would be well worth investigating its robustness to alternative or more general specifications. One obvious assumption to change is that the candidates present interest groups with "take it or leave it" offers that allow them to extract all their surplus. One could alternatively follow Grossman and Helpman (1994) in assuming the opposite; i.e., that interest groups make "take it or leave it" offers. It seems likely that the conclusion that even interest group members can benefit from campaign finance policy might 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.

It would also be interesting to allow for a richer set of candidate types. For example, one could introduce multiple levels of qualifications. Presumably, equilibrium would involve only candidates with qualifications above some critical level advertising. This critical level would depend on the cost of advertising. For a result like Proposition 2 to hold, it would have to be the case that, in equilibrium, more qualified candidates promised more favors. Alternatively, one could assume that candidates differed in their willingness to take favors - some were less power-hungry than others. Under the latter assumption, the number of times a voter had seen a candidate's advertisement might have some significance. There might be a penalty for advertising too heavily, because voters would take it as a signal of a candidate being more power-hungry and hence having promised more favors. This might limit the incentive of power-hungry candidates to offer favors even when contributions are unrestricted.[25] This extension becomes all the more interesting if parties can

[25] The idea is that a qualified candidate's spending would generate a probability distribution over the number of messages voters had received. A certain fraction would have seen no messages, some fraction just one, etc. More spending would shift the probability distribution to the right. If less power-hungry spending candidates are

observe how power-hungry potential candidates are and can decide what type of candidates to run.

expected to raise less money, voters who observed a higher number of messages would believe that a candidate was more likely to be power-hungry. This may dampen the effectiveness of large scale advertising campaigns and thereby reduce the incentives of power-hungry candidates to raise money.

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7 Appendix

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

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

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

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

and that (C, f, ξ) satisfies (17). 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 $\pi(C, 0; \xi) \in (1/2, 1)$.

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 (17), that $0 = \frac{(1-\sigma)\delta}{2\beta}$ - a contradiction. It follows that

$$G(C, f, C, f, \xi) = C/\gamma. \qquad (A.2)$$

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

Since $\xi > 0$, we know from (17) 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 $\eta \geq 0$ such that

$$\begin{aligned} \frac{\partial U}{\partial C_L} - \eta\left(\frac{1}{\gamma} - \frac{\partial G}{\partial C_L}\right) &\leq 0 \ (= \text{ if } C > 0) \ (A.3) \\ \text{and} \quad \frac{\partial U}{\partial f_L} + \eta\frac{\partial G}{\partial f_L} &\leq 0 \ (= \text{ if } f > 0) \ (A.4) \end{aligned}$$

Suppose that f were to equal 0. Then, equation (A.4) implies that $\eta \leq \frac{-\partial U/\partial f_L}{\partial G/\partial f_L}$ and (A.3) implies that $\eta(\frac{1}{\gamma} - \frac{\partial G}{\partial C_L}) \geq \frac{\partial U}{\partial C_L}$. 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 $(A.1)$, $\Psi(C, 0, C, 0; \xi) \geq 0$.

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 (A.2) that

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

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

$$\Psi(C, f, C, f; \xi) = 0. \qquad (A.5)$$

To see this, note that since $f > 0$, equation $(A.4)$ implies that $\eta = \frac{-\partial U/\partial f_L}{\partial G/\partial f_L}$. Moreover, it follows from $(A.2)$ that $f > 0$ implies that $C > 0$. This means that equation $(A.3)$ implies that $\eta = \frac{\partial U/\partial C_L}{\frac{1}{\gamma} - \frac{\partial G}{\partial C_L}}$. Thus

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

which implies $(A.5)$. It follows that (C, f, ξ) satisfies $(A.2)$, $(A.5)$ and (17). This provides three equations in the three unknowns and enables the computation of equilibrium by numerical methods.[26] QED

Proof of Proposition 2: We prove the result via a sequence of three claims.

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

$$\overline{C} = \frac{\gamma}{2}(\beta + \delta) + \gamma(b(\delta) - \delta)(1 - \frac{\sigma}{2})$$

Proof: As shown in the proof of Proposition 1 it must be the case that $\xi > 0$ and that (C, f, ξ) satisfies equation $(A.2)$. 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 $(A.2)$, we have that

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

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

[26] If (C, f, ξ) satisfies these three equations then it will be an equilibrium provided that equations $(A.2)$ and $(A.5)$ are sufficient to imply that (C, f) solves problem (14). 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 the earlier version of the paper "Power-hungry Candidates, Policy Favors, and Pareto Improving Campaign Contribution Limits" which is available at http://people.cornell.edu/pages/sc163/cfrs11.pdf.

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

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 $b'' < 0$,

$$\begin{aligned} C(r) &\geq \sqrt{\frac{\xi(r)\alpha\gamma}{2\varepsilon}\{(b'(f(r))-1)r + \beta b'(f(r)) + b(f(r)) + (1-\sigma)(\delta - f(r))b'(f(r))\}} - \alpha \\ &> \sqrt{\frac{\tau\alpha\gamma}{2\varepsilon}\{(b'(\delta)-1)r + \beta b'(\delta)\}} - \alpha > \overline{C}. \end{aligned}$$

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

Claim 3: *There exists* $\widehat{\xi} > 0$ *such that for all* $\xi \in (0, \widehat{\xi})$ *the pair of equations* (17) *and* $(A.2)$ *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* $(0, \widehat{\xi})$ *and*

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

Proof: This claim may be established graphically by computing the loci of (C, f) combinations satisfying equations (17) and $(A.2)$ for given ξ. Consider first equation (17). 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 $\max\{0, \delta - \frac{2\beta\xi}{1-\sigma}\}$, 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 $(A.2)$. 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 non-negative 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:

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

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 (17) and $(A.2)$ if and only if $f \in [\max\{0, \delta - \frac{2\beta\xi}{1-\sigma}\}, \delta - 2\beta\xi)$, $C = C_o(f, 0)$ 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 $f = \max\{0, \delta - \frac{2\beta\xi}{1-\sigma}\}$. 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 $f = \max\{0, \delta - \frac{2\beta\xi}{1-\sigma}\}$. To see this, note that for ξ sufficiently small, we have that $\max\{0, \delta - \frac{2\beta\xi}{1-\sigma}\} = \delta - \frac{2\beta\xi}{1-\sigma}$ and $C_i(\delta - \frac{2\beta\xi}{1-\sigma}; \xi)$ is positive, while $C_o(\delta - \frac{2\beta\xi}{1-\sigma}; \xi) = 0$. 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 (17) and $(A.2)$ have a unique solution $(C^*(\xi), f^*(\xi))$ in the domain $\Re_+ \times [0, \delta]$. The situation is illustrated in Figure 3. 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 $C^*(\xi) = C_i(f^*(\xi); \xi)$,

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

As established in the proof of Proposition 1, we know that $(C(r), f(r), \xi(r))$ satisfies (17) and $(A.2)$. 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. QED

Proof of Lemma 1: We begin by calculating the payoffs of the various types of citizens in the unrestricted equilibrium. Given symmetry, we can divide the population into just three types: partisans (i.e., leftists and rightists), interest group members, and swing-voters. We deal with each in turn.

Consider a representative partisan. Given symmetry, the elected candidate is equally likely to be from either party. The expected payoff of the partisan is therefore $\delta - f^* - \beta/2$ if the elected candidate is qualified and $-\beta/2$ if not. Recall that both parties select a qualified candidate with probability σ^2 while only one party selects a qualified candidate with probability $2\sigma(1-\sigma)$. In the latter case, the qualified candidate wins with probability $\pi^* = \pi(C^*, 0; \xi^*)$ and hence the probability that a qualified candidate is elected is $\sigma^2 + 2\sigma(1-\sigma)\pi^*$. The expected payoff of the partisan is therefore

$$[\sigma^2 + 2\sigma(1-\sigma)\pi^*](\delta - f^*) - \frac{\beta}{2}. \qquad (A.6)$$

Interest group members provide campaign contributions to qualified candidates and also get policy favors enacted when their candidate wins. The expected payoff of a representative interest group member is therefore

$$[\sigma^2 + 2\sigma(1-\sigma)\pi^*](\delta - f^* + \frac{b(f^*)}{2}) - \frac{\beta}{2} - \frac{\sigma C^*}{\gamma}. \quad (A.7)$$

The fact that $b(f^*)$ is divided by two reflects the fact that the interest group only gets its favors implemented if the qualified candidate it is backing 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 μ, each is equally likely to have any ideology on $[\mu - \tau, \mu + \tau]$. 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 location of the average swing voter.

Suppose first that both parties select unqualified candidates. Party L's candidate will win if the ideology of the median swing voter is less than $\mu^*(0,0) = 1/2$. Thus, if μ is less than 1/2 then the average swing voter's payoff is $-\beta\mu$. If μ exceeds 1/2 then Party R's candidate wins and the average swing voter's payoff is $-\beta(1-\mu)$. Taking expectations over the realization of μ, the average swing voter's expected payoff is

$$-\int_{\frac{1}{2}-\varepsilon}^{\frac{1}{2}} \beta\mu \frac{d\mu}{2\varepsilon} - \int_{\frac{1}{2}}^{\frac{1}{2}+\varepsilon} \beta(1-\mu)\frac{d\mu}{2\varepsilon} = -\beta(\frac{1-\varepsilon}{2}).$$

The key point is that states in which the average swing-voter is left-leaning are states in which Party L's candidate will win.

Suppose now that both parties select qualified candidates. Party L's candidate will win if the ideology of the median swing voter is less than $\mu^*(C^*, C^*) = 1/2$. If μ is less than 1/2 then the majority of swing voters vote for Party L's candidate and the average swing voter's payoff is $\delta - f^* - \beta\mu$. If μ exceeds 1/2 then Party R's candidate wins and the average swing voter's payoff is $\delta - f^* - \beta(1-\mu)$ The average swing voter's expected payoff is therefore

$$\delta - f^* - \int_{\frac{1}{2}-\varepsilon}^{\frac{1}{2}} \beta\mu \frac{d\mu}{2\varepsilon} - \int_{\frac{1}{2}}^{\frac{1}{2}+\varepsilon} \beta(1-\mu)\frac{d\mu}{2\varepsilon} = \delta - f^* - \beta(\frac{1-\varepsilon}{2}).$$

Next consider the case in which just one party's candidate is qualified. For concreteness, assume that it is Party L's candidate. Party L's candidate will win if the ideology of the median swing voter is less than $\mu^*(C^*, 0) = 1/2 + \xi^*\lambda(C^*)$. If μ is less than $1/2 + \xi^*\lambda(C^*)$ then the majority of swing voters vote for Party L's candidate and the average swing voter's payoff is $\delta - f^* - \beta\mu$. If μ exceeds $1/2 + \xi^*\lambda(C^*)$ then Party R's candidate wins and the average swing voter's payoff is $-\beta(1-\mu)$. Taking expectations over the realization of μ and using the fact that $\xi^*\lambda(C^*) = \varepsilon(2\pi^* - 1)$ the average swing voter's expected payoff is

$$\int_{\frac{1}{2}-\varepsilon}^{\frac{1}{2}+\varepsilon(2\pi^*-1)} [\delta - f^* - \beta\mu]\frac{d\mu}{2\varepsilon} - \int_{\frac{1}{2}+\varepsilon(2\pi^*-1)}^{\frac{1}{2}+\varepsilon} \beta(1-\mu)\frac{d\mu}{2\varepsilon} = (\delta - f^*)\pi^* - \beta(\frac{1}{2} - 2\varepsilon\pi^*(1-\pi^*)).$$

Aggregating over these three situations, the expected payoff of a swing voter is

$$[\sigma^2 + 2\sigma(1-\sigma)\pi^*](\delta - f^*) - \beta(\frac{1}{2} - \varepsilon\{\frac{\sigma^2 + (1-\sigma)^2}{2} + 2\sigma(1-\sigma)2\pi^*(1-\pi^*)\}). \quad (A.8)$$

By similar reasoning, the payoffs of partisans, interest group members, and swing voters in the equilibrium (C, f, ξ) under policy $(l, 0)$ are

$$[\sigma^2 + 2\sigma(1-\sigma)\pi](\delta - f) - \frac{\beta}{2}, \qquad (A.9)$$

$$[\sigma^2 + 2\sigma(1-\sigma)\pi](\delta - f + \frac{b(f)}{2}) - \frac{\beta}{2} - \frac{\sigma C}{\gamma}, \quad (A.10)$$

and

$$[\sigma^2 + 2\sigma(1-\sigma)\pi](\delta - f) - \beta(\frac{1}{2} - \varepsilon\{\frac{\sigma^2 + (1-\sigma)^2}{2} + 2\sigma(1-\sigma)2\pi(1-\pi)\}). \quad (A.11)$$

That partisans and swing voters will be strictly better off if $\pi^* \approx \pi$ and $f^* > f$ follows directly from comparing $(A.6)$ and $(A.9)$ and $(A.8)$ and $(A.11)$. Thus, we need only deal with interest group members.

We know that $(A.2)$ holds at the unrestricted equilibrium. We can use this to express the expected payoff of an interest group member in the unrestricted equilibrium as:

$$\delta[\sigma^2 + \frac{\sigma(1-\sigma)}{2} + (1-\sigma)\sigma\pi^*] - f^*\sigma\pi^* - \frac{\beta}{2}[1 - \sigma + 2\sigma\pi^*]. \; (A.12)$$

Under the policy $(l, 0)$, it is clear from (18) that

$$G(C, f, C, f; \xi) \geq C/\gamma$$

and hence the expected payoff of an interest group member is at least

$$\delta[\sigma^2 + \frac{\sigma(1-\sigma)}{2} + (1-\sigma)\sigma\pi] - f\sigma\pi - \frac{\beta}{2}[1 - \sigma + 2\sigma\pi]. \; (A.13)$$

Since $\pi \simeq \pi^*$ and $f < f^*$, it is clear that $(A.13)$ exceeds $(A.12)$ and hence interest group members will also be better off. QED

Proof of Proposition 3: From Proposition 2 we know that $\lim_{r\to\infty}\pi(C(r),0;\xi(r)) = 1/2$ and that $\lim_{r\to\infty} f(r) = \delta > 0$. If contributions were banned, the equilibrium would be $(C, f, \xi) = (0, 0, \frac{(1-\sigma)\delta}{2\beta})$ and the probability that a qualified candidate defeats an unqualified one is 1/2. The result then follows from Lemma 1. QED

Proof of Proposition 4: As shown in the proof of Proposition 3, the payoffs of the three types of citizens in the unrestricted equilibrium (C^*, f^*, ξ^*) are given by $(A.6)$, $(A.7)$, and $(A.8)$. We need to demonstrate the existence of a policy (l, s) and an equilibrium under (l, s) which yields all types of citizens higher payoffs.

Let Ω denote the class 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 status quo; i.e.,

$$\pi(l(1+s), 0; \frac{(1-\sigma)(\alpha + l(1+s))\delta}{2\beta(\alpha + (1-\sigma)l(1+s))}) = \pi^*.$$

This requires that

$$l(1+s) = \frac{\alpha C^*(\delta - f^*)}{(\delta\alpha + (1-\sigma)C^* f^*)}. \qquad (A.14)$$

Second, (l, s) is such that interest groups are willing to contribute l without the promise of favors (assuming that the effectiveness of advertising is given by $\xi' = \frac{(1-\sigma)(\alpha+l(1+s))\delta}{2\beta(\alpha+(1-\sigma)l(1+s))}$). This requires that

$$G(l, 0, l, 0; \xi') \geq l/\gamma$$

or, equivalently, that

$$l \leq \gamma(\pi^* - \frac{1}{2})(\beta + (1-\sigma)\delta). \qquad (A.15)$$

By construction, for any policy $(l, s) \in \Omega$, $(C, f, \xi) = (l, 0, \frac{(1-\sigma)(\alpha+l(1+s))\delta}{2\beta(\alpha+(1-\sigma)l(1+s))})$ is an equilibrium under (l, s). In this equilibrium, the probability that a qualified candidate defeats an unqualified one is π^*. Payoffs are as follows: partisans get

$$[\sigma^2 + 2\sigma(1-\sigma)\pi^*]\delta - \frac{\beta}{2} - 2\sigma sl; \qquad (A.16)$$

interest group members get

$$[\sigma^2 + 2\sigma(1-\sigma)\pi^*]\delta - \frac{\beta}{2} - 2\sigma sl - \sigma\frac{l}{\gamma}; \quad (A.17)$$

and swing voters get

$$[\sigma^2 + 2\sigma(1-\sigma)\pi^*]\delta - \beta(\frac{1}{2} - \varepsilon\{\frac{\sigma^2 + (1-\sigma)^2}{2} + 2\sigma(1-\sigma)2\pi^*(1-\pi^*)\}) - 2\sigma sl. \quad (A.18)$$

Three general points should be noted. First, partisans are better off in this equilibrium than in the unrestricted equilibrium if and only if swing voters are better off. Second, while interest group members always bear a higher share of the costs of campaign spending than do regular citizens, the shares become more equal as l decreases and s increases. Third, aggregate expected utility is higher in this equilibrium than in the unrestricted case.

To see the third point, note from $(A.6)$, $(A.7)$, and $(A.8)$, that if the fraction of swing voters in the population is η, aggregate utility in the unrestricted equilibrium is

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

From $(A.16)$, $(A.17)$, and $(A.18)$ in the equilibrium under the policy (l, s), aggregate utility is

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

Subtracting the former from the latter, yields

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

This is positive, since from $(A.14)$, it is clear that $l(1+s) < C^*$ and, from the properties of b, $f^* > \gamma b(f^*)$.

To progress further, we must distinguish two cases depending upon the relative shares of the costs of campaign spending borne by interest group members and regular citizens in the unrestricted equilibrium. In the unrestricted equilibrium, the aggregate costs of campaign spending $2\sigma C^*$ are borne in the following way. Citizens who are not interest group members bear a cost

$$[\sigma^2 + 2\sigma(1-\sigma)\pi^*]f^*,$$

which is just the expected cost of the favors provided by qualified candidates. Interest group members bear a cost

$$[\sigma^2 + 2\sigma(1-\sigma)\pi^*](f^* - \frac{b(f^*)}{2}) + \frac{\sigma C^*}{\gamma}.$$

Using $(A.2)$, the latter can be rewritten as

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

Thus, whether interest group members bear a higher share of the costs of spending in the unrestricted equilibrium depends upon the level of favors.

Suppose first that interest group members bear a greater share of the costs of campaign spending in the unrestricted equilibrium; i.e., that

$$f^*(\sigma + \pi^*(1-2\sigma)) < (\pi^* - 1/2)(\beta + (1-\sigma)\delta). \qquad (A.19)$$

It is then possible to find policies in Ω which make interest group members better off than in the unrestricted equilibrium. From $(A.12)$ and $(A.17)$, this requires that:

$$\frac{l}{\gamma} + 2sl \leq (\pi^* - \frac{1}{2})(\beta + (1-\sigma)\delta) + f^*\pi^*. \qquad (A.20)$$

In general, when $(A.19)$ holds, there are many policies in Ω that satisfies this requirement. The precise choice of (l, s) necessary to generate a Pareto improvement depends upon the features of the status quo equilibrium (C^*, f^*, ξ^*). We distinguish three different cases.

Case 1: This case arises when the status quo equilibrium (C^*, f^*, ξ^*) is such that

$$\frac{\alpha C^*(\delta - f^*)}{(\delta\alpha + (1-\sigma)C^* f^*)} \le \gamma(\pi^* - \frac{1}{2})(\beta + (1-\sigma)\delta). \qquad (A.21)$$

Then, we simply set

$$(l, s) = (\frac{\alpha C^*(\delta - f^*)}{(\delta\alpha + (1-\sigma)C^* f^*)}, 0).$$

Clearly, (l, s) is an element of Ω and $(A.20)$ is satisfied. Moreover, since $s = 0$ and they pay no taxes, regular citizens must be better off under the equilibrium $(C, f, \xi) = (l, 0, \frac{(1-\sigma)(\alpha+l)\delta}{2\beta(\alpha+(1-\sigma)l)})$ than in the unrestricted equilibrium.

Case 2: This case arises when the status quo equilibrium (C^*, f^*, ξ^*) is such that

$$\gamma(\pi^* - \frac{1}{2})(\beta + (1-\sigma)\delta) < \frac{\alpha C^*(\delta - f^*)}{\delta\alpha + (1-\sigma)C^* f^*} \le \gamma(\pi^* - \frac{1}{2})(\beta + (1-\sigma)\delta) + \frac{f^*\pi^*}{2} \qquad (A.22)$$

Then, we set

$$l = \gamma(\pi^* - \frac{1}{2})(\beta + (1-\sigma)\delta)$$

and

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

These two values solve the pair of equations $(A.14)$ and $(A.15)$ with equality. That $(A.20)$ is satisfied follows from $(A.22)$.

To prove that regular citizens must be better off under the equilibrium $(C, f, \xi) = (l, 0, \frac{(1-\sigma)(\alpha+l(1+s))\delta}{2\beta(\alpha+(1-\sigma)l(1+s))})$ than in the unrestricted equilibrium, we need to show that:

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

Substituting in the expression for sl, this becomes

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

From $(A.2)$, we know that

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

Thus, by $(A.19)$ and the fact that $\gamma b(f^*) \leq f^*$, we have that

$$C^* < f^*(\frac{\sigma}{2} + (1-\sigma)\pi^*).$$

This implies the result.

Case 3: This case arises when the status quo equilibrium (C^*, f^*, ξ^*) is such that

$$\gamma(\pi^* - \frac{1}{2})(\beta + (1-\sigma)\delta) + \frac{f^*\pi^*}{2} < \frac{\alpha C^*(\delta - f^*)}{\delta\alpha + (1-\sigma)C^* f^*}. \qquad (A.23)$$

Then, we choose (l, s) so that interest group members are exactly as well off as they are in the unrestricted equilibrium. Formally, (l, s) solves the pair of equations $(A.14)$ and $(A.20)$ with equality. This yields

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

and

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

Equations $(A.19)$ and $(A.23)$ ensure that these values are positive and satisfy $(A.15)$. That regular citizens must be better off under the equilibrium $(C, f, \xi) = (l, 0, \frac{(1-\sigma)(\alpha + l(1+s))\delta}{2\beta(\alpha + (1-\sigma)l(1+s))})$ than in the unrestricted equilibrium, follows immediately from the fact that aggregate utility is higher and interest group members are, by construction, exactly as well off.

It only remains to deal with the case in which interest group members bear a smaller share of the costs of campaign spending in the unrestricted equilibrium; i.e.,

$$f^*(\sigma + \pi^*(1-2\sigma)) \geq (\pi^* - 1/2)(\beta + (1-\sigma)\delta). \qquad (A.24)$$

Then it may not be possible to find policies in Ω which 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 $(C, f, \xi) = (0, 0, \frac{(1-\sigma)\delta}{2\beta})$. Partisans and interest group members get a payoff

$$[\sigma^2 + \sigma(1-\sigma)]\delta - \frac{\beta}{2}.$$

Swing voters get a payoff

$$[\sigma^2 + \sigma(1-\sigma)]\delta - \frac{\beta}{2} + \beta\varepsilon\{\frac{\sigma^2 + (1-\sigma)^2}{2} + \sigma(1-\sigma)\}.$$

Given $(A.6)$, $(A.9)$, and $(A.12)$, 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

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

Given $(A.24)$, it is enough to show that

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

which follows from the fact that

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

QED.

Figure 1

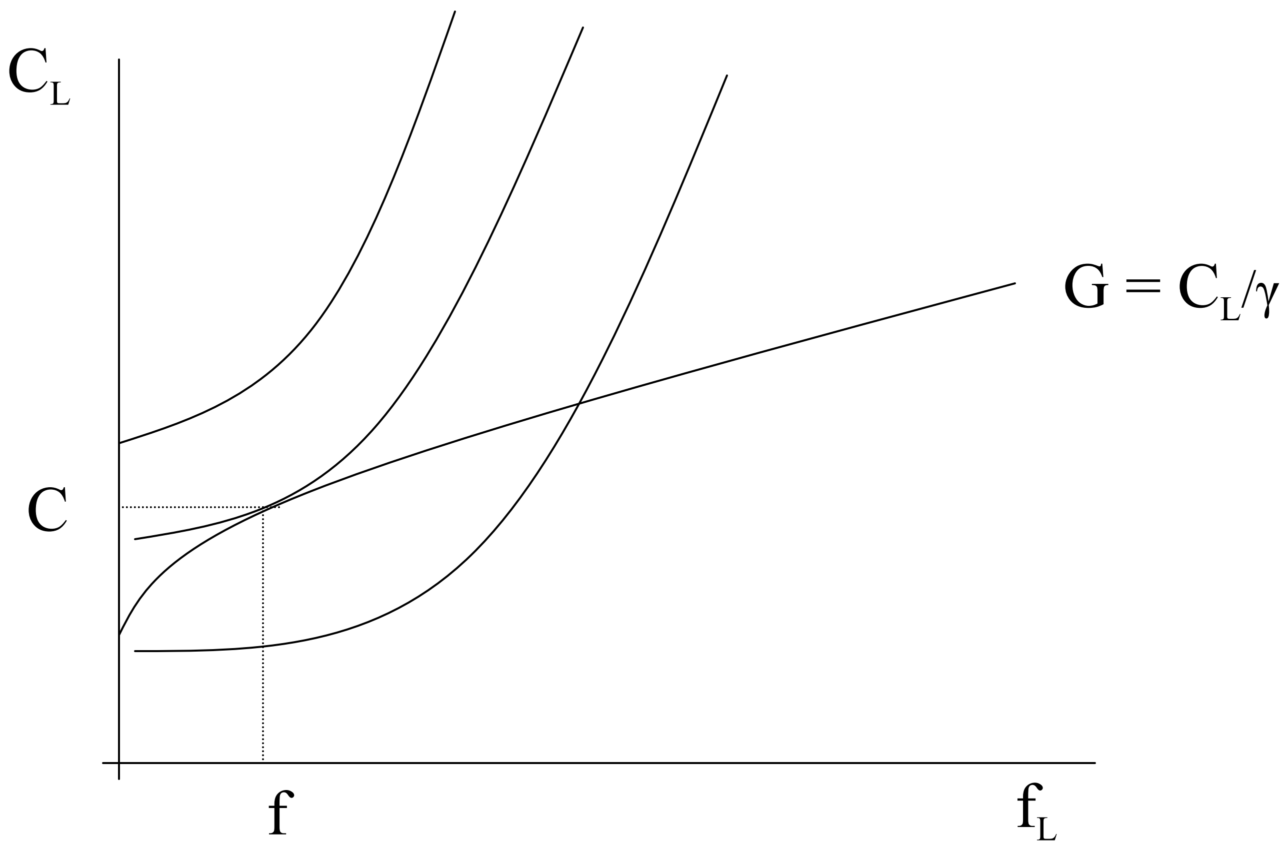

Figure 2

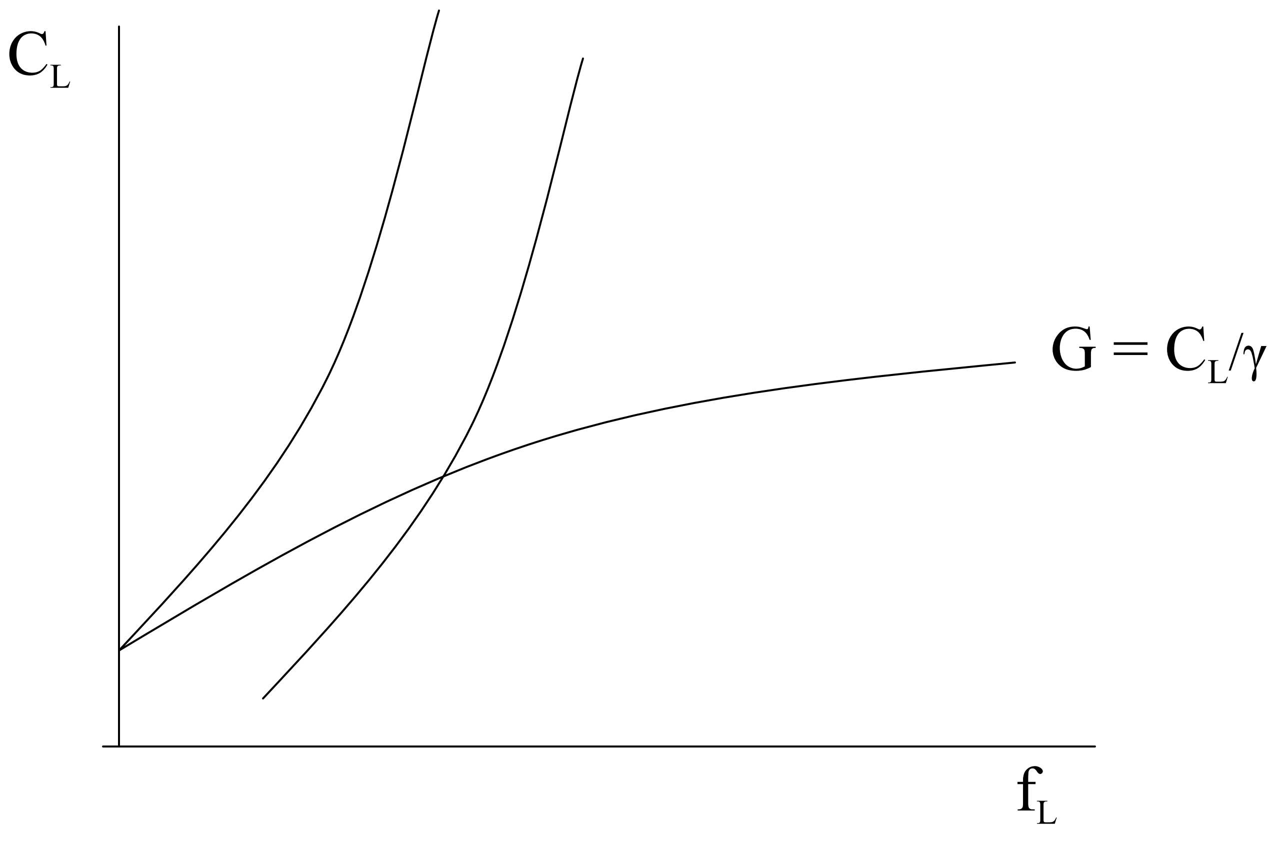

Figure 3