“One Man, One Dollar”?

Examining the equalization argument in support of campaign contribution limits

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Abstract

Arguably the most important campaign finance regulations in U.S. federal elections are limits imposed on the amount that an individual or organization may donate to a federal campaign. Such contribution limits are advocated on two separate grounds. The first is that they prevent corruption, the second is that they democratize the financing of campaigns by equalizing the relative influence of donors. According to the latter argument, an equalization of donor influence is desirable because it causes campaign resources to more accurately reflect public support for candidates and their political ideas. I construct a formal model to illustrate this equalization argument in support of contribution limits. The analysis calls attention to a number of implicit assumptions underlying the corresponding money primary analogy for campaign fund-raising. The central assumption is that

a candidate's reliance on large contributions is an indicator of negative characteristics not revealed through her campaign communication. The model also suggests a method for testing this assumption, as it implies a negative relationship between a candidate's reliance on large contributions and her electoral success. Using data on elections to the House of Representatives between 1990 and 2002, I find no evidence that such a negative relationship exists. This empirical result casts doubt on the equalization argument in support of campaign contribution limits.

1 Introduction

Ever since the passage of the Federal Election and Campaign Act of 1971 and its amendments in 1974 (FECA), the regulation of campaign finance in the United States has been a controversial and much debated issue. Over the following three decades, Supreme Court rulings and further legislative reforms have established a set of regulations defining permissible behavior for individuals and organizations who contribute or spend money with the intention of affecting the outcome of a federal election. Although the regulation of campaign finance has enjoyed wide public, legislative, and judicial support, the objectives being pursued, as well as the practical effects of the regulations in place, have remained matters of controversy.

Arguably the most important of these regulations are limits imposed on the amount that an individual or organization may donate to a federal campaign. For example, during the period I investigate in this essay, individuals were permitted to contribute at most $1000 to a congressional candidate per election.[1] Two different arguments have commonly been brought forth in support of these contribution

[1]The Bipartisan Campaign Reform Act of 2002 raised the limit on individual contributions to $2000 in order to adjust for inflation. Current law includes separate limits on contributions to and from Political Action Committees (PACs) and parties. I do not explicitly distinguish these different contribution sources in the theoretical argument below. The central

limits. The first is that they help to prevent corruption in the narrow sense of that term. The second is that they equalize the relative influence of donors and cause financial resources to more closely reflect public support for candidates (Sunstein 1994, Neuborne 1999, Hasen 1996, Rosenkranz and Hasen 1999, Foley 1994, Strauss 1994).

I refer to the latter of these as the equalization argument in support of contribution limits. It is based on constitutional as well as practical propositions. The first is that Congress may regulate the financing of campaigns with the intent of bringing about a proportionality of financial resources and public support. The second is that campaign contribution limits will serve this purpose in practice.

The compatibility of the former of these propositions with the First Amendment has been challenged before the Supreme Court. I briefly review the Court's most important rulings on this issue in section 2. While the Court explicitly endorsed the anti-corruption rationale for campaign contribution limits, I will argue that it has been unable to form a clear position as to the constitutionality of the equalization argument. In an effort to avoid potential conflict, supporters of campaign contribution limits have therefore preferred to rely on the less controversial anti-corruption rationale when advocating legislation that many feel is actually aimed at the establishment of equal influence. This has led to a situation in which the two arguments are no longer clearly distinguished from one another and the practical questions raised by the equalization argument are rarely explicitly stated or thoroughly investigated.[2] Specifically, the proposition that campaign contribution limits increase the proportionality of

point is that all contribution limits ultimately have the effect of limiting the amount of money that a candidate can raise from a given set of supporters.

[2]For a further discussion of this situation and its unfortunate impact on the discussion of campaign finance policy, see Rosenkranz and Hasen (1999), who observe that "*Buckley* leaves us with a jurisprudential landscape that forces proponents of reform to cast their proposals as anticorruption devices rather than as measures to equalize political power. (...) It is no surprise, therefore, that scholarly literature has largely ignored the intersection of money, politics, and equality."

financial resources to public support appears to have been taken for granted. Indeed, I will show that the Supreme Court itself has expressed this expectation and argue that this constitutes implicit evidence of support for the equalization argument.

In section 3, I use a simple formal model to illustrate the logic of the equalization argument. The model serves to derive and illustrates the central assumptions of the corresponding money primary analogy for campaign finance. One is that candidates who collect small numbers of large contributions systematically take less popular policy positions or exhibit less popular characteristics than those who collect large numbers of small contributions. Another is that these characteristics cannot be explicitly revealed by way of campaign communication, so that "truly" popular candidates are unable to distinguish themselves through campaign advertisements. (I therefore call these characteristics "unadvertisable".) The final assumption is that the kind of information that *can* be explicitly revealed through campaign communication is less "important" to voters (in a sense that will be made more precise below) than are "unadvertisable" characteristics. Under these conditions, a limit on campaign contributions would reduce the financial resources available to unpopular candidates. This would cause a candidate's ability to spend money and communicate to reflect her degree of public support. Voters would benefit from this because campaign communication would then implicitly reveal information that is more valuable to them than the explicit information lost as a consequence of the policy.

Unlike the constitutional proposition discussed above, these practical assumptions are essentially empirical in nature. Specifically, the model suggests that the conditions under which voters would prefer that a contribution limit be imposed imply a negative relationship between a candidate's reliance on large contributions and her electoral success. To my knowledge, the existence of such a relationship has not been previously investigated. In section 4 of the paper, I use data on elections to the House

of Representatives between 1990 and 2002 to conduct such an investigation. I find no evidence that a negative relationship exists. This result casts doubt on the equalization argument in support of campaign contribution limits. Section 5 concludes. Proofs and additional tables are contained in the Appendix.

2 The constitutional debate

Not long after the FECA and its amendments were originally passed, its limits on campaign contributions and expenditures were challenged before the Supreme Court. Those who questioned the law argued that it would restrict the ability of donors and candidates to engage in political communication and therefore violates the First Amendment. In a landmark ruling on campaign finance legislation (*Buckley v. Valeo 1976*), the Court agreed that regulations which reduce the financial resources available to candidates would adversely affect their ability to engage in political speech. Specifically, the Court observed that

> "a restriction on the amount of money a person or group can spend on political communication during a campaign necessarily reduces the quantity of expression by restricting the number of issues discussed, the depth of their exploration, and the size of the audience reached. (...) The electorate's increasing dependence on television, radio, and other mass media for news and information has made these expensive modes of communication indispensable instruments of effective political speech." [424 US 1, 19]

The Court concluded that regulations which have the effect of reducing expenditures on political communication are unconstitutional unless narrowly targeted to achieve a legitimate and pressing state interest. It went on to reject the idea that an equalization of relative voices constitutes such a legitimate

interest, stating famously that "the concept that government may restrict the speech of some elements of society in order to enhance the relative voices of others is wholly foreign to the First Amendment" [424 U.S. 1, 49]. According to the Court, the only legitimate objective of regulating campaign finance could be to combat corruption or the appearance thereof [424 U.S. 1, 26 - 27]. Based on these principles, the Supreme Court struck down the FECA's expenditure limits because they would constrain the ability of candidates to communicate with voters, and because they were not directly aimed at preventing corruption.

However, despite its clear rejection of spending limits, the Court chose to uphold the FECA's limits on campaign contributions. Here, the Court argued that these regulations would help to prevent corruption. Further, it predicted that contribution limits, unlike limits on expenditures, would *not* adversely affect the ability of candidates or donors to communicate. This latter prediction is of central interest to the present discussion. It is based, first, on a conceptual separation of donor and candidate speech, and second, on a largely implicit theory of how candidate communication is affected by contribution limits in practice. Specifically, the Court argued that a

> "contribution serves as a general expression of support for the candidate and his views, but does not communicate the underlying basis for the support. The quantity of communication by the contributor does not increase perceptibly with the size of his contribution, since the expression rests solely on the undifferentiated, symbolic act of contributing. (...) While contributions may result in political expression if spent by a candidate or an association to present views to the voters, the transformation of contributions into political debate involves speech by someone other than the contributor." [424 U.S. 1, 21].

Thus, according to the Court, a donor's political expression begins and ends with the act of making a contribution. By definition, this separation of donor speech from candidate expenditures implies that a contribution limit does not violate donors' First Amendment rights. This would be true even if the regulation did affect candidates' aggregate receipts and expenditures.

More importantly for the present discussion, the Court also based its decision on the practical prediction that candidate communication would not be adversely affected because contribution limits "merely (...) require candidates (...) to raise funds from a greater number of persons" [424 U.S. 1, 22]. Although this statement appears to suggests that candidate resources would remain essentially unaffected by contribution limits, this does not actually appear to have been the Court's expectation. Instead, it predicted that

> "given the limitation on the size of outside contributions, the financial resources available to a candidate's campaign, like the number of volunteers recruited, will normally vary with the size and intensity of the candidate's support" [424 U.S. 1, 56].

Clearly, the Court expected a candidate's ability to collect small contributions to reflect ("vary with") her level of public support. Although it rejected an equalization of candidate expenditures, this prediction appears to suggest that the Court implicitly endorsed an equalization of influence at the donor level. In other words, the Court's decision in *Buckley* suggests that the First Amendment prohibits regulations aimed at equalizing the amounts candidates can spend, but that it is compatible with regulations aimed at causing the resources at their disposal to reflect actual levels of public support. Furthermore, the Court clearly expected that contribution limits would have this effect in practice.

The Burger Court's largely implicit support for the equalization argument in *Buckley* has since been more explicitly reiterated by the Rehnquist Court's decision in *Austin v. Michigan Chamber of*

Commerce (1990). In that case, the Court argued that a provision in the Michigan Campaign Finance Act prohibiting the use of corporate treasury funds for the purposes of political communication could be justified on the grounds that it

> "aims at *a different type of corruption* in the political arena: the corrosive and distorting effects of immense aggregations of wealth (...) that have little or no correlation to the public's support for the corporation's political ideas" [494 U.S. 652, 660, emphasis added].

Justice Scalia argued in dissent that the *Austin* decision "ultimately rests upon that proposition whose violation constitutes the 'New Corruption': Expenditures 'must reflect actual public support for the political ideas espoused'." The decision thus explicitly endorses the objective of "calibrating political speech to the degree of public opinion that supports it" [494 U.S. 652, 693].

As this brief review of its rulings has shown, it appears that the Supreme Court's decision to uphold campaign contribution limits has to a large extent been based on the constitutional proposition that campaign finance legislation may aim to cause candidates' financial resources to reflect public support, and on the expectation that contribution limits will have this effect in practice. While the legal debate over the constitutionality of the underlying objective continues (see Sunstein 1994, Fiss 1996, Neuborne 1999), relatively little attention has been paid to the question of predicting and measuring the effects that contribution limits have on candidate communication and electoral competition in practice. The remainder of this paper is devoted to this practical question.

3 A formal model of the "money primary" analogy

The basic idea of what I am calling the equalization argument in support of campaign contribution limits can be stated quite simply. The central premise of the argument is that the fund-raising process

can be socially useful because (or to the extent that) relative success at raising campaign funds constitutes an accurate measure of relative public support for candidates. However, differences in individual contribution sizes imply that the relative aggregate amounts raised by different candidates will not necessarily be proportional to the relative number of donors who supported each of them with contributions. If the number of donors is proportional to the size of a candidate's public support, aggregate receipts will therefore constitute a biased measure of a candidate's "true" popularity. In particular, it would be biased in favor of candidates who rely more heavily on large contributions. The equalization argument essentially says that the imposition of contribution limits serves to correct this bias.

According to this argument, campaign fund-raising is comparable to conducting a poll among donors. This is apparent when advocates of contribution limits speak of the fund-raising process as a "money primary". According to this analogy, a contribution limit is analogous to a one-man-one-vote rule in the money primary. It is conceivable that such rule a might be advocated as an end in itself. I want instead to ask whether it serves the practical purpose of increasing the correlation between candidate resources and actual public support. In the following section, I use a formal model to investigate the practical effects of such a rule on candidate communication and electoral outcomes, and to identify conditions under which voters would prefer to impose it.

3.1 Related literature

There is by now an extensive formal literature seeking to understand the impact of campaign contributions and campaign finance regulations on electoral competition and policy outcomes (Ashworth 2005, Austen-Smith 1987, Baron 1994, Coate 2004a, 2004b, Gerber 1996, Grossman and Helpman 1996, Potters et al 1997, Prat 2000, 2002). Formal theorists have approached this issue by attempting

to incorporate campaign contributions into more basic models of electoral competition. Two different theoretical approaches have been proposed. One assumes that the effectiveness of campaign spending is due to an exogenously assumed influence over some voters (e.g. Grossman and Helpman 1996, Baron 1994). Another assumes that voters are imperfectly informed and react rationally to information made available as a result of campaign spending. This approach comes in two versions. One tells a classic signalling story. Candidates essentially burn money and voters observe the amount of money being burned. If the ability of a candidate to collect contributions is related to characteristics that voters prefer, burning money will constitute a positive implicit signal that increases a candidate's chance of winning the election (Gerber 1996, Potters et al 1997, Prat 2000, 2002). Another approach independently proposed by Coate (2004a, 2004b) and Ashworth (2005) assumes that candidates must spend money in order to send messages (advertisements) to voters. Such messages may constitute mere cheap talk, in which case they are equivalent to money burning (except that only those voters who receive a message know that money has been burned). In addition, campaign messages may contain explicit (truthful) information. The model developed below separates these effects by introducing "advertisable" and "unadvertisable" candidate characteristics (see below).

A detailed review of this literature is beyond the scope of this essay (see Prat 2004). Suffice it to say that existing studies have considered campaign contributions as a means by which special interest groups are able to gain influence over candidates and shift policy away from the median voter's ideal. The central policy question has been whether campaigns finance regulations can reduce special interest influence relative to that of voters. Thus, it has been assumed that donor and voter interests are opposed, and that campaign finance policy aims to balance the two. Within the message sending framework, this conflict of interest is complicated by the fact that donors help to pay for advertisements that may provide

valuable information to voters.

3.2 Contribution of the paper

This paper contributes to the discussion by addressing a new, slightly different question. Specifically, I ask whether equalizing the relative influence of donors by way of a contribution limit can "calibrate" their overall influence in a way that causes it to more closely reflect the interests of voters. While the central argument I am making is in large part independent of how campaign spending affects elections, the message-based approach is useful because it allows me to explicitly discuss the effects of campaign contribution limits on candidate communication and speech. It therefore provides the ideal framework in which to relate the formal analysis to the legal discussion reviewed above.

I extend the message-sending framework developed by Coate (2004a) by considering differences in candidates' reliance on large contributions, and by highlighting the relative importance of both explicit and implicit information made available through campaign spending. In order to illustrate the impact of a contribution limit on these two aspects of campaign communication, I distinguish between an "advertisable" and an "unadvertisable" candidate characteristic. Candidates who have positive advertisable characteristics can send a campaign message that credibly reveals this to voters. Possible examples of advertisable characteristics include verifiable facts about a candidate's personal and political history (e.g. "Candidate X served in the military").

As in Coate (2004a, 2004b), I assume that a candidate must spend money to send such a message to voters, and that she must acquire the necessary resources by soliciting contributions from donors. The key to the argument is that the size of a candidate's contributor base may be systematically related to characteristics that cannot be revealed through campaign messages. I refer to these as "unadvertisable"

characteristics. Examples of unadvertisable characteristics may include specific elements of a candidate's future policy agenda (e.g. "Candidate X plans to propose health care legislation that will lower your medical bills" or "Candidate X plans to grant subsidies to peanut farmers.")

Unadvertisable characteristics can affect the size and composition of a candidate's donor base if potential contributors have access to information about them. For example, we can imagine that donors are especially interested in a particular policy area and therefore know the details of a candidate's agenda. Alternatively, we can imagine that donors are members of formally organized interest groups that provide information and selective incentives to them.[3] Under these conditions, candidates who differ in terms of their unadvertisable characteristics may also differ in the size and intensity of their financial support, and therefore in their reliance on large contributions.

The analysis shows that a campaign contribution limit will have a positive effect on voter welfare if and only if two conditions are satisfied. The first is that a candidate's reliance on large contributions indicates the presence of less preferred unadvertisable characteristics (from the point of view of voters). For example, candidates who collect large contributions may be more likely to harbor unpopular policy positions which are not revealed in their campaign advertisements. The second is that these hidden characteristics are sufficiently important relative to characteristics which can be explicitly revealed through campaign communication. I conclude that these conditions constitute the key assumptions underlying the equalization argument in support of contribution limits.

In addition to highlighting these assumptions, the model suggests a method of testing them em-

[3]Olson (1965) argued that organized interest groups can overcome collective action problems by providing selective incentives to their members. If many contributors are indeed members of such groups, Olson's observation that small and intensely interested groups are most likely to organize suggests that the number of donors contributing to a candidate need not necessarily reflect her "true" popularity.

pirically. In particular, when conditions are such that voters prefer a contribution limit be imposed, candidates who collect larger individual contributions attain lower vote shares than those who collect small contributions. Therefore, a negative relationship between a candidate's vote share and her reliance on large contributions constitutes a necessary condition for a contribution limit to be beneficial. This hypothesis is investigated empirically in section 4.

3.3 Setup

Candidates We imagine a political community (e.g. a congressional district) that is going to hold an election. There are two candidates, put forth by political parties labeled $j \in \{D, R\}$ (i.e. "Democratic" and "Republican"). Each is characterized by an ideology i_j as well as two other characteristics, labeled q_{ja} and q_{ju}. Party D's candidate always has ideology 0, party R's candidate always has ideology 1. The "nonideological" characteristics q_a and q_u are randomly assigned by nature, where it is assumed for simplicity that they are independently and identically distributed for candidates of both parties.

With probability σ_a, a candidate has a favorable "advertisable" characteristics (denoted $q_a = 1$). Candidates who have such a characteristic can send a message (e.g. a television advertisement) that reveals this to voters. Candidates who lack positive advertisable characteristics (denoted $q_u = 0$) cannot send such a message.

In addition, candidates differ in terms of an "unadvertisable" characteristic denoted $q_u \in \{0, 1\}$. Intuitively, the unadvertisable characteristic can be interpreted as anything of importance which cannot be credibly conveyed through campaign communication. In discussing the model, I will interpret $q_u = 1$ as denoting a "special interest candidate". Relative to the "public interest" ($q_u = 0$) type, special interest candidates plan to impose a tax on voters at large in order to serve a "special interest".[4] The

[4]However, this precise interpretation is not necessary. The bottom line is that candidates differ in terms of characteristics

probability that a candidate with advertisable characteristic q_a is a "special interest" type is denoted σ_{uq_a}. Thus, a candidate type is, $(q_a, q_u) \in \{(1,0),(1,1),(0,0),(0,1)\}$.

Voter preferences Voters are characterized by separable preferences over the winning candidate's ideology (her party label) and her non-ideological characteristics. A voter's ideology is a location $i \in (0,1)$ representing his proximity to the two parties located at 0 and 1. If party D's candidate is elected, a voter with ideology i incurs a loss equal to i. If party R's candidate is elected, he incurs a loss of $(1-i)$. Voter ideology i is uniformly distributed on an interval $[\mu-\tau, \mu+\tau] \subset (0,1)$. The median voter's ideology, μ, is ex ante uncertain and determined by a random draw from a uniform distribution on $\left[\left(\frac{1}{2}-\varkappa\right)-r, \left(\frac{1}{2}-\varkappa\right)+r\right]$, where x represents the median voter's expected preference for the Democratic candidate. Intuitively, the preference parameter $\varkappa$ measures the strength of party D in the district.

In addition, voters care about candidates' advertisable and unadvertisable characteristics. If the winner of the election is type (q_a, q_u), all voters receive a net transfer equal to $u_v(q_a, q_u)$. I refer to $u_v(q_a, q_u)$ as the voter's nonideological payoff because it does not depend on the candidate's party label.

I assume that a candidate of type $(1, q_u)$ is preferred to one of type $(0, q_u)$ for $q_u = 0, 1$, and that a candidate of type $(q_a, 0)$ is preferred to one of type $(q_a, 1)$ for $q_a = 0, 1$. That is, $q_a = 1$ denotes to presence of a preferred advertisable characteristic (such as a special qualification for office) and $q_u = 1$ represents the presence of a less preferred unadvertisable characteristic (such as being a "special

that cannot be revealed through campaign advertisements, and that one of these ($q_u = 0$) is preferred to the other ($q_u = 1$). Holding constant their advertisable characteristics, the two candidate types are exactly analogous to "high" and "low" types in a classic signaling model.

interest" type). Given these assumptions, I normalize payoffs as follows.

$$\begin{aligned}(1-\sigma_{u0})\cdot u_v(0,0)+\sigma_{u0}\cdot u_v(0,1) &= 0\\ u_v(1,0) &= 1\\ u_v(1,1) &= 1-z,\, z>0.\end{aligned}$$

Interpreting payoffs as monetary transfers, this says all voters will receive $\$1$ if the winner of the election has a favorable advertisable characteristic ($q_a = 1$). However, they must pay a cost equal to $\$z$ if she is a "special interest" type ($q_u = 1$). Thus, an intuitive interpretation of this setup is that "special interest" $(1, 1)$ candidates plan to grant a subsidy that benefits a particular group at a cost of z to voters at large.

If the winner of the election is of type (q_a, q_u, i'), a voter with ideology i receives a payoff equal to

$$U_v(q_a, q_u, i', i) = u_v\left(q_a, q_u\right) - \phi \cdot |i - i'|$$

Uninformed voters and campaign messages Following a common approach in the modeling of elections, I assume that there are two types of voters. A fraction $(1-\alpha)$ are "informed", a fraction α are "uninformed".[5] Informed voters learn about candidate characteristics from sources other than the campaigns themselves. Intuitively, these voters are assumed to be interested in politics and therefore read newspapers, etc. As a result, informed voters learn the candidates' advertisable and unadvertisable characteristics irrespective of their campaign spending.

In contrast, uninformed voters only know the candidates' party labels and are not assumed to actively search out additional information about them. Any such information must therefore be provided

[5]More precisely, I am assuming that for all $i \in [\mu - \tau, \mu + \tau]$, there is a continuum of voters with identical preferences, a fraction $(1-\alpha)$ of which are "informed" and a fraction α of which are "uninformed".

to them via campaign messages (e.g. advertisements). The intuitive idea is that there is a set of voters who are only marginally interested in the election, and who therefore receive only information that is bundled with other products such as TV or radio programming.

After the campaign, both informed and uninformed voters are assumed to vote sincerely for the candidate whom they prefer given their posterior beliefs.[6] Informed voters therefore always vote for the candidate whom they truly prefer. In the absence of any additional information, uninformed voters would simply cast their ballots according to their ideological preference.

Candidates may improve their chances of winning the election by sending a campaign message to uninformed voters. Those who have a positive advertisable characteristic can send a campaign message, denoted $m = 1$, that credibly reveals this to uninformed voters. The cost of sending such a message is B.[7] Those who lack a positive advertisable characteristic are unable to send such a message. In contrast to advertisable characteristics, unadvertisable characteristics cannot be revealed through campaign messages. The "effectiveness" of campaign messages in improving a candidate's chance of being elected depends on voter beliefs and is therefore determined in equilibrium.

[6] It has been argued that sincere voting may not be rational even in a two-candidate election when voters are imperfectly informed (see Feddersen and Pesendorfer 1996). Here, I am assuming that voters rationally interpret campaign messages and form correct posterior beliefs. Their sincere vote choice, strictly speaking, may not be rational. Also note that I am not allowing for abstention.

[7] Note that the advertising choice is discrete in this model. That is, candidates can either choose to send a message to all voters or not to send a message at all. In this respect, my approach mirrors that of Ashworth (2005). With certain technical caveats, the main arguments of the paper extend to a model in which campaign messages are transmitted to a fraction of the electorate that is continuously increasing in campaign spending. (This is the setup developed by Coate 2004a, 2004b). The main caveat is that this relationship is (sufficiently) concave. This implies that the preferred aggregate level of spending does not grow faster than the size of a candidate's support group, so that larger donor groups will find it optimal to make smaller per capita contributions. The discrete model allows for a cleaner and more intuitive discussion.

Donors In order to send a message, candidates of type $(1, q_u)$ must raise B dollars by soliciting contributions from donors. In order to make a general argument, I do not explicitly specify the policy preferences of donors. Instead I assume that a candidate of type $(1, q_u)$ is associated with a donor group characterized by a size γ_{q_u} and an "intensity of support" f_{q_u}. All members of a donor base are assumed to be identical. The "intensity of support" f_{q_u} represents the value that each individual donor attaches to having the associated candidate elected. Thus, each donor is willing to contribute $f_{q_u} \cdot \Delta\pi$ for an increase of $\Delta\pi$ in the candidate's probability of winning. That is, donors are electorally motivated and their willingness to contribute depends on the effectiveness of campaign spending in improving their preferred candidate's chance of being elected.

Since individual contributions constitute a public good among the members of a donor group, an uncoordinated voluntary contributions mechanism would not yield positive contributions in this context. I therefore assume that the members of each group coordinate their decisions and share the cost of their aggregate contribution equally.[8]

Sequence of events The sequence of events is as follows: (1) Nature draws one candidate for each party, (2) donors make campaign contributions, (3) candidates send messages, and (4) voters update their beliefs and vote.

[8]The precise mechanism underlying the group's decision is unimportant, since all members are identical. Alternatively, this assumption can be interpreted as stating that donors follow a sort of Kantian imperative, each independently giving the amount that they believe would be the optimal per capita contribution for their group. (For a similar approach, see Roemer's (2005) notion of a "Kantian Equilibrium".)

3.4 Analysis

Candidate reputations and the effectiveness of campaign messages The effects of campaign messages on voters' beliefs and behavior depends on what types of candidates they believe are sending such messages. Beliefs concerning the behavior of a type (q_a, q_u) candidate are denoted $\hat{\lambda}_{(q_a,q_u)} \in \{0,1\}$. If voters believe that a type (q_a, q_u) candidate sends a message, we write $\hat{\lambda}_{(q_a,q_u)} = 1$. Otherwise, $\hat{\lambda}_{(q_a,q_u)} = 0$. Since only candidates with favorable advertisable characteristics can send messages, we must have $\hat{\lambda}_{(0,q_u)} = 0$. Thus, only $\hat{\lambda}_{(1,0)}$ and $\hat{\lambda}_{(1,1)}$ are determined in equilibrium. A vector of such beliefs is denoted $\hat{\boldsymbol{\lambda}} = \left(\hat{\lambda}_{(1,0)}, \hat{\lambda}_{(1,1)}\right) \in \{0,1\}^2$.

Given beliefs $\hat{\boldsymbol{\lambda}}$, an uninformed voter can determine his expected utility from electing a candidate depending on whether or not she has sent a message during the campaign. Note that voters always know a candidate's party label, so that campaign messages only affect beliefs about nonideological characteristics. A voter who sees a campaign advertisement learns that the candidate has a favorable advertisable characteristic, i.e. that $q_a = 1$. This is the message's *explicit* information content. In addition, the voter forms posterior beliefs concerning the probability that $q_u = 1$. These beliefs are determined by $\hat{\boldsymbol{\lambda}}$, and they constitute the message's *implicit* information content. If a candidate has sent no message during the campaign, the uninformed voter receives no explicit information and instead forms posterior beliefs about both advertisable and unadvertisable characteristics. These beliefs will likewise depend on $\hat{\boldsymbol{\lambda}}$.

I define a candidate's "reputation" $\rho\left(q_a, q_u, m, \hat{\boldsymbol{\lambda}}\right)$ as the weighted average of informed and uninformed voters' expected nonideological payoff from electing her, given her real type, the message she sends, and voter beliefs. Recall that informed voters know the true type of each candidate irrespective of the message she sends. Thus, given beliefs $\hat{\boldsymbol{\lambda}}$, a candidate of type (q_a, q_u) who sends message

$m \in \{\emptyset, 1\}$ will attain a reputation of

$$\rho\left(q_a, q_u, m, \hat{\boldsymbol{\lambda}}\right) = (1-\alpha) \cdot u_v\left(q_a, q_u\right) + \alpha \cdot E[u_v(q_a, q_u)|m, \hat{\boldsymbol{\lambda}}]$$

Note that the presence of informed voters (i.e. $\alpha < 1$) implies that a candidate's reputation is an increasing function of her true value to voters. In addition, it depends on whether she sends a campaign message and how this affects the posterior expectations of uninformed voters (if $\alpha > 0$).

I define the "effectiveness of advertising", $\xi\left(\hat{\boldsymbol{\lambda}}\right)$, to be equal to the difference between an uninformed voter's expected payoff from electing a candidate who has sent a message compared to one who has not. That is,

$$\xi\left(\hat{\boldsymbol{\lambda}}\right) = E[u_v(q_a, q_u)|m = 1, \hat{\boldsymbol{\lambda}}] - E[u_v(q_a, q_u)|m = \emptyset, \hat{\boldsymbol{\lambda}}]$$

The proof of the following lemma is relegated to the appendix.

Lemma 1 *Suppose candidates D and R are of type (q_{Da}, q_{Du}) and (q_{Ra}, q_{Ru}), and that they send messages m_D and m_R, respectively. Then, given beliefs $\hat{\boldsymbol{\lambda}}$, the probability with which candidate D wins the election is equal to*

$$\pi_D = \frac{1}{2} + \nu \cdot \varkappa + \eta \cdot \left[\rho\left(q_{Da}, q_{Du}, m_D, \hat{\boldsymbol{\lambda}}\right) - \rho\left(q_{Ra}, q_{Ru}, m_R, \hat{\boldsymbol{\lambda}}\right)\right]$$

where η and ν are positive exogenous parameters.

That is, the probability with which candidate D wins depends on the ex ante bias in favor of her party, $\varkappa$, and the difference between her and her opponent's reputations. Given voter beliefs $\hat{\boldsymbol{\lambda}}$, a candidate of type $(1, q_u)$ who sends a message will therefore increase her probability of winning the election by $\eta \cdot \left[\rho\left(1, q_u, 1, \widehat{\lambda}\right) - \rho\left(1, q_u, \emptyset, \widehat{\lambda}\right)\right] = \alpha \cdot \eta \cdot \xi\left(\hat{\boldsymbol{\lambda}}\right)$.

Campaign contributions and communication in the absence of a contribution limit An individual donor's expected payoff from paying for a candidate's message is $\eta \cdot \alpha \cdot \xi\left(\hat{\boldsymbol{\lambda}}\right) \cdot f_{q_u}$. Recall that donors share the cost of their aggregate contribution equally. Since the total cost of sending a message is B, they face a binary decision of whether or not to donate $\frac{B}{\gamma_{q_u}}$ each in order to enable their candidate to advertise. If $\alpha \cdot \eta \cdot \xi\left(\hat{\boldsymbol{\lambda}}\right) \cdot f_{q_u} > \frac{B}{\gamma_{q_u}}$, they prefer to each contribute $\frac{B}{\gamma_{q_u}}$. If $\alpha \cdot \eta \cdot \xi\left(\hat{\boldsymbol{\lambda}}\right) \cdot f_{q_u} < \frac{B}{\gamma_{q_u}}$, they prefer not to make contributions. When $\alpha \cdot \eta \cdot \xi\left(\hat{\boldsymbol{\lambda}}\right) \cdot f_{q_u} = \frac{B}{\gamma_{q_u}}$, they are indifferent. In this case, I will assume that they choose to contribute. Thus, in the absence of contribution limits, a function mapping voter beliefs $\hat{\boldsymbol{\lambda}}$ into a communication pattern is given by

$$\lambda\left(1, q_u|\hat{\boldsymbol{\lambda}}\right) = \begin{cases} 1 & if \quad \xi\left(\hat{\boldsymbol{\lambda}}\right) \cdot \gamma_{q_u} \cdot f_{q_u} \geq \frac{B}{\alpha \cdot \eta} \\ 0 & otherwise \end{cases} \qquad \text{for } q_u = 0, 1$$

Note that $\lambda\left(q_u|\hat{\boldsymbol{\lambda}}\right) > 0$ (i.e. the candidate will advertise) if and only if (a) the effectiveness of advertising $\xi\left(\hat{\boldsymbol{\lambda}}\right)$ is positive, (b) The size and / or intensity of her support base is large enough.

Campaign contributions and communication under a contribution limit Suppose that a contribution limit of l dollars is imposed. Then, a candidate can collect at most $\gamma_{q_u} \cdot l$ dollars. Therefore she will be able to send a message only if $\xi\left(\hat{\boldsymbol{\lambda}}\right) \cdot \gamma_{q_u} \cdot f_{q_u} > \frac{B}{\alpha \cdot \eta}$ (as above) and in addition $\gamma_{q_u} > \frac{B}{l}$. Thus, under a contribution limit l, a function that maps beliefs $\hat{\boldsymbol{\lambda}}$ into a communication pattern is given by

$$\tilde{\lambda}\left(1, q_u|\hat{\boldsymbol{\lambda}}, l\right) = \begin{cases} \lambda\left(1, q_u|\hat{\boldsymbol{\lambda}}\right) & if \quad \gamma_{q_u} \geq \frac{B}{l} \\ 0 & otherwise \end{cases} \qquad \text{for } q_u = 0, 1$$

That is, a contribution limit "blocks" messages sent by candidates with contribution bases smaller than $\frac{B}{l}$ because the individual contributions necessary to finance their campaigns would exceed the limit. In this way, the model captures the basic intuition that a contribution limit will tend to affect those who have fewer supporters while leaving those with large support bases unaffected.

Laissez-faire and policy equilibria A laissez-faire equilibrium is a vector of advertising levels $\boldsymbol{\lambda}^* = \left(\lambda^*_{(1,0)}, \lambda^*_{(1,1)}\right) \in \{0,1\}^2$ such that $\boldsymbol{\lambda}^*$ is the advertising pattern that arises when voter beliefs are given by $\boldsymbol{\lambda}^*$ (and therefore the effectiveness of advertising is $\xi^* = \xi\left(\boldsymbol{\lambda}^*\right)$). That is,

$$\lambda^*_{(1,q_u)} = \lambda\left(1, q_u | \boldsymbol{\lambda}^*\right) \text{ for } q_u = 0, 1$$

An equilibrium under a limit l is a vector of advertising levels $\widetilde{\boldsymbol{\lambda}}^*(l) \in [0,1]^2$ and an $\tilde{\xi}^*(l)$ such that

$$\tilde{\lambda}^*_{(1,q_u)}(l) = \tilde{\lambda}\left(q_u | \hat{\boldsymbol{\lambda}}, l\right) \text{ for } q_u = 0, 1$$

and the associated effectiveness of advertising is denoted $\tilde{\xi}^*(l) = \xi\left(\widetilde{\boldsymbol{\lambda}}^*(l)\right)$.

Voter welfare The welfare measure I use to evaluate the effects of a contribution limit is the median voter's expected utility given a particular equilibrium advertising pattern. Specifically, suppose that the equilibrium advertising pattern is given by $\boldsymbol{\lambda} \in \{0,1\}^2$. (It does not matter whether it is the result of a laissez-faire or policy equilibrium.) Then a monotone transformation of the median voter's expected utility in equilibrium is given by the following welfare measure (see Appendix).

$$W\left(\boldsymbol{\lambda}\right) = \sum_{q_u \in \{0,1\}} \sigma(1, q_u) \cdot \lambda_{(1,q_u)} \cdot \xi\left(\boldsymbol{\lambda}\right) \cdot \left[u_v(1, q_u) - \bar{u}_v\right]$$

where $\bar{u}_v = \sigma_a \cdot (1 - \sigma_u \cdot z)$ is his expected nonideological utility from electing an average (i.e. randomly drawn) candidate.

This measure conveniently represents the value of an advertising pattern to voters, calling attention to the interrelated objectives of maximizing both the volume $\lambda_{(1,q_u)}$ and effectiveness $\xi\left(\boldsymbol{\lambda}\right)$ of campaign messages sent by above average candidates (those for whom $\left[u_v(1, q_u) - \overline{u}_v\right] > 0$). Note that this measure is equal to zero when no advertising takes place. Thus $W\left(\boldsymbol{\lambda}\right)$ measures welfare relative to a benchmark of prohibiting all contributions and spending.

Pooling vs. separating equilibria Borrowing the terminology familiar from the signaling literature, equilibrium advertising patterns can be grouped according to whether they are associated with "separating" or "pooling" equilibria. A pooling equilibrium is one in which either both candidates of type $(1,0)$ and those of type $(1,1)$ advertise or one in which neither type does so. In the former case, voters can distinguish all candidates who exhibit positive advertisable characteristics from those who do not, but they cannot distinguish between them based on unadvertisable characteristics. In the latter case, voters are completely unable to distinguish different candidate types. In a separating equilibrium, only one candidate type (i.e. either type $(1,0)$ or type $(1,1)$) advertises, and her message therefore perfectly reveals her type to voters. All other types remain indistinguishable from one another.

The distinction between pooling and separating equilibria is relevant because the informational effect of a contribution limit is that under certain conditions it will cause a shift from a pooling equilibrium to a separating equilibrium. For example, suppose that the status quo (before imposition of a contribution limit) is the pooling equilibrium $\boldsymbol{\lambda}^* = (1,1)$. That is, suppose both "public" and "special interest" candidates are able to finance political advertisements in equilibrium. In this case, a voter who observes a campaign message learns that the candidate exhibits a preferred advertisable characteristic, but he cannot make an inference about her unadvertisable characteristic. If a contribution limit prevents "special interest" candidates from advertising, it may shift the situation to the separating equilibrium $\boldsymbol{\lambda}^* = (1,0)$, in which only "public interest" candidates advertise. In this new equilibrium, campaign advertisements reveal that the candidate exhibits favorable advertisable *and* unadvertisable characteristics. The cost of obtaining this increased information content is that "special interest" types are no longer able to distinguish themselves from those who lack positive advertisable characteristics. The net benefit associated with a contribution limit therefore depends on whether it is more important to

distinguish between candidates based on advertisable or unadvertisable characteristics. More generally, I summarize the conditions under which voters prefer a limit be imposed in a series of propositions.

Proposition 1 *Suppose* $z \geq \frac{1}{\sigma_u}$*, and let* $f_{q_u} \to \infty$ *for* $q_u = 0, 1$ *(i.e. suppose donors are sufficiently motivated).*[9] *Then,* $\lambda^* = (0, 0)$ *and advertising is ineffective. Voter welfare increases with the imposition of a limit if and only if* $\gamma_0 > \gamma_1$*, i.e. if and only if public interest candidates are supported by larger donor groups (and therefore collect smaller contributions) than special interest candidates.*

Proof. *See Appendix.* ■

The intuition underlying this result is as follows. If the cost of electing a special interest candidate is significantly larger than the benefit associated with a favorable advertisable characteristic, and if special interest candidates are common enough among those who exhibit favorable advertisable characteristics, voters would be concerned that an advertising candidate is a special interest type. (They are "rationally cynical.") Therefore, campaign advertisements are ineffective and no candidate advertises in equilibrium. As a consequence, uninformed voters obtain no information about candidate characteristics and are left to base their voting decisions on party labels. In this case, preventing the special interest type from advertising can remove the negative connotation associated with campaign messages. In the Supreme Court's words, this corresponds to a reduction in the appearance of ("new") corruption. As a result, campaign messages will become more effective and public interest candidates will choose to advertise. This leads to a separating equilibrium, allowing uninformed voters to identify and select preferred candidates.

Proposition 2 *Suppose* $z \in \left(1, \frac{1}{\sigma_u}\right)$*, and let* $f_{q_u} \to \infty$ *for* $q_u = 0, 1$*. Then,* $\lambda^* = (1, 1)$ *and advertising*

[9] All propositions assume that "donors are sufficiently motivated". If this assumption is not satisfied, the statements would become more complicated but the substantive content of the general argument would not be affected.

is effective. Voter welfare increases with the imposition of a limit if and only if $\gamma_0 > \gamma_1$, i.e. if and only if public interest candidates are supported by larger groups (and therefore collect smaller contributions) than special interest candidates.

Proof. *See Appendix.* ■

If the cost of electing a special interest candidate and / or their frequency among those who exhibit positive advertisable characteristics is small enough, campaign advertising will be effective even when voters know that such candidates are advertising. Note that this is true even though $z > 1$, i.e. even though the cost of the special interest transfer completely outweighs the benefit associated with the advertisable characteristic. In this case, blocking the special interest type is beneficial for two reasons. First, uninformed voters avoid selecting special interest candidates. That is, they are no longer being "fooled" into forming inflated expectations of a candidate's true quality. Second, because they are aware of this, voters are less cynical. Therefore, as in the previous case, the effectiveness of advertising increases and strengthens selection in favor of the most preferred $(1, 0)$ type.

Proposition 3 *Suppose $z \in [\frac{1}{2}, 1)$, and let $f_{q_u} \to \infty$ for $q_u = 0, 1$. Then, $\lambda^* = (1, 1)$ and advertising is effective. Voter welfare increases with the imposition of a limit if and only if $\gamma_0 > \gamma_1$, and $\sigma_u < \overline{\sigma}_u(z, \sigma_a)$, where $\overline{\sigma}_u(z, \sigma_a)$ is increasing in z and σ_a.*

Proof. *See Appendix* ■

For $z \in [\frac{1}{2}, 1)$, special interest candidates with positive advertisable qualifications are preferred by voters to those who lack such qualifications. That is, the cost of the special interest transfer, z, does not fully outweigh the value of the advertisable characteristic. Thus, all candidates who have positive advertisable characteristics are preferred to those who do not. In this case, preventing special interest types from advertising would generate both benefits and costs. Specifically, blocking the special interest

type enables voters to select public interest over special interest candidates among those who exhibit positive advertisable characteristics, generating a benefit that is increasing in z and in σ_a. On the other hand, voters would no longer be able to distinguish special interest candidates who exhibit positive advertisable characteristics from those who lack such characteristics. The welfare loss associated with this is decreasing in z and σ_a, and increasing in σ_u. In sum, the net benefit of blocking the special interest type is increasing in z and σ_a and decreasing in σ_u. Therefore, voters will prefer that a limit be imposed only if z and σ_a are large and σ_u is small.

Proposition 4 *Suppose $z \in (0, \frac{1}{2})$, and let $f_{q_u} \to \infty$ for $q_u = 0, 1$. Then, $\lambda^* = (1, 1)$ and advertising is effective. Voter welfare increases with the imposition of a limit if and only if $\gamma_0 > \gamma_1$, $\sigma_a > \bar{\sigma}_a(z)$, and $\sigma_u \in (\underline{\sigma}_u(z, \sigma_a), \overline{\sigma}_u(z, \sigma_a))$, where $\underline{\sigma}_u(z, \sigma_a)$ is decreasing in z and σ_a, and $\overline{\sigma}_u(z, \sigma_a)$ is increasing in z and σ_a.*

For very small special interest costs, voters are likely to be more concerned with distinguishing between those who have and those who lack positive advertisable characteristics than they are with identifying public interest types. The latter concern dominates only to the extent that most candidates have positive advertisable characteristics anyway (σ_a is large) and if there is enough variation in the unadvertisable characteristic such that it is interesting to learn about it (σ_u is neither too large nor too small.) Again, these conditions on σ_a and σ_u essentially say that the unadvertisable characteristic must be sufficiently important.

3.5 Summary and empirical question

To summarize, the analysis shows that a campaign contribution limit will have a positive effect on voter welfare if and only if two conditions are satisfied. The first is that a candidate's reliance on

large contributions is related to her unadvertisable characteristics. The interpretation above was that candidates who rely on large contributions are likely to serve "special interests". The second is that these hidden characteristics are sufficiently important relative to advertisable characteristics that can be explicitly revealed through campaign communication. I conclude that these conditions constitute the key assumptions underlying the equalization argument in support of contribution limits. Intuitively, these are the conditions under which it would make sense for voters to employ the results of a "money primary" as an indicator of whom they would like to support in the election.

As I pointed out in the introduction, the question whether the conditions are satisfied is ultimately empirical in nature. Putting aside the constitutional debate over its compatibility with the First Amendment, the practical theory underlying the equalization argument can therefore be empirically investigated. Specifically, the model makes the following empirical prediction when voters prefer that a limit be imposed.

Proposition 5 *Suppose $\alpha < 1$. (I.e. not all voters are uninformed.) Then, if voters prefer that a limit be imposed, an advertising candidate's vote share is decreasing in the size of her individual contributions. That is, holding constant her aggregate level of spending as well as the type and spending of her opponent, a candidate who collects large individual contributions attains a lower vote share than a candidate who collects small contributions.*

Proof. *See discussion below.* ■

This result follows directly from the form of the vote share and probability of winning functions. Specifically, a candidate's vote share depends positively on the expected utilities of both uninformed and informed voters. It follows that special interest types attain smaller vote shares, other things equal. Voters benefit from a contribution limit only if these less popular candidates rely more heavily on large

contributions. (Note that this is a necessary, not a sufficient condition, as we are inherently unable to evaluate the magnitude of the difference.)

4 Is reliance on large contributions negatively related to public support?

In the following section, I attempt to assess whether there is empirical evidence that a candidate's reliance on large contributions is negatively related to her degree of public support. Obviously the main difficulty in this context is how to measure public support. It appears that the most objective measure available is a candidate's electoral success. However, the premise of the whole discussion about campaign finance is that electoral outcomes are a function of campaign spending as well as candidates' true popularity. Therefore, spending must be controlled for. The question I seek to answer in the following section is whether a candidate's electoral success is negatively related to her reliance on large campaign contributions after the impact of campaign spending has been controlled for. Note that this approach is consistent with the formal model presented above, which suggested that voter-preferred candidates will tend to achieve larger vote shares than others who spend the same amounts (see Proposition 5).

4.1 Data and Empirical strategy

The data set I use comprises 1735 elections to the House of Representatives held between 1990 and 2002.[10] The dependent variable in all regressions is the challenger's share of the vote. The independent

[10] All elections are challenger-incumbent contests between a Republican and a Democratic candidate in which both candidates attained at least ten percent of the vote.

variables I use include the candidates' levels of spending and other factors commonly controlled for, such as the strength of the challenger's party in the district, national partisan tides, and the challenger's political experience. As a measure of a candidate's reliance on large contributions, I include the fraction of her total receipts due to contributions in excess of $750. (The contribution limit during this period was $1000.) Information on candidate receipts, spending, and contribution sizes is taken from FEC data sets.[11] These data also include information on party labels, incumbency status, and electoral outcomes. Information about challenger experience in elective office was obtained from a data set compiled and provided by Gary Jacobson.[12]

As outlined above, the empirical approach I follow is based on the idea that a candidate's electoral success is determined by a combination of her campaign spending and her "actual" level of public support. This suggest that, holding constant the level of campaign spending and other factors, differences in candidates' electoral success reflect different levels of public support. Ceteris paribus, "truly popular" candidates are expected to be more successful on election day than less popular candidates who spend the same amount on their campaigns. According to the equalization argument discussed above, such candidates should rely less heavily on large contributions. Therefore, I want to test whether candidates who rely more heavily on large contributions tend to do worse in the election after spending and other factors have been controlled for.

The econometric specification I employ builds on previous empirical studies aimed at estimating the effects of campaign spending (Jacobson 1978, 1990; Green and Krasno 1988, 1990). As discussed in that literature, the central econometric problem in this context is the endogeneity of spending, especially by incumbents. Incumbents tend to raise their expenditures when faced with a strong challenger or

[11] I thank Paul Clark at the FEC for his assistance in working with these data sets.

[12] I thank Gary Jacobson for sharing these data with me.

other electoral troubles. Therefore the incumbent's spending is positively correlated with unmeasured factors that harm her electoral prospects, leading the econometrician to underestimate its effectiveness. Although my main concern here is not to acquire consistent estimates of the returns to spending, this endogeneity problem leads to biased estimates of all coefficients. Therefore, I take a two stage least squares approach similar to that proposed by Green and Krasno (1988), using lagged incumbent spending as an instrument for current spending. The idea is that the incumbent's lagged spending is related to her overall ability to collect contributions but unrelated to the quality of her current opponent.[13]

The main difference between my estimations and those done in previous studies is that I include a measure of the candidates' reliance on large contributions among the dependent variables. Specifically, I use the fraction of both candidates' total receipts due to donations in excess of $750.The question of interest is whether this statistic has a significant effect on a candidate's vote share. If so, a negative effect would lend support to the central assumption underlying the equalization argument in support of contribution limits. That is, it would suggest that campaign contribution limits have the desired effect of reducing the receipts of "unpopular" candidates. An insignificant or positive effect, by contrast, would suggest that such limits may lead to the unintended consequence of reducing the receipts of an essentially arbitrary set of candidates (if the effect is insignificant), or of systematically harming "popular" candidates (if it is positive).

I am aware of only one other study that has looked at the relationship between candidate fundraising statistics and electoral success (Dharmapala and Palda 2000). In that analysis, the authors speculate that the concentration of a candidate's contribution sources may be related to her public appeal, and suggest that this hypothesis can be tested by estimating the relationship between a "campaign contribution concentration index" and electoral success. For challengers and open seat candidates,

[13] See Green and Krasno (1988, 1990) and Jacobson (1990) for an interesting discussion of these econometric issues.

Dharmapala and Palda show that, controlling for a candidate's share of spending in the district, there is a negative relationship between concentration of contribution sources and electoral success. The authors suggest that their result is evidence that campaign contributions constitute "speech" and are therefore protected under the First Amendment.

4.2 Specification and Results

I estimate a model in which the challenger's share of the vote (chl_vote) is a linear function of her district party strength, defined as the share of the vote attained by her party's candidate in the previous election (chl_dps), her level of spending (chl_spend), the incumbent's spending (inc_spend), her party label (chl_dem), whether she has previously held elective office (chl_exper), and the share of both candidates' receipts due to individual contributions above $750 (chl_frac750p and inc_frac750p). As I have mentioned, an instrumental variable approach is necessary due to the endogeneity of incumbent spending. Like Green and Krasno (1988), I use lagged spending as an instrument for current spending.

More specifically, the first step is to regress incumbent spending on lagged spending (denoted inc_lag) and all other exogenous variables. The corresponding instrumental variable equation is

$$inc\_spend^{*} = \alpha_0 + \alpha_1 \cdot chl\_dps + \alpha_2 \cdot chl\_spend + \alpha_3 \cdot inc\_lag + \alpha_4 \cdot chl\_dem + \alpha_5 \cdot chl\_exper + \alpha_6 \cdot chl\_frac750p + \alpha_7 \cdot inc\_frac750p + e.$$

The fitted values, $\widehat{\text{inc\_spend}}^{*}$, are then used in place of inc_spend in the second stage equation,

$$chl\_vote = \beta_0 + \beta_1 \cdot chl\_dps + \beta_2 \cdot chl\_spend + \beta_3 \cdot \widehat{\text{inc\_spend}}^{*} + \beta_4 \cdot chl\_dem + \beta_5 \cdot chl\_exper + \beta_6 \cdot chl\_frac750p + \beta_7 \cdot inc\_frac750p + u.$$

This procedure purges the incumbent spending variable of its correlation with the error term, leading to consistent estimates. The estimates obtained by this procedure are reported in Table 1. Table 2 shows

the estimates of the instrumental variable equation.

Note first that the estimated effects of campaign spending are consistent with those obtained in previous studies. Specifically, challenger spending is found to have a significant positive effect on the challenger's vote share. For example, in 1994 an increase of $100 000 in the challenger's spending was associated with an increase of 1.3 percent in her vote share. As expectecd, estimated coefficients on incumbent spending are negative for all years except 2002, though they are small and significant only for 1994, 2000, and in the pooled regression. This suggests that incumbent spending has only a weak marginal effect on vote shares. For example, the pooled regression suggests that an increase of $100 000 in the incumbent's spending was associated with an increase of only 0.1 percent in her vote share.

I now turn to the question of interest. Namely, is reliance on large contributions negatively related to electoral success? The estimated coefficients associated with the share of the challenger's contributions above $750 are positive in all years except 1992, where it is small and insignificant. They are positive and significant in all other years except 1996, as well as in the pooled regression. The pooled estimate of 5.7 suggests that an increase of 20 percent in the fraction of challenger receipts due to large contributions was associated with an increase of just over one percent in her vote share. The corresponding results for incumbents are similar but less significant. The estimated coefficients on the share of the incumbent's receipts due to large contributions are negative in all years except 1998 and 2000, where they are insignificant. It is negative and significant in 1994 and in the pooled regression. The pooled estimate of -2.48 suggests that an increase of 40 percent in the share of the incumbent's receipts due to large contributions is associated with an increase of one percent in her share of the vote.

Table 1. Estimates of 2SLS models, 1992-2002

	1992	1994	1996	1998	2000	2002	Pooled
Challenger's district party strength	0.454	0.579	0.688	0.571	0.630	0.522	0.600
	(0.068)***	(0.063)***	(0.047)***	(0.050)***	(0.052)***	(0.048)***	(0.023)***
Challenger's spending (in $100K)	3.030	1.349	0.598	0.811	0.527	0.331	0.584
	(0.482)***	(0.215)***	(0.134)***	(0.136)***	(0.104)***	(0.098)***	(0.056)***
Incumbent's spending (in $100K)	-0.334	-0.299	-0.013	-0.058	-0.235	0.149	-0.099
	(0.331)	(0.179)*	(0.111)	(0.064)	(0.106)**	(0.162)	(0.055)*
Challenger is a Democrat	-0.317	-9.465	7.878	2.022	2.032	-2.410	
	(1.005)	(0.926)***	(0.716)***	(0.743)***	(0.674)***	(0.725)***	
Challenger has previously held elective office	1.838	1.867	2.924	1.405	1.586	0.715	2.362
	(1.215)	(1.123)*	(0.847)***	(0.839)*	(0.755)**	(0.933)	(0.395)***
Share of challenger's total receipts due to individual contributions above $750	-0.352	6.870	3.946	6.518	4.000	6.760	5.741
	(5.047)	(3.920)*	(2.767)	(2.986)**	(2.364)*	(2.574)***	(1.326)***
Share of incumbent's total receipts due to individual contributions above $750	-5.698	-8.859	-3.978	2.403	1.579	-5.680	-2.480
	(6.398)	(4.037)**	(2.565)	(2.846)	(2.657)	(3.989)	(1.428)*
Constant	16.963	17.685	4.556	8.696	9.419	13.933	12.273
	(2.354)***	(2.002)***	(1.818)**	(1.707)***	(1.851)***	(1.558)***	(0.940)***
Observations	194	204	218	191	191	169	1167
Adjusted R-squared	0.49	0.66	0.71	0.67	0.65	0.67	0.62

Note: The dependent variable is the challenger's percentage share of the vote. Challenger's district party strength is the percentage share of the vote attained by the challenger's party's candidate in the previous election. Incumbent spending is instrumented using lagged spending. (Races involving freshmen are therefore excluded.) The instrumental variable equations are reported in table 2. Spending has been adjusted for inflation (1990 = 1.00). The pooled regression includes year-specific intercepts and party label effects not reported in the table. For detailed results, refer to column 2 of Table 3 in the appendix. Standard errors are in parentheses; * significant at 10%; ** significant at 5%; *** significant at 1%

Table 2. Estimates of IV equations, 1992-2002

	1992	1994	1996	1998	2000	2002	Pooled
Challenger's district party strength	0.002	0.032	-0.108	-0.162	-0.096	0.023	-0.036
	(0.030)	(0.031)	(0.031)***	(0.033)***	(0.053)*	(0.046)	(0.016)**
Challenger's spending (in $100K)	1.059	0.459	0.680	0.513	0.757	0.495	0.659
	(0.153)***	(0.098)***	(0.061)***	(0.082)***	(0.055)***	(0.062)***	(0.029)***
Incumbent's spending in previous election	0.563	0.539	0.877	1.078	0.787	0.284	0.610
	(0.083)***	(0.049)***	(0.062)***	(0.043)***	(0.079)***	(0.045)***	(0.024)***
Challenger is a Democrat	-0.167	-0.882	0.236	1.229	0.233	0.083	
	(0.447)	(0.457)*	(0.460)	(0.459)***	(0.640)	(0.716)	
Challenger has previously held elective office	-0.145	0.313	0.931	0.518	0.697	0.855	0.488
	(0.546)	(0.568)	(0.542)*	(0.522)	(0.715)	(0.899)	(0.276)*
Share of challenger's total receipts due to individual contributions above $750	1.867	-0.140	-1.439	-0.725	1.195	1.287	0.561
	(2.225)	(1.984)	(1.785)	(1.854)	(2.244)	(2.527)	(0.927)
Share of incumbent's total receipts due to individual contributions above $750	9.391	1.506	0.210	-1.993	1.670	10.733	2.849
	(2.330)***	(2.007)	(1.649)	(1.777)	(2.500)	(3.198)***	(0.976)***
Constant	0.702	0.768	3.755	3.964	3.306	2.142	2.411
	(1.041)	(1.018)	(1.144)***	(1.081)***	(1.789)*	(1.545)	(0.650)***
Observations	194	204	218	191	191	169	1167
Adjusted R-squared	0.47	0.54	0.69	0.81	0.71	0.50	0.62

Note: The dependent variable is the incumbent's spending in $100K. Challenger's district party strength is the percentage share of the vote attained by the challenger's party's candidate in the previous election. Spending has been adjusted for inflation (1990 = 1.00). Standard errors are in parentheses.
* significant at 10%; ** significant at 5%; *** significant at 1%

Overall, these results suggest that there is an insignificant or possibly even weakly *positive* relationship between a candidate's reliance on large contributions and her electoral success. Contrary to the expectation underlying the money primary analogy, it does not appear to be the case that a candidate who collects five hundred $1000 is less popular than one who collects one thousand $500 contributions. I argued above that such a result would cast doubt on the central assumption underlying the equalization argument in support of contribution limits, namely that reliance on large contributions reflects a lack of public support. Although evidence for a positive relationship between reliance on large contributions and vote share is weak, these results suggests that contribution limits may indeed have the unintended effect of reducing the resources of popular candidates.

5 Conclusion

Campaign contribution limits are in large part advocated on the grounds that they democratize the financing of campaigns and cause campaign resources to reflect public support for candidates and their political ideas. Despite lingering questions as to its compatibility with the First Amendment, I have argued that the Supreme Court's opinions in *Buckley* and *Austin* indicate a certain level of support for what I have called the equalization argument in support of contribution limits. Specifically, while the Court rejected an equalization of candidates' aggregate expenditures, it implicitly endorsed the objective of equalizing the influence of individual donors in determining how large those aggregate expenditures will be. As a practical matter, the Court explicitly stated that it expected contribution limits to increase the correlation between candidates' aggregate resources and public support.

Using a simple formal model, I demonstrated that the equalization argument and the corresponding money primary analogy are based on a specific set of practical assumptions. The central assumption is

that candidates who rely heavily on large contributions exhibit less popular characteristics than those who rely on small contributions. Another is that the characteristics in question are "unadvertisable," so that popular candidates are unable to explicitly distinguish themselves through campaign communication. The final assumption is that the kind of information that *can* be explicitly revealed through campaign advertising is less important to voters than are unadvertisable characteristics. Under these assumptions, a contribution limit prevents unpopular candidates from advertising and thus enables uninformed voters to distinguish truly preferred candidates from those who exhibit unpopular hidden characteristics.

In addition, the formal model suggested a method of empirically testing these assumptions. Specifically, when voters prefer that a contribution limit be imposed, a candidate's vote share will be positively related to her level of spending but negatively related to her reliance on large contributions. I tested this hypothesis using data on congressional elections held between 1990 and 2002. The empirical estimations showed that, controlling for her aggregate level of spending, a candidate's reliance on large contributions has an insignificant or even a weakly positive effect on her vote share. This result casts doubt on the equalization argument in support of contribution limits.

6 Appendix

6.1 Proof of Lemma 1

Informed voters know the candidates' types, so an informed voter with ideology i will vote for candidate D if $u_v(q_{Da}, q_{Du}) - \phi \cdot i > u_v(q_{Ra}, q_{Ru}) - \phi \cdot (1-i)$. An uninformed voter with ideology i will vote for candidate D after seeing the pair of messages $(m_D, m_R) \in \{0, 1, \emptyset\}^2$ if $E\left[u_v(q_{Da}, q_{Du}) | m_D, \hat{\boldsymbol{\lambda}}\right] - \phi \cdot$

$i > E\left[u_v(q_{Ra}, q_{Ru})|m_R, \hat{\boldsymbol{\lambda}}\right] - \phi \cdot (1-i)$. Given a realization of μ, the fraction of informed voters casting a ballot for candidate D is $\frac{1}{2} + \frac{1}{2\tau} \cdot \left(\frac{1}{2} - \mu\right) + \frac{1}{4\tau\phi} \cdot [u_v(q_{Da}, q_{Du}) - u_v(q_{Ra}, q_{Ru})]$. The fraction of uninformed voters doing so is $\frac{1}{2} + \frac{1}{2\tau}\left(\frac{1}{2} - \mu\right) + \frac{1}{4\tau\phi} E\left[u_v(q_{Da}, q_{Du}) - u_v(q_{Ra}, q_{Ru})|m_D, m_R, \hat{\boldsymbol{\lambda}}\right]$. Then the total fraction of all voters voting for candidate D is $\frac{1}{2} + \frac{1}{2\tau} \cdot \left(\frac{1}{2} - \mu\right) + \frac{(1-\alpha)}{4\tau\phi} \cdot [u_v(q_{Da}, q_{Du}) - u_v(q_{Ra}, q_{Ru})]$
$+\frac{\alpha}{4\tau\phi} \cdot \left[(1-\lambda_D) \cdot E\left[u_v|\emptyset, \widehat{\lambda}\right] + \lambda_D \cdot E\left[u_v|q_{Da}, \widehat{\lambda}\right]\right] - \frac{\alpha}{4\tau\phi} \cdot \left[(1-\lambda_R) \cdot E\left[u_v|\emptyset, \widehat{\lambda}\right] + \lambda_R \cdot E\left[u_v|q_{Ra}, \widehat{\lambda}\right]\right]$.
Thus, defining the candidate's reputation as $\rho_j\left(q_{ja}, q_{ju}, \lambda_j, \widehat{\lambda}\right) = (1-\alpha) \cdot u_v(q_{ja}, q_{ju})$
$+\alpha \cdot \left((1-\lambda_j) \cdot E\left[u_v|\emptyset, \widehat{\lambda}\right] + \lambda_j \cdot E\left[u_v|q_{ja}, \widehat{\lambda}\right]\right)$, the probability with which candidate D wins the election is

$$\pi_D\left(q_{Da}, q_{Du}, q_{Ra}, q_{Ru}, \lambda_D, \lambda_R|\widehat{\lambda}\right) = \Pr\left(\mu < \frac{1}{2} + \frac{1}{2\phi} \cdot \left[\rho_D\left(q_{Da}, q_{Du}, \lambda_D, \widehat{\lambda}\right) - \rho_R\left(q_{Ra}, q_{Ru}, \lambda_R, \widehat{\lambda}\right)\right]\right)$$
$$= \frac{1}{2} + \frac{1}{4r\phi} \cdot \left[\rho_D\left(q_{Da}, q_{Du}, \lambda_D, \widehat{\lambda}\right) - \rho_R\left(q_{Ra}, q_{Ru}, \lambda_R, \widehat{\lambda}\right)\right] + \frac{1}{2r} \cdot \varkappa.$$

Welfare measure

Given a pair of competing candidates (q_{Da}, q_{Du}) and (q_{Ra}, q_{Ru}), candidate D wins the election if and only if the median voter, μ, is far enough to the left given the relative reputations of the candidates. I.e. if $\mu < \tilde{\mu}\left(q_{Da}, q_{Du}, q_{Ra}, q_{Ru}\right)$, where $\tilde{\mu}\left(q_{Da}, q_{Du}, q_{Ra}, q_{Ru}, \boldsymbol{\lambda}^*\right) = \frac{1}{2} + \frac{1}{2\phi}\left[\rho\left(q_{Da}, q_{Du}, \boldsymbol{\lambda}^*\right) - \rho\left(q_{Ra}, q_{Ru}, \boldsymbol{\lambda}^*\right)\right]$ and $\rho\left(q_a, q_u, \boldsymbol{\lambda}^*\right) = (1-\alpha) \cdot u_v\left(q_a, q_u\right) + \alpha \cdot \xi\left(\boldsymbol{\lambda}^*\right) \cdot \lambda^*_{(q_a, q_u)}$. Given this value $\tilde{\mu}$, the median voter's expected utility in this situation is $E\left[U_v|q_{Da}, q_{Du}, q_{Ra}, q_{Ru}, \boldsymbol{\lambda}^*\right] = \int\limits_{\left(\frac{1}{2}-\varkappa\right)-r}^{\tilde{\mu}} \left[u_v\left(q_{Da}, q_{Du}\right) - \phi \cdot \mu\right] \, dF\left(\mu\right) +$
$\int\limits_{\tilde{\mu}}^{\left(\frac{1}{2}-\varkappa\right)+r} \left[u_v\left(q_{Ra}, q_{Ru}\right) - \phi \cdot (1-\mu)\right] dF\left(\mu\right)$. The median voter's *ex ante* expected utility is
$V\left(\boldsymbol{\lambda}^*\right) = \sum\limits_{\left(q_{Da}, q_{Du}\right)} \sigma\left(q_{Da}, q_{Du}\right) \sum\limits_{\left(q_{Ra}, q_{Ru}\right)} \sigma\left(q_{Ra}, q_{Ru}\right) \cdot E\left[U_v|q_{Da}, q_{Du}, q_{Ra}, q_{Ru}, \boldsymbol{\lambda}^*\right]$.
Notice that $V\left(\mathbf{0}\right)$ is simply a constant. Subtracting it from $V\left(\boldsymbol{\lambda}^*\right)$ yields $V\left(\boldsymbol{\lambda}^*\right) - V\left(\mathbf{0}\right) = \frac{\alpha^2}{4r\phi} \cdot$
$\xi\left(\boldsymbol{\lambda}^*\right) \cdot \sum\limits_{\left(q_a, q_u\right)} \sigma\left(q_a, q_u\right) \cdot \lambda^*_{(q_a, q_u)} \cdot \left[u_v\left(q_a, q_u\right) - \bar{u}_v\right]$. Finally, we can divide by the constant $\frac{\alpha^2}{4r\phi}$ to get the

normalized welfare measure.

Equilibrium conditions

Here, I derive and discuss the conditions for laissez-faire equilibrium. The conditions for policy are analogous in a straightforward way (i.e. by simply excluding equilibria in which excluded types advertise and dropping the condition for those types in other equilibria.). Simple calculations show that the effectiveness of advertising in any particular equilibrium is given by

$$\xi\left(\boldsymbol{\lambda}^{*}\right)=\frac{\sum_{(q_a,q_u)}\sigma\left(q_a,q_u\right)\cdot\lambda^{*}_{(q_a,q_u)}\cdot\left[u_v\left(q_a,q_u\right)-\bar{u}_v\right]}{\left(\sum_{(q_a,q_u)}\sigma\left(q_a,q_u\right)\cdot\lambda^{*}_{(q_a,q_u)}\right)\left(1-\sum_{(q_a,q_u)}\sigma\left(q_a,q_u\right)\cdot\lambda^{*}_{(q_a,q_u)}\right)},$$

where $\sigma\left(q_a,q_u\right)$ denotes the probability of drawing a candidate of type $\left(q_a,q_u\right)$ and $\bar{u}_v$ is the expected utility from a randomly chosen candidate.

Suppose that $\lambda^{*}=(1,0)$. That is, only the $(1,0)$ type advertises in equilibrium. Then the effectiveness of advertising is then given by $\xi\left(1,0\right)=\left(\frac{1-\sigma_a+\sigma_u\cdot\sigma_a\cdot z}{1-\sigma_a\cdot(1-\sigma_u)}\right)$. Note that this is positive. Thus, the $(1,0)$ type will advertise if $\gamma_0\cdot f_0\cdot\xi\left(1,0\right)>\frac{1}{\eta}\cdot B$. Further, since the $(1,1)$ type is not advertising, we must have $\gamma(1)\cdot f(1)\cdot\xi\left(1,0\right)<\frac{1}{\eta}\cdot B$. Voter welfare in this equilibrium is given by $W^{*}(1,0)=\frac{\sigma_a\cdot(1-\sigma_u)}{1-\sigma_a\cdot(1-\sigma_u)}\cdot\left[1-\sigma_a\cdot(1-\sigma_u\cdot z)\right]^2$.

Suppose that $\lambda^{*}=(0,1)$.That is, the $(1,0)$ type does not advertise and the $(1,1)$ type advertises with probability 1. Then the effectiveness of advertising is given by $\xi\left(0,1\right)=\left(\frac{1-\sigma_a-(1-\sigma_u\cdot\sigma_a)\cdot z}{1-\sigma_u\cdot\sigma_a}\right)$. Advertising is effective in this equilibrium only if $z<\frac{1-\sigma_a}{1-\sigma_u\cdot\sigma_a}$. For the $(1,0)$ type not to advertise under these circumstances, it must be that $\gamma_0\cdot f_0\cdot\xi\left(0,1\right)<\frac{B}{\eta}$, while for the $(1,1)$ type to do so, we must have$\gamma_1\cdot f_1\cdot\xi\left(0,1\right)>\frac{B}{\eta}$. Voter welfare in this equilibrium is given by $W^{*}(0,1)=\frac{\sigma_a\cdot\sigma_u}{1-\sigma_u\cdot\sigma_a}\cdot\left[1-\sigma_a-(1-\sigma_u\cdot\sigma_a)\cdot z\right]^2$.

Suppose that $\lambda^* = (1,1)$, i.e. candidates of type $(1,0)$ and $(1,1)$ each advertise with probability 1. The effectiveness of advertising is $\xi(1,1) = 1 - \sigma_u \cdot z$. Advertising is effective if $z < \frac{1}{\sigma_u}$, i.e. if the cost of electing a "special interest" candidate is not too large. Since both types of candidates are choosing to advertise, we must have $\gamma_0 \cdot f_0 \cdot \xi(1,1) > \frac{B}{\eta}$ and $\gamma_1 \cdot f_1 \cdot \xi(1,1) > \frac{B}{\eta}$. Voter welfare in this equilibrium is given by $W^*(1,1) = \sigma_a \cdot (1 - \sigma_a) \cdot (1 - \sigma_u \cdot z)^2$

Finally, suppose that $\lambda^* = (0,0)$, i.e. no candidate advertises. In this case, effectiveness is not well defined. We are therefore free to specify beliefs for voters. Suppose that voters believe that a candidate who advertises in this equilibrium is a special interest type with probability $\hat{q}_u(0,0)$. Since no one advertises, not deviating will lead to a reputation of $\bar{u}_v$. Then, the effectiveness of advertising in the "no ad" equilibrium is given by $\xi(0,0) = (1 - \sigma_a) - (\hat{q}_u(0,0) - \sigma_a \sigma_u) \cdot z$. Since no advertising takes place, this is the benchmark situation in which voter welfare is equal to zero.

Proof of Proposition 1

Note that $\xi(1,1) = 1 - \sigma_u \cdot z < 0$. That is, messages would be ineffective if both candidates were advertising. This rules out the pooling equilibrium $(1,1)$. Since $f_{q_u} \to \infty$, we cannot have a separating equilibrium because both candidates will advertise when messages are effective. Therefore, the unique equilibrium is $\lambda^* = (0,0)$. Beliefs are chosen such that deviations from the no advertising equilibrium are ineffective. For example, voters may believe that a candidate who advertises is a special interest type with probability $\hat{q}_u(0,0) = \sigma_u$. Then $\xi(0,0) = 1 - \sigma_u \cdot z - \bar{u}_v = (1 - \sigma_a) \cdot (1 - \sigma_u \cdot z) < 0$. Voter welfare is $W(0,0) = 0$. Now consider the effects of a contribution limit. If $\gamma_0 > \gamma_1$, a limit just below $\frac{B}{\gamma_1}$ will prevent special interest candidates from advertising. Then, since $\xi(1,0) > 0$, $\tilde{\lambda}^* = (1,0)$. That is, public interest candidates will advertise effectively in the policy equilibrium. Thus welfare increases

to $W(1,0) > 0$. If $\gamma_0 < \gamma_1$, a limit will prevent either public interest candidates or both candidates from advertising. Since $\xi(0,1) < 0$, advertising will remain ineffective and the policy equilibrium will be $\tilde{\lambda}^* = (0,0)$. Thus welfare remains unchanged. So when $z \geq \frac{1}{\sigma_u}$, voters benefit from the imposition of a contribution limit if and only if $\gamma_0 > \gamma_1$.

Proof of Proposition 2

Note that $\xi(1,1) = 1 - \sigma_u \cdot z > 0$. Thus, for f_{q_u} large enough, $\lambda^* = (1,1)$. Also note that $\xi(1,0) > \xi(1,1)$ and $\Delta u_v(1,1) < 0$. Thus, $W(1,0) - W(1,1) = \sigma_a \cdot (1-\sigma_u) \cdot (\xi(1,0) - \xi(1,1)) \cdot \Delta u_v(1,0) - \sigma_a \cdot \sigma_u \cdot \xi(1,1) \cdot \Delta u_v(1,1) > 0$. That is, since effectiveness of advertising increases and the special interest type's message contributes negatively to voter welfare, voters would prefer that only the public interest candidate advertises. Thus, as in the previous case, voters benefit from the imposition of a contribution limit if and only if $\gamma_0 > \gamma_1$.

Proof of Propositions 3 and 4

I will prove both claims simultaneously. Suppose $z \in (0,1)$. Then $\xi(1,1) = (1 - \sigma_u \cdot z) > 0$. Thus, for f_{q_u} large enough, $\lambda^* = (1,1)$. Voter welfare is $W(1,1) > 0$. Suppose $\gamma_0 < \gamma_1$, the imposition of a contribution limit results in either $\tilde{\lambda}^* = (0,0)$ or $\tilde{\lambda}^* = (0,1)$. The former will occur if $\xi(0,1) < 0$, i.e. if $z > \frac{1-\sigma_a}{(1-\sigma_u \cdot \sigma_a)}$. Then welfare drops from $W(1,1) > 0$ to $W(1,1) = 0$. $\tilde{\lambda}^* = (0,1)$ will occur if and only if $z < \frac{1-\sigma_a}{(1-\sigma_u \cdot \sigma_a)}$. This implies $\Delta u_v(1,1) = 1 - \sigma_a - (1 - \sigma_a\sigma_u) \cdot z > 0$. Also note that $\xi(1,1) - \xi(0,1) = (1-\sigma_u) \cdot z + \frac{\sigma_a \cdot (1-\sigma_u)}{1-\sigma_a\sigma_u} > 0$. Therefore,

$$W(0,1) - W(1,1) = \sigma_a \cdot \sigma_u \cdot (\xi(0,1) - \xi(1,1)) \cdot \Delta u_v(1,1) - \sigma_a \cdot (1-\sigma_u) \cdot \xi(1,1) \cdot \Delta u_v(1,0) < 0$$

That is, since effectiveness of advertising decreases and both special and public interest candidates' messages contribute positively to voter welfare, welfare must decrease with the imposition of a contribution limit when $\gamma_0 < \gamma_1$.

Suppose $\gamma_0 > \gamma_1$. In this case, the imposition of a limit results in $\tilde{\lambda}^* = (1, 0)$. The change in effectiveness and welfare that results depends on the probabilities σ_a and σ_u. In particular,

$$\xi(1,0) - \xi(1,1) = \frac{\sigma_u \cdot [z \cdot (1 + \sigma_a \sigma_u) - \sigma_a]}{1 - \sigma_a \cdot (1 - \sigma_u)} > 0 \text{ iff } \sigma_u > \frac{1}{z} - \frac{1}{\sigma_a}$$

(note that this is always true for $z > \sigma_a$, otherwise it depends on σ_u.) More importantly, the change in welfare that results from a contribution limit is equal to

$$W(1,0) - W(1,1) = \frac{\sigma_a \cdot (1 - \sigma_u)}{1 - \sigma_a \cdot (1 - \sigma_u)} \cdot [1 - \sigma_a \cdot (1 - \sigma_u \cdot z)]^2 - \sigma_a \cdot (1 - \sigma_a) \cdot (1 - \sigma_u \cdot z)^2$$

so that for $z \in (0, 1)$ and $\gamma_0 > \gamma_1$, welfare will increase with the imposition of a contribution limit if and only if

$$\sigma_a > \frac{1 - z \cdot (2 - \sigma_u \cdot z)}{1 - z \cdot (2 - \sigma_u \cdot (2 - \sigma_u) \cdot z)}$$

Due to its nonlinear form, this condition is somewhat difficult to discuss analytically. I therefore use a graphical representation to aid the interpretation. Specifically, refer to Figure 2.1. The figure is displayed in $\sigma_a - \sigma_u$ space. The solid lines represent points at which $W(1,0) = W(1,1)$. They are plotted for $z = \frac{2}{5}$ (blue), $\frac{12}{25}$ (green), $\frac{1}{2}$ (black), $\frac{13}{25}$ (orange), and $\frac{3}{5}$ (pink). For each value of z, the region in which $W(1,0) > W(1,1)$ is the area *above* the corresponding solid line. For $z \in \left(0, \frac{1}{2}\right)$, welfare increases with the imposition of a contribution limit if and only if σ_a is large and σ_u takes on intermediate values, i.e. if and only if $\sigma_u \in (\underline{\sigma}_u(z, \sigma_a), \overline{\sigma}_u(z, \sigma_a))$, where $\underline{\sigma}_u(z, \sigma_a)$ is decreasing in z and σ_a, and $\overline{\sigma}_u(z, \sigma_a)$ is increasing in z and σ_a.

For $z \in [\frac{1}{2}, 1)$, welfare increases with the imposition of a limit if and only if σ_a is large and σ_u is small, i.e. if and only if $\sigma_u < \overline{\sigma}_u(z, \sigma_a)$, where $\overline{\sigma}_u(z, \sigma_a)$ is increasing in z and σ_a. As z increases,

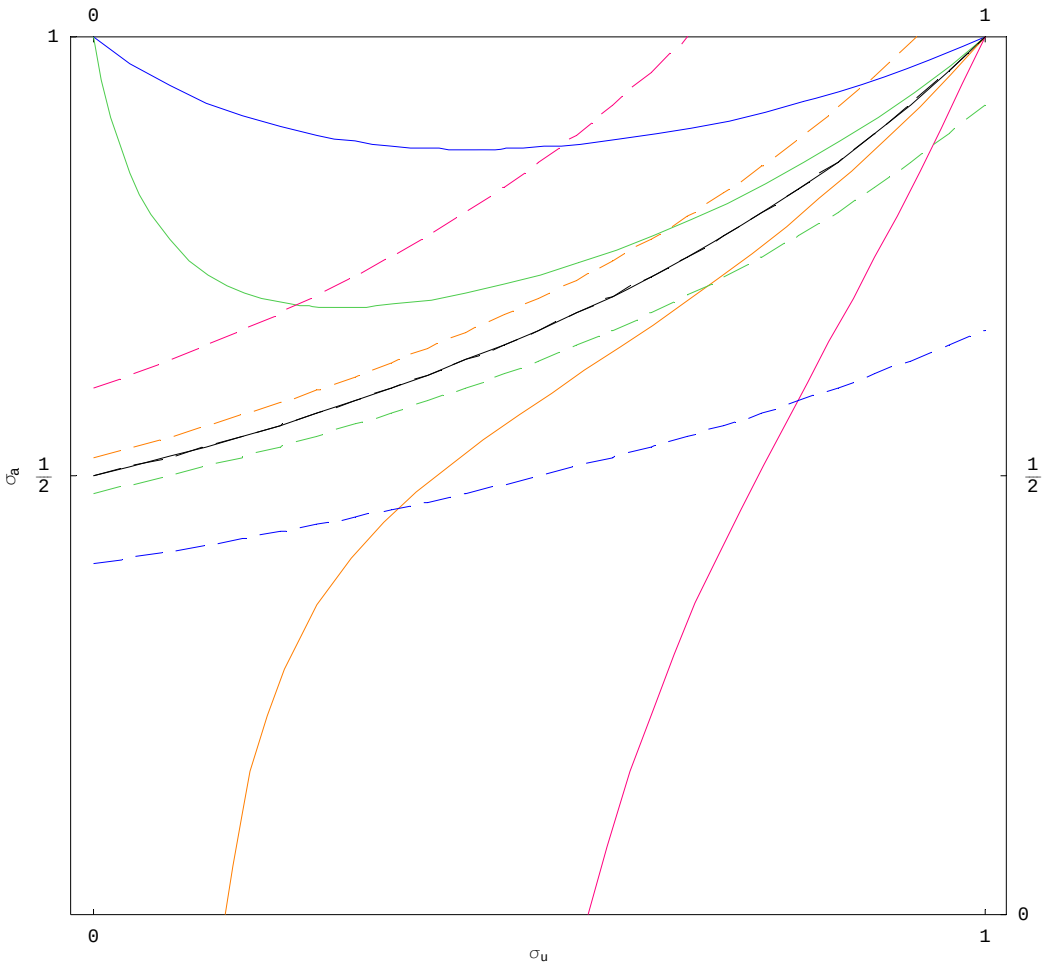

Figure 1: Regions in $\sigma_a - \sigma_u$ space. The solid lines represent points at which $W(1,0) = W(1,1)$. They are plotted for $z = \frac{2}{5}$ (blue), $\frac{12}{25}$ (green), $\frac{1}{2}$ (black), $\frac{13}{25}$ (orange), and $\frac{3}{5}$ (pink). For each value of z, the region in which $W(1,0) > W(1,1)$ is the area *above* the corresponding solid line. For these parameter values, voters would prefer that a contribution limit be imposed. The dashed lines represent points at which $\xi(1,0) = \xi(1,1)$. They are drawn for the corresponging values of z. The effectiveness of advertising increases with the imposition of a limit for points *below* this line. For $z = \frac{1}{2}$, the two lines coincide. (Thus, the effectiveness of advertising would go down after a voter-preferred limit is imposed.)

the solid line shifts down and the area in which voters prefer that a limit be imposed encompasses more and more of the parameter space. When $z = 1$, Proposition 2 applies and a limit is beneficial for all points in the space. Q.E.D.

Table 3. Estimates of OLS models, 1990-2002

	1990	1992	1994	1996	1998	2000	2002	Pooled
Challenger's district party strength	0.293	0.331	0.443	0.564	0.615	0.576	0.468	0.517
	(0.060)***	(0.056)***	(0.045)***	(0.039)***	(0.043)***	(0.045)***	(0.042)***	(0.018)***
Challenger's spending (in $100K)	1.225	1.726	0.841	0.797	0.295	0.406	0.153	0.383
	(0.269)***	(0.278)***	(0.142)***	(0.099)***	(0.071)***	(0.074)***	(0.050)***	(0.037)***
Incumbent's spending (in $100K)	0.283	0.164	0.290	-0.069	0.025	-0.048	0.191	0.103
	(0.210)	(0.136)	(0.100)***	(0.071)	(0.058)	(0.061)	(0.070)***	(0.033)***
Challenger is a Democrat	1.549	0.151	-8.488	6.304	1.648	1.788	-1.885	
	(0.884)*	(0.953)	(0.770)***	(0.613)***	(0.665)**	(0.616)***	(0.717)***	
Challenger has previously held elective office	0.868	2.541	1.632	2.361	1.641	0.753	-0.434	2.146
	(1.243)	(1.092)**	(0.878)*	(0.713)***	(0.767)**	(0.690)	(0.885)	(0.346)***
Share of challenger's total receipts due to individual contributions above $750	-0.836	1.735	11.727	3.399	4.088	4.568	11.771	2.076
	(1.012)	(4.584)	(3.312)***	(2.667)	(2.031)**	(2.258)**	(2.489)***	(0.725)***
Share of incumbent's total receipts due to individual contributions above $750	-4.509	-9.471	-11.543	-6.426	0.745	-0.673	-6.361	-4.446
	(4.603)	(5.226)*	(3.129)***	(2.463)***	(2.861)	(2.526)	(3.321)*	(1.305)***
Constant	23.291	19.504	18.866	9.596	7.884	10.456	14.906	14.162
	(2.007)***	(2.070)***	(1.570)***	(1.456)***	(1.608)***	(1.705)***	(1.505)***	(0.854)***
Observations	225	242	298	295	249	224	202	1735
Adjusted R-squared	0.35	0.42	0.67	0.74	0.63	0.66	0.61	0.56

Note: The dependent variable is the challenger's percentage share of the vote. Challenger's district party strength is the percentage share of the vote attained by the challenger's party's candidate in the previous election. Spending has been adjusted for inflation (1990 = 1.00). The pooled regression includes year-specific intercepts and party label effects not reported in the table. For detailed results, refer to column 1 of Table X in the appendix.
Standard errors are in parentheses; * significant at 10%; ** significant at 5%; *** significant at 1%

Table 4. Pooled Regressions (detailed results)

	OLS	2SLS	IV Equation
Challenger's district party strength	0.517	0.600	-0.036
	(0.018)***	(0.023)***	(0.016)**
Challenger's spending (in $100K)	0.383	0.584	0.659
	(0.037)***	(0.056)***	(0.029)***
Incumbent's spending (in $100K)	0.103	-0.099	
	(0.033)***	(0.055)*	
Challenger has previously held elective office	2.146	2.362	0.488
	(0.346)***	(0.395)***	(0.276)*
Share of challenger's total receipts due to individual contributions above $750	2.076	5.741	0.561
	(0.725)***	(1.326)***	(0.927)
Share of incumbent's total receipts due to individual contributions above $750	-4.446	-2.480	2.849
	(1.305)***	(1.428)*	(0.976)***
Democratic Challenger in 1990	1.647		
	(0.783)**		
Democratic Challenger in 1992	-0.822	-1.066	-0.170
	(0.755)	(0.773)	(0.540)
Democratic Challenger in 1994	-10.322	-9.862	-0.505
	(0.696)***	(0.784)***	(0.548)
Democratic Challenger in 1996	6.326	7.509	0.605
	(0.674)***	(0.737)***	(0.514)
Democratic Challenger in 1998	1.965	2.046	1.153
	(0.728)***	(0.776)***	(0.541)**
Democratic Challenger in 2000	1.555	1.878	0.345
	(0.766)**	(0.769)**	(0.538)
Democratic Challenger in 2002	-2.758	-2.775	0.441
	(0.810)***	(0.818)***	(0.573)
Dummy for 1990	2.725		
	(0.771)***		
Dummy for 1992	0.907	0.770	0.723
	(0.753)	(0.764)	(0.539)
Dummy for 1994	4.854	4.239	-0.491
	(0.715)***	(0.736)***	(0.512)
Dummy for 1996	-2.971	-4.289	-0.430
	(0.766)***	(0.761)***	(0.529)
Dummy for 1998	-2.536	-3.095	-1.029
	(0.781)***	(0.805)***	(0.557)*
Dummy for 2000	-1.963	-2.880	0.300
	(0.781)**	(0.779)***	(0.546)
Incumbent's spending in previous election			0.610
			(0.024)***
Constant	14.162	12.273	2.411
	(0.854)***	(0.940)***	(0.650)***
Observations	1735	1167	1167
Adjusted R-squared	0.56	0.62	0.62

Note: The dependent variable in columns 1 and 2 is the challenger's percentage share of the vote. The dependent variable in column 3 is the incumbent's spending in $100K. Note the inclusion of year-specific intercepts and party label effects. Standard errors in parentheses; * significant at 10%; ** significant at 5%; *** significant at 1%

Table 5. Summary fundraising statistics

	challengers		incumbents	
variable	mean	sd	mean	sd
		1990		
Spending in $100K	1.03	1.76	4.31	2.51
Receipts in $100K	1.05	1.78	4.34	2.27
Fraction of receipts due to individual contributions	0.52	0.30	0.43	0.19
Fraction of receipts due to PAC contributions	0.13	0.20	0.54	0.19
Fraction of receipts due to candidate contributions	0.25	0.29	0.01	0.04
Fraction receipts due to contributions above $750	0.11	0.13	0.10	0.10
		1992		
Spending in $100K	1.48	2.03	6.00	3.90
Receipts in $100K	1.58	2.05	5.28	3.41
Fraction of receipts due to individual contributions	0.52	0.27	0.45	0.18
Fraction of receipts due to PAC contributions	0.15	0.21	0.51	0.19
Fraction of receipts due to candidate contributions	0.17	0.23	0.01	0.03
Fraction receipts due to contributions above $750	0.11	0.11	0.11	0.09
		1994		
Spending in $100K	1.83	2.64	5.62	3.80
Receipts in $100K	1.94	2.76	5.59	3.32
Fraction of receipts due to individual contributions	0.52	0.28	0.47	0.17
Fraction of receipts due to PAC contributions	0.12	0.18	0.50	0.17
Fraction of receipts due to candidate contributions	0.20	0.25	0.01	0.04
Fraction receipts due to contributions above $750	0.11	0.11	0.13	0.09
		1996		
Spending in $100K	2.17	3.49	6.51	5.03
Receipts in $100K	2.25	3.55	6.88	5.28
Fraction of receipts due to individual contributions	0.55	0.27	0.52	0.17
Fraction of receipts due to PAC contributions	0.18	0.22	0.47	0.17
Fraction of receipts due to candidate contributions	0.17	0.24	0.00	0.02
Fraction receipts due to contributions above $750	0.12	0.11	0.16	0.12
		1998		
Spending in $100K	2.40	4.60	7.05	6.20
Receipts in $100K	2.40	4.59	7.68	6.03
Fraction of receipts due to individual contributions	0.54	0.29	0.51	0.18
Fraction of receipts due to PAC contributions	0.17	0.21	0.47	0.18
Fraction of receipts due to candidate contributions	0.18	0.26	0.00	0.02
Fraction receipts due to contributions above $750	0.13	0.13	0.17	0.11

Table 5. Summary fundraising statistics 1990 – 2002 (continued)

variable	challengers mean	challengers sd	incumbents mean	incumbents sd
		2000		
Spending in $100K	3.04	5.98	8.88	7.2
Receipts in $100K	2.96	5.93	9.07	6.41
Fraction of receipts due to individual contributions	0.6	0.26	0.52	0.17
Fraction of receipts due to PAC contributions	0.14	0.17	0.47	0.17
Fraction of receipts due to candidate contributions	0.22	0.27	0	0.02
Fraction receipts due to contributions above $750	0.17	0.14	0.2	0.11
		2002		
Spending in $100K	2.3	5.29	9.1	5.95
Receipts in $100K	2.25	5.26	9.29	6.04
Fraction of receipts due to individual contributions	0.55	0.29	0.52	0.17
Fraction of receipts due to PAC contributions	0.15	0.21	0.47	0.17
Fraction of receipts due to candidate contributions	0.26	0.3	0	0.02
Fraction receipts due to contributions above $750	0.15	0.14	0.23	0.12

Note: Receipts and expenditures are adjusted for inflation (1990 = 1.00). In order to save space, the fraction of receipts due to party contributions is not reported. It is equal to the remainder.

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