

Helping Friends or Influencing Foes: Electoral and Policy Effects of Campaign Finance Contributions*

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Abstract

Campaign finance contributions may influence policy by affecting elections or influencing the choices of politicians once in office. To study the trade-offs between these two paths to influence, we use a game in which contributions may affect electoral outcomes and signal policy-relevant information to politicians. In the model, a campaign donor and two politicians each possess private information correlated with a policy-relevant state of the world. The donor may allocate his budget to either an ally candidate who has relatively similar preferences or a moderate candidate whose preferences are relatively divergent from the donor's preferred policy. Contributions that increase the likelihood of the moderate being elected can signal good news about the donor's preferred policy and influence the moderate's policy choice. However, when the electoral effect of contributions is too small to demand sufficiently high costs to deter imitation by groups with negative information, this informational effect breaks down.

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Running for office in the United States is expensive and the cost is continually rising. The cost of the 2016 United States Presidential and Congressional elections was just under 6.5 billion dollars, which translates to over one-fifth of the GDP of Vermont, with the inflation-adjusted cost of Congressional elections increasing by around 45% since 2008 and 73% since 2000.¹ Furthermore, the rise of unlimited soft money has allowed a larger proportion of campaign funds to be provided by a smaller set of elite donors and groups. For scholars and policymakers interested in electoral representation, a basic question in need of answers is: What do donors think they are getting in return for spending so much money? A good answer to this question would further inform our understanding of the role of interest groups in modern policymaking, shape our views about whether or not the current campaign finance regime is harmful to representation, and allow us to formulate better predictions about the effects of reform proposals.

Extant literature provides several possible answers to the question of donor motivations, though none are completely satisfying on their own. We can divide the key motivations of large donors into two categories: influencing electoral outcomes and influencing the behavior of politicians. A pure electoral model assumes that donors take politicians' preferences and behavior as given and spend money to help the electoral prospects of like-minded politicians (e.g., Poole, Romer and Rosenthal 1987). Alternatively, contributions may influence the behavior of politicians either through quid pro quo exchange (e.g., Grossman and Helpman 1994) or by signaling policy-relevant information to policymakers (e.g., Gordon and Hafer 2005).

Each of these accounts provides an incomplete picture of the influence of contributions. For instance, the pure electoral and quid pro quo models imply that donors should strictly benefit when the candidate they backed wins an election, which runs contrary to evidence for at least corporate contributions (Fowler, Garro and Spenkuch 2018). Furthermore, there is little evidence of a connection between contributions and the behavior of individual legislators, suggesting limited empirical support for a quid pro quo model (Ansolabehere, de Figueiredo and Snyder 2003). Sig-

¹The inflation-adjusted dollar amount for 2016 federal election spending is \$6,444,253,265, which is approximately a 50% increase in overall spending in federal elections compared to 2000 (Data retrieved from Open Secrets on June 7, 2018 at <https://www.opensecrets.org/overview/cost.php?display=T&infl=Y>).

naling models provide a better account of these patterns, since a signal of policy information may still be useful to politicians who did not receive the contribution, but some questions remain unanswered: What makes *campaign contributions* useful informational devices as opposed to some other conspicuous expenditure? How can we explain the targeting of informational contributions? Our answers to these questions are based on the idea that influencing elections and influencing politicians are interrelated goals. If a donor's policy-relevant information affects their perceived stake in the election then the electoral effects of contributions may contribute to the costs that allow contributions to serve as credible signals. This makes campaign contributions uniquely useful signals and also pushes some donors to contribute to the candidate they least prefer on electoral grounds in order to signal favorable information.

To illustrate our argument, consider the example of a political action committee (PAC) for a trade association that seeks to avoid expensive regulation of a new product produced by its members. There is a continuum of regulatory policies that may be proposed and implemented, ranging from no regulations to an outright ban on the product. A coming election will determine who will take office and make this key decision, and the race is between two candidates who we will label the Ally and the Moderate. The Ally, like the trade association, always prefers zero regulation. The Moderate's policy preferences depend on some unknown information θ about which only noisy information is available. For instance, θ may capture information about the risks associated with the product, the economic costs of regulating the product, or voters' demand for regulation. Higher values of θ suggest more regulation is needed. Through internal studies, the trade association has noisy private information about θ . Specifically, assume θ is a number in the unit interval and the trade association observes a binary signal that is "bad" with probability θ and "good" with probability $1 - \theta$. Thus, a good signal suggests that θ is closer to zero, implying a low level of regulation is appropriate. We will refer to the PAC's signal as its "type." Furthermore, if the Moderate takes office she will convene a committee and conduct an independent study about how much, if any, regulation would be beneficial. This study provides another binary signal distributed in the same way, at which point she will set the final level of regulation equal to what she believes to be the

‘correct’ level of regulation (i.e., her expectation of the value of θ).

The choice faced by the PAC is whether to contribute to the Ally candidate or the Moderate candidate. The contributions are assumed to have a positive effect on the probability the recipient wins the election. Thus, from an electoral perspective, the PAC clearly prefers to contribute to the Ally’s campaign. However, contributions are also publicly observable and may convey the PAC’s private information about θ . We argue that this consideration will sometimes cause the PAC to contribute to the Moderate in order to convince her that it has favorable information. For contributions to be a credible signal of information the good type of PAC must be more willing than the bad type to contribute to the Moderate in order to convince her its signal was good.

This is true in this example for two reasons. First, the PAC’s information helps it predict what signal the Moderate will receive if she gains office. If the PAC receives a bad signal then it believes the Moderate’s signal will likely also be bad. The bad type of PAC therefore expects to be more heavily regulated by the Moderate than the good type even if it manages to successfully misrepresent its own information. Furthermore, the expected *difference* between the Moderate’s policy and the Ally’s policy is larger when θ is expected to be higher. This means that the bad type places relatively higher weight on electoral rather than signaling aspects of influence and therefore will not trade away electoral influence for behavioral influence as readily as the good type. Thus, the trade-off between influencing elections and influencing politicians’ behavior induces payoffs to the PAC that allow for credible information transmission through contributions.

To generalize this logic we analyze a model of large campaign contributions in which donors are motivated by influencing electoral outcomes as well as influencing the behavior of politicians. We provide a general argument for why the electoral effects of campaign contributions make them uniquely useful signals of policy information and create opportunities for information transmission that may not otherwise exist. The key mechanism is the one described in the example above: a donor that has a good case on policy grounds expects opposing politicians to be more persuaded to move policy in their direction and is therefore more willing to forgo opportunities to put allies in positions of power. These donors therefore distinguish themselves to politicians by crossing the

aisle more often to make contributions to opposing politicians. Thus, we provide an empirically plausible account of informative campaign contributions that explains why campaign expenditures may be particularly useful compared to other expenditures. Furthermore, the theory offers predictions about the distribution of these expenditures across candidates and races, as well as insight into several important empirical questions in the literature.

Existing accounts of campaign contributions

We explain donor behavior as a mixture of electoral motivation and signaling to policymakers. These two effects have been analyzed in isolation but, as we will demonstrate, the combination of electoral and signaling effects leads to unexpected insights that help explain empirical patterns in donor behavior.

Electoral effects. A first-order effect of campaign contributions from the perspective of the politician is that money helps win elections. Empirical work on aggregate campaign spending (Erikson and Palfrey 2000; Hall 2016) as well as experimental analyses of specific uses of campaign dollars (see Green and Gerber 2015) show that campaign spending is effective. The demonstrable effects of campaign spending on electoral outcomes provide an opportunity for donors to influence policy by boosting the election prospects of like-minded politicians. Empirical analysis of contribution behavior provides indirect evidence that donors consider electoral effects when allocating contributions. For instance, Bonica (2013) and Barber, Canes-Wrone and Thrower (2017) show that individual donors allocate more contributions to ideologically close politicians in close races. Furthermore, surveys of individual donors show that they consistently rate “to affect election outcome” as a top reason for donating (Barber 2016).

Research on PACs provides more mixed evidence with respect to ideological and electoral motivations for contributions. Poole, Romer and Rosenthal (1987) and Levitt (1998) show that PACs allocate more funds to highly rated legislators in close elections, but other research shows that PACs frequently cross ideological lines and target politicians that seem likely to remain in office (Snyder 1990, 1992). Snyder (1992) draws a distinction between “investor” PACs and “ideological”

PACs, which helps explain some varying results.² Our theory suggests private information about the merits of the position the PAC intends to advocate as one cause of selection into investment-oriented versus ideological behavior.³ Models of pure electoral motivation also cannot explain why firms appear not to benefit from backing the winner of an election though, as Fowler, Garro and Spenkuch (2018) note, this finding is consistent with many signaling models of contributions, including the one in this paper. Overall, the evidence suggests the need for a theory that includes some electoral motivation but allows other motivations to operate simultaneously.

Other research highlights the trade-off between electing friends and lobbying enemies. Felli and Merlo (2007) study a citizen-candidate model in which interest groups may donate campaign funds and make ex post transfers in exchange for policy favors. In equilibrium, groups only donate campaign funds to their most preferred candidate and only make ex post transfers when their least preferred candidate wins the election. Thus, interest groups either influence electoral outcomes or buy policy, but not both. The mechanism for policy influence in our model differs from that of Felli and Merlo (2007): we assume that campaign donors cannot contract with politicians and posit that policy influence occurs when contributions transmit policy-relevant information to politicians. There are also no ex post contributions in our model since they would not transmit any information.

Signaling to policymakers. Though some variation in contribution behavior can be explained by electoral motivation, the evidence above makes clear that the audience for many contributions is the politician rather than the voters. An important way that campaign contributions are theorized to influence policymakers is by signaling important information. This idea appears in a handful of papers which differ with respect to the nature of the information being transmitted and the actions to be taken by the policymaker. In some informational models contributions pay for access to

²This mixed evidence is less a matter of inconsistent results and more a matter of emphasis. On one hand, more money goes toward close races. On the other hand, a substantial amount of money goes toward races in which the incumbent has virtually no chance of losing, suggesting the electoral motivation can only explain part of the story.

³Most of the PAC research cited above occurred prior to the *Citizens United* decision removing most restrictions on outside spending in elections (*Citizens United v. Federal Election Commission*, 558 U.S. 310 (2010)). This decision led to an increase in electoral strategies by donors, in part by allowing contributions to be sizable enough to have a significant impact. Recent research on outside spending organizations suggests that many pursue electoral strategies. For instance, in state legislative elections, *Citizens United* was found to have a large and positive impact on Republican success, in part due to strategic targeting of key races (Klumpp, Mialon and Williams 2016).

the politician and additional information may be transmitted once access is granted (Austen-Smith 1995, 1998; Cotton 2012; Lohmann 1995). In Austen-Smith (1995) and Lohmann (1995), interest groups' information is unverifiable but the credibility of informational lobbying can be enhanced by costly political contributions. In Austen-Smith (1998) and Cotton (2009, 2016), interest groups pay access fees in order to deliver verifiable information to the politician. Policymakers impose access fees in order to extract rent from interest groups; therefore, they tend to grant more access to wealthy groups. We do not explicitly model access but the mechanism we highlight relates closely to that in Cotton (2009, 2016). Both here and in Cotton's papers, informative contributions are driven by politicians' access to an independent source of policy information. In Cotton's models, the politician directly observes the private information about the policy advocated by the largest donor, which limits groups' temptation to exaggerate. In our model, the state of the world generates correlation between the signals of interest groups and politicians. Thus, the interest group's signals affect the intensity of its electoral preference for the sympathetic candidate, implying good types' greater willingness to forgo electoral gains to influence the moderate's policy choices.

In other models, as in this one, contributions serve as signals aimed at influencing policy choices directly. For instance, both Gordon and Hafer (2005) and Gordon and Hafer (2007) model political expenditures such as campaign contributions or lobbying as signaling information to politicians to influence outcomes. In Gordon and Hafer (2005) firms contribute to politicians to signal to regulators they are willing to fight undesirable regulatory action. By "flexing their muscles" through contributions they are able to induce regulators to engage in more favorable levels of regulatory oversight (from the firms' perspectives). In Gordon and Hafer (2007) this logic is extended to incorporate legislative decisions. Firms are able to potentially influence both legislative choices over the stringency of a regulatory mandate as well as the level of regulatory enforcement chosen by an agency by strategically choosing both the allocation and level of contributions. We build on the foundations provided by these articles by also developing a costly signaling theory of campaign contributions.⁴

⁴Two other papers are not explicitly about campaign contributions but do share aspects in common with this paper. In Fox and Rothenberg (2011) politicians have private information about their policy preferences and the incumbent

In the models discussed above, the important characteristics of campaign contributions are that they are public and costly. Because many other activities have these characteristics, existing models do not necessarily uniquely predict that campaign contributions serve as signals. For instance, Gordon and Hafer (2005) note in relation to their model that other conspicuous expenditures (e.g., donating to charities) would be consistent with the theoretical mechanism highlighted in that paper, and remain agnostic as to whether the political expenditures they describe are lobbying expenditures or campaign contributions.⁵ Austen-Smith (1995) and Cotton (2012) are each motivated by campaign contributions but the mechanisms highlighted are not specific to campaigns. In Austen-Smith (1995) contributions are simply money spent and the probability of electing the politicians is exogenous. In Cotton (2012) contributions are simply a transfer from interest groups to politicians. Our model differs from the literature in this respect. The signaling value of contributions comes not from the fact that they are costly but from the fact that they are used to influence electoral outcomes. Thus, our model better explains why, under some circumstances, campaign contributions are uniquely good signaling devices relative to other costly expenditures. Because the causal mechanism in our model is tied explicitly to electoral outcomes, the model also generates predictions about how contributions will be distributed across candidates. For instance, contributions aimed at influencing politicians' behavior are more likely to reach across the aisle and electorally motivated contributions are more likely to flow only to political allies.

may bias policy toward an interest group to signal preference similarity, aiming to prevent the group from withholding contributions or giving to the challenger. (This latter effect is also found in earlier work on the signaling aspects of contributions (specifically, Gordon and Hafer 2007).) Our model also provides a theory of the informational influence of contributions, but information flows in the opposite direction than in Fox and Rothenberg: contributions signal policy information to politicians. Wolton (2017) also highlights multiple channels of interest group influence on policy outcomes. In his model, groups can engage in both inside lobbying (contributions or informational lobbying), which may affect policy content, and outside lobbying (grassroots mobilization or advertising), which may affect whether a policy succeeds or fails. Inside lobbying can signal group capacity for outside lobbying. Thus, overall influence depends on both channels, even when outside lobbying is never employed. The avenues of influence in our model are simultaneous, whereas they are closer to *ex ante* and *ex post* in Wolton (2017).

⁵However, Gordon and Hafer (2007) develop a theory in which political expenditures, specifically, drive policy influence. By utilizing the signaling aspects of contributions and/or lobbying, firms are able to commit *ex ante* to rewarding politicians for their policy "forbearance." In that sense, Gordon and Hafer (2007) points out how political expenditures, as opposed to, say, donating to charities, could specifically benefit firms, but that article is similarly agnostic between campaign contributions and lobbying as the relevant political expenditure.

Competing explanations. The literature also proposes some reasons for campaign contributions that do not play a role in our model. First, a large literature in political economy has emphasized quid pro quo exchange as a reason for contributions (e.g., Grossman and Helpman 1994). As we have discussed, we do not think existing evidence is consistent with rampant bribery and quid pro quo exchanges as a driving factor in campaign money (Fowler, Garro and Spenkuch 2018; Ansolabehere, de Figueiredo and Snyder 2003).

As an alternative, Ansolabehere, de Figueiredo and Snyder (2003) have suggested that contributions may be driven by a simple consumption motive: donors simply have a taste for contributing to campaigns, which would explain why many contributions are so small. That theory may explain the large number of small individual donations, but this paper is concerned with larger contributions from, for example, PACs, social welfare organizations, or so-called “mega-donors” with known agendas. There is good reason to believe that these contributions are not driven by consumption motivations. First, following the *Citizens United* decision, an increasing share of the total money raised by campaigns is from large donors. Second, there is some evidence that business donors give as if they expect a return on investment. For instance, Gordon, Hafer and Landa (2007) show that executives contribute more if their compensation is directly tied to company performance. Finally, with respect to small contributions, Bouton, Castanheira and Drazen (2018) show that small contributions can also be justified by electoral motivations. Furthermore, their electoral modeling explains some patterns of contributions that are not clearly explained by consumption motives. In the ‘Generalizations and extensions’ section we also consider a stylized example of ‘small’ contributions and show that the implications of our model are, in some circumstances, consistent with small contributions as well.

Overall, we build on existing literature addressing the electoral and persuasive effects of campaign contributions by developing a theory that incorporates both channels of influence simultaneously. The signaling aspects of contributions are fundamentally intertwined with their electoral impact. Through that interrelation we provide insight into why campaign contributions, relative to other political expenditures, may be uniquely beneficial to campaign donors. This also provides

insight into important empirical questions in the campaign finance literature. For instance, we derive results that help explain observed patterns of donation to candidates of the opposing party, provide insight into the difficulties of measuring donor returns from contributions, provide insight and predictions regarding the relationship between contributions and roll call votes, and highlight effects of donating to opposing candidates and parties. Before discussing these implications we develop and analyze our model of campaign finance, and present the main results.

A model of campaign contributions

Players, types, and sequence of play. We model a situation in which a single campaign donor may spend money to influence the outcome of a two-candidate election. There are three players: a Moderate candidate M , an Ally candidate A , and a campaign Donor D . The ‘Donor’ can be conceptualized as an interest group such as certain unions, corporate PACs, trade associations, or issue-specific super PACs or social welfare organizations. However, highly influential individual “mega-donors” with known agendas would also fit naturally with our interpretation of the model. We index players with $i \in \{M, A, D\}$ and use $-i$ to denote the set of all players other than i .⁶

The set of feasible policies is $X = \mathbb{R}$, where smaller numbers denote policies that are more favorable to the Donor. Thus, we may interpret $x \in X$ to be the intensity of regulation of the industry represented by the Donor, assuming that the industry prefers to avoid regulation. Additionally, there is a state of the world $\theta \in [0, 1]$ that may affect players’ policy preferences. The common prior belief is that θ is distributed according to a continuous distribution with density f and full support on $[0, 1]$. If the policy choice is interpreted as the intensity of regulation, then θ can be interpreted as some piece of information that would affect the public’s demand for regulation, such as information about a product’s safety or its potential environmental impacts.

The sequence of the game is as follows. First, all players receive independent, noisy signals $s_i \in \{G, B\}$ about the state of the world, where $\Pr[s_i = B|\theta] = \theta$. A signal $s_i = G$ denotes a “good” signal from the Donor’s perspective and $s_i = B$ denotes a “bad” signal. That is, $s_i = G$ ($s_i = B$)

⁶Throughout, we will refer to candidates with feminine pronouns and the Donor with masculine pronouns.

suggests that lower (higher) policy is more likely to be optimal, which is preferred (opposed) by the Donor.⁷ The signals are private information. Second, the Donor chooses contributions levels $c = (c^M, c^A)$ where c^M is the contribution to the Moderate and c^A is the contribution to the Ally. We assume that $c^M + c^A \leq 1$, which implies the Donor has a political budget of one that he can allocate across the Moderate and the Ally.⁸ The probability of the Moderate candidate winning the election is a continuous function $p(c^M, c^A)$ that is increasing in c^M , and decreasing in c^A . Finally, the winner of the election chooses a policy $x \in X$.

Players' preferences. The Donor's preferences are independent of the state of the world: he prefers less regulation to more regulation for any θ . His preferences are, therefore, represented by the utility function,

$$u_D(x, c^M, c^A) = -x. \quad (1)$$

The candidates are policy motivated and their preferences are assumed to satisfy three properties. First, the candidates prefer more regulation when they believe θ is larger. Second, the Ally's preferences are more aligned with the Donor's than are the Moderate's preferences. Third, the Ally is less sensitive to information about θ than the Moderate.⁹ The three properties described above are represented in a stylized manner with the following utility functions:

$$u_M(x, \theta) = -(x - \theta)^2, \quad (2)$$

$$u_A(x, \theta) = -(bx - \theta)^2, \quad (3)$$

where $b > 1$ represents the difference in how the candidates wish to relate policy to the state of the world. One intuitive property of the candidates' policy preferences is that they are relatively

⁷That is, $s_D = G$ corresponds to a signal of 0, suggesting lower policy is more likely to be optimal, while $s_D = B$ corresponds to a signal of 1, suggesting higher policy is more likely beneficial. In that sense, good signals are "low" signals and bad signals are "high" signals. We use G and B to avoid confusing signals with contributions, which will sometimes take values of 0 or 1 in the analysis to follow.

⁸The upper bound of one on the Donor's budget is simply a normalization for any budget constraint.

⁹None of these three properties follow from the other two. For instance, as we discuss in Appendix B.2, the commonly employed additive bias model, used for instance in Crawford and Sobel (1982), satisfies the first two properties but not the third whereas our multiplicative bias satisfies all three.

similar when θ is believed to be small and diverge as θ increases. For instance, if both candidates believe that a particular pesticide poses no threat to public safety ($\theta = 0$), then they would both agree to zero regulation. Only if they learned of potential harm from the pesticide would candidate preferences diverge, perhaps because they would trade off (known) economic and public-safety benefits at different rates.

Equilibrium concept. The analysis focuses on pure strategy perfect Bayesian equilibria (PBE). A pure strategy for the Donor is a function $\sigma_D : \{G, B\} \rightarrow [0, 1]^2$ that maps signals into contribution decisions. A pure strategy for a candidate $i \in \{M, A\}$ is a function $\sigma_i : \{G, B\} \times [0, 1]^2 \rightarrow X$ that maps the candidate's signal and the Donor's contribution decisions into policy choices. Beliefs over θ and s_{-i} are denoted by joint distribution functions $\mu(\theta, s_{-i}|\cdot)$ which are players' conditional beliefs about the state θ and the signals of other players given their own signals and, in the case of candidates, observed contributions by the Donor. Given beliefs $\mu(\theta, s_{-i}|\cdot)$, we denote the marginal belief about θ as $\bar{\mu}(\theta|\cdot) = \sum_{s_{-i} \in \{G, B\}^2} \mu(\theta, s_{-i}|\cdot)$. A PBE is a strategy profile and system of beliefs such that players' strategies are sequentially rational and beliefs are consistent with Bayes' rule on the path of play.

Comments on modeling assumptions

Though our intention is to provide a model of campaign contributions, the model is flexible enough to describe other forms of electorally useful activities. For instance, endorsements from specific groups may have meaningful effects in some elections (Arceneaux and Kolodny 2009; Grossman and Helpman 1999) and the donor may vary the intensity of these endorsements to induce different effects. Additionally, Hertel-Fernandez (2018) documents how corporations increasingly mobilize their own employees into politics. None of the results in this paper rely on the fact that campaign contributions are financially costly: the factors leading to information revelation by donors arise endogenously through electoral effects rather than costs of contributions, so the costless contributions in our model still reveal information. In Appendix A.2 we include direct costs of contributions and show that the main results remain unchanged, which we briefly summarize

following presentation of our main results.

We assume there is a true state of the world, θ , that can be conceptualized multiple ways. One way to interpret θ is directly related to policy consequences. For example, it could be conceptualized as a set of facts determining which policies will produce desirable effects, such as the risks associated with a product to be (potentially) regulated or the effect that a change in employment laws has on firms' hiring decisions. In this case, we can think of the candidates as being policy motivated. We can also interpret θ as voter demand for policy or regulation. A classic example is Hansen's study of the farm lobby, which shows that the farm lobby was able to gain influence by providing politicians with information about group members' policy preferences (Hansen 1991). The key assumption about θ is that the Donor is able to provide additional information about it above the independent information the politicians receive. In this case, we can think of candidates' preferences as being generated by a trade-off between reelection concerns and policy preferences.

We do not include a strategic voter in the model and simply assume that a contribution to a candidate increases the probability that candidate wins the election. We do not think of the electoral effects of contributions as being generated by voters using them to update their beliefs about θ . There are typically many issues at stake in a campaign and many donors such as interest groups specialize in policy areas that are relatively low salience to the voter. Furthermore, the voter may not be aware of the source of contributions. One way to think about campaign contributions is as a factor that contributes valence (i.e., non-policy appeal) to the candidate (Meirowitz 2008).

Overall, three key assumptions contribute to the main result in this paper. First, both donors and candidates receive private signals about the state of the world. The Donor's preferences do not depend directly on the state or on his signal. Instead, differences in behavior between good types ($s_D = G$) and bad types ($s_D = B$) of donors are driven entirely by the way the Donor's signal affects his expectations about candidate signals. In other words, information transmission about donors' signals through contributions is credible in part because donors know that politicians also have other sources of information. Second, contributions have electoral effects. Combined with the previous assumption, this helps create differences in incentives between good types and bad

types of the Donor. Bad types of donors expect politicians to choose different policies than do good types *even if both types choose the same contributions*, opening the door to the possibility that the Donor will contribute informatively. Finally, the level of preference divergence between the Moderate and Ally candidates increases with the expected value of θ . This assumption is useful because it implies that the perceived electoral stakes are higher for bad types of donors (who expect θ to be larger) than for good types. Thus, contributions to the Moderate candidate have an extra electoral cost for bad types that are not felt by good types, implying that good types of donors may reveal themselves by making such contributions.

Equilibrium analysis

Posterior beliefs

A preliminary step to characterizing equilibria is to derive players' beliefs at each information set given the strategies of the other players.

Donor beliefs. The Donor observes his own signal s_D but no actions of other players. Thus, the Donor forms beliefs about the state of the world using his signal and beliefs about other players' signals follow from his beliefs about the state. Specifically, the Donor updates beliefs about θ given s_D using Bayes' rule:

$$\bar{\mu}(\theta|s_D) = \int_0^\theta \frac{f(\theta')\theta'^{\mathbb{I}_{(s_D=B)}}(1-\theta')^{1-\mathbb{I}_{(s_D=B)}}}{\int_0^1 f(\tilde{\theta})\tilde{\theta}^{\mathbb{I}_{(s_D=B)}}(1-\tilde{\theta})^{1-\mathbb{I}_{(s_D=B)}}d\tilde{\theta}}d\theta', \quad (4)$$

where $\mathbb{I}_{(s_D=B)}$ is an indicator function that takes on the value of one if $s_D = B$ and zero if $s_D = G$. The fraction in equation 4 is a direct application of Bayes' rule for densities and the outer integral converts the beliefs into a distribution function. Given these beliefs about θ , the probability that some other player $j \neq i$ receives the signal $s_j = B$ is simply,

$$\Pr[s_j = B|s_D] = \int_0^1 \bar{\mu}(\theta|s_D)\theta d\theta = \mathbb{E}[\theta|s_D].$$

That is, the probability that the Donor assigns to candidates receiving a bad signal, which is unfavorable given his preference for lower regulation, is simply equal to the Donor's posterior expectation of θ given s_D .¹⁰

Candidate beliefs. The candidate who takes office observes her own signal as well as the Donor's contribution decision. Both pieces of information may inform her beliefs about θ . Since we are focused on pure strategy equilibria there are only two possibilities. The first possibility is that the contributions reveal nothing about the Donor's signal, in which case a candidate updates only on her own signal as in Equation 4 (substituting s_A or s_M for s_D). The second possibility is that contributions fully reveal the Donor's signal in which case the candidate updates using Bayes' rule as if she observed both signals. In this case, let $\hat{s}_D(c^M, c^A)$ be candidate j 's estimate of s_D given Donor contributions (c^M, c^A) . Then, we have the following expression that characterizes candidate j 's beliefs about θ given her own signal and observed Donor contributions:

$$\bar{\mu}(\theta|s_j, (c^M, c^A)) = \int_0^\theta \frac{f(\theta') \theta'^{\mathbb{I}_{(\hat{s}_D(c^M, c^A)=B)} + \mathbb{I}_{(s_j=B)}} (1 - \theta')^{2 - \mathbb{I}_{(\hat{s}_D(c^M, c^A)=B)} - \mathbb{I}_{(s_j=B)}}}{\int_0^1 f(\tilde{\theta}) \tilde{\theta}^{\mathbb{I}_{(\hat{s}_D(c^M, c^A)=B)} + \mathbb{I}_{(s_j=B)}} (2 - \tilde{\theta})^{1 - \mathbb{I}_{(\hat{s}_D(c^M, c^A)=B)} - \mathbb{I}_{(s_j=B)}} d\tilde{\theta}} d\theta', \quad (5)$$

where the indicator functions $\mathbb{I}_{(s_j=B)}$ and $\mathbb{I}_{(\hat{s}_D(c^M, c^A)=B)}$ are defined as in Equation 4.

With Donor and candidate posterior beliefs in hand we can now state our first result, which shows that players' optimal actions depend crucially on their conditional expectations about θ given their respective signals and in the case of candidates, their beliefs about the Donor's signal given his contributions.

Lemma 1. *All players' optimal actions depend on their beliefs only through the conditional expectation of the state θ , $\mathbb{E}[\theta|\cdot]$. Furthermore, these expectations, $\mathbb{E}[\theta|s_D]$ and $\mathbb{E}[\theta|s_j, \hat{s}_D(c^M, c^A)]$, are increasing in bad signals observed or inferred: $\mathbb{E}[\theta|B] > \mathbb{E}[\theta|G]$ and $\mathbb{E}[\theta|B, B] > \mathbb{E}[\theta|G, B] = \mathbb{E}[\theta|B, G] > \mathbb{E}[\theta|G, G]$ respectively.*

In sum, signals to the Donor provide him with information about both the state θ and the likelihood that the winning candidate receives a signal favorable to his interests. When the Donor

¹⁰This expectation is fully derived as a function of the model's primitives in the Appendix.

observes $s_D = G$ ($s_D = B$) he believes θ is lower (higher), which is favorable (unfavorable) from his perspective because it is likely the winning candidate will also receive a signal favorable (unfavorable) to his interests. Candidates observe both independent signals that provide them with information about θ and the Donor's contributions. If contributions reveal no further information then the winning candidate simply uses her own information to update her beliefs about θ . If contributions do provide information then the winning candidate is able to infer the Donor's signal (good or bad) to further update her beliefs about θ . Lemma 1 shows that these expectations fully dictate Donor contribution decisions and candidate policy choices, which we analyze next.

Policy choices

Lemma 1 shows that optimal actions depend on players' conditional expectations regarding θ . We begin our analysis of players' actions with a result that characterizes candidate equilibrium policy choices as a function of these beliefs.

Proposition 1. *The Moderate candidate sets policy to her expectation of θ given her signal and Donor contributions ($\sigma_M(s_M, (c^M, c^A)) = \mathbb{E}[\theta | s_M, \hat{s}_D(c^M, c^A)]$), and the Ally candidate sets policy to her analogous expectation of θ scaled toward zero proportional to her bias b ($\sigma_A(s_A, (c^M, c^A)) = \mathbb{E}[\theta | s_M, \hat{s}_D(c^M, c^A)]/b$). The difference in Moderate and Ally policy choices is therefore increasing in the Ally's bias b and in the expected value of the state θ . Furthermore, the Ally becomes identical to the Moderate as $b \rightarrow 1$ and becomes perfectly aligned with the Donor as $b \rightarrow \infty$.*

Proposition 1 provides several immediate implications. First, information that increases the expected value of θ for both candidates also increases the difference between their optimal policies. That is, as each candidate's expectation of θ increases, holding the Ally's bias fixed, the Moderate's optimal policy shifts more than the Ally's does.¹¹ Second, the difference between the optimal policies of the Moderate and the Ally also increases as the Ally's bias b increases. As b approaches its lower bound of one, there is no difference between the Moderate and the Ally. As b grows

¹¹This illustrates why the Ally is less sensitive to information about θ than the Moderate, as discussed above in reference to our assumptions about candidate preferences.

arbitrarily large, the Ally's optimal policy for any beliefs goes to zero, implying that the Ally's preferences approach those of the Donor.

Proposition 1 also allows us to fully describe candidate policy strategies in pooling and separating equilibria. In a pooling equilibrium, the Donor's contributions are uninformative. Thus, candidates choose policy based only on their own signals: $x_M = \mathbb{E}[\theta|s_M]$ and $x_A = \mathbb{E}[\theta|s_A]/b$. In a separating equilibrium, the Donor's contributions are informative and reveal his signal so that $x_M = \mathbb{E}[\theta|s_M, (c^M, c^A)] = \mathbb{E}[\theta|s_M, s_D]$ and $x_A = \mathbb{E}[\theta|s_A, \hat{s}_D(c^M, c^A)] = \mathbb{E}[\theta|s_A, s_D]/b$. This implies that in a pooling equilibrium, each candidate pursues one of only two distinct policy choices: one for each value of their signal. In contrast, in a separating equilibrium, candidate policy choices respond to both their own signals and those revealed by the Donor. Though there are four combinations of signals in that case, exchangeability of the signals means that candidates respond to the sum of the two signals and, therefore, the candidates have only three distinct policy choices.¹²

Informative campaign contributions

As with most signaling games of this kind, there exists a pooling equilibrium in which both types of Donor make the same contribution. In this case, a pooling equilibrium consists of both Donor types contributing the maximum amount to the Ally candidate. A pooling equilibrium therefore corresponds to pure electoral motivation. As we have discussed, this equilibrium fails to account for many empirical patterns of campaign contributions. We will therefore focus on deriving conditions under which there exists a separating equilibrium. A separating equilibrium is one in which different types of the Donor choose different contributions and, as a result, politicians perfectly infer the Donor's information from his contributions.

When choosing contributions, the Donor must take into account the effect of his contributions on the policy choices of the politicians. From the perspective of a type s_D Donor, the expected policy choice of the Moderate following contributions (c^M, c^A) is denoted $\bar{x}(\hat{s}_D(c^M, c^A), s_D)$ which

¹²For example, in a separating equilibrium the Moderate sets $x_M = \mathbb{E}[\theta|s_M + s_D]$ so the three distinct policy choices are given by $\mathbb{E}[\theta|0]$ when $s_M = s_D = 0$, $\mathbb{E}[\theta|1]$ when either $s_M = 1$ or $s_D = 1$ and $s_M \neq s_D$, and $\mathbb{E}[\theta|2]$ when $s_M = s_D = 1$. The Ally's choices are analogous with the additional division by b : $x_A = \mathbb{E}[\theta|s_A + s_D]/b$.

is defined as,

$$\bar{x}(\hat{s}_D(c^M, c^A), s_D) = \mathbb{E}[\theta | s_D] \mathbb{E}[\theta | s_M = B, \hat{s}_D(c^M, c^A)] + (1 - \mathbb{E}[\theta | s_D]) \mathbb{E}[\theta | s_M = G, \hat{s}_D(c^M, c^A)], \quad (6)$$

which depends on the Donor's type through his posterior expectation of θ and depends on contributions only through the politicians' beliefs induced by those contributions ($\hat{s}_D(c^M, c^A)$). That is, Equation 6 shows that a Donor of type s_D expects the Moderate to receive the unfavorable bad signal $s_M = B$ with probability $\mathbb{E}[\theta | s_D]$ and the favorable good signal $s_M = G$ with probability $1 - \mathbb{E}[\theta | s_D]$, and in each case the Moderate will set policy equal to the expectation of θ given her own signal and beliefs about the Donor's signal, as in Lemma 1. Critically, the fact that the Donor places a higher probability on the event that $s_M = B$ when $s_D = B$ means that for any set of contributions (c^M, c^A) the Donor expects the Moderate candidate's policy choice to be higher, and therefore worse given his interests, when he receives an unfavorable signal ($s_D = B$) than a favorable signal ($s_D = G$): $\bar{x}(\hat{s}_D(c^M, c^A), B) > \bar{x}(\hat{s}_D(c^M, c^A), G)$. Thus, even if both types of the Donor pooled on the same action they would not have the same expected payoff. Conditional on the Moderate candidate winning office, good types of Donors expect more favorable policies than bad types of Donors expect due to their having received a favorable signal. Furthermore, the expected policy choice of the Ally is simply $\bar{x}(\hat{s}_D(c^M, c^A), s_D)/b$. In both cases the expected policy depends on contributions only through the beliefs induced by those contributions.

In line with this logic, a type s_D Donor's expected utility from some contribution (c^M, c^A) is,

$$-p(c^M, c^A) \bar{x}(\hat{s}_D(c^M, c^A), s_D) - (1 - p(c^M, c^A)) \frac{\bar{x}(\hat{s}_D(c^M, c^A), s_D)}{b},$$

which can be rewritten as,

$$-\bar{x}(\hat{s}_D(c^M, c^A), s_D) \frac{p(c^M, c^A)(b-1) + 1}{b}. \quad (7)$$

Equation 7 reveals the main forces driving contribution behavior in the model. The Donor's ex-

pected utility for contributing (c^M, c^A) is composed of the behavioral effect of the contributions on politician policy choices, $-\bar{x}(\hat{s}_D(c^M, c^A), s_D)$, multiplied by the electoral effect of the contributions weighted by the preference divergence between the candidates, which is $\frac{p(c^M, c^A)(b-1)+1}{b}$. An increase in c^M or decrease in c^A leads to an increase in the probability with which the Moderate is elected ($p(c^M, c^A)$), which would reduce the Donor's utility if politician behavior was held constant. Importantly, since this electoral effect is multiplied by $-\bar{x}(\hat{s}_D(c^M, c^A), s_D)$, which is further from zero for the bad type of Donor than the good type, the same change in the probability of electing the Moderate reduces the bad type of Donor's utility by more than the good type. This leads to a sorting condition that is key to separating equilibrium: the good type of Donor is more willing than the bad type to help the Moderate win in order to induce desirable policymaking behavior from politicians, which is captured formally in the following result.

Lemma 2 (Sorting condition). *Let (c^M, c^A) and $(\tilde{c}^M, \tilde{c}^A)$ denote different Donor contribution choices with $p(c^M, c^A) > p(\tilde{c}^M, \tilde{c}^A)$. In any equilibrium, if the bad type of Donor weakly prefers to give (c^M, c^A) over $(\tilde{c}^M, \tilde{c}^A)$ then the good type of Donor strictly prefers to give (c^M, c^A) over $(\tilde{c}^M, \tilde{c}^A)$.*

Lemma 2 lays the groundwork for our argument that campaign contributions are credible signals of policy information by establishing that a good type of Donor is more willing to trade off electoral influence for influence over politicians' behavior. To finish the argument we must show that there is some contribution that the bad type of Donor would not send even if it persuaded the politicians that he was a good type. To show this, it is sufficient to compare the two most extreme contributions from the perspective of the bad type of Donor. In any separating equilibrium, the bad type will maximize his electoral influence by contributing his entire budget to the Ally. We then ask: Would the bad type of Donor be willing to instead contribute his entire budget to the Moderate if it meant persuading the politicians that he was a good type? If the answer is yes then there must not be a separating equilibrium because if that contribution would not deter imitating by bad types of donors then neither would any other contribution. If the answer is no, then we know that some equilibrium contribution would deter the bad type of Donor from imitating. Furthermore, since the bad type of Donor's expected utility is continuous in the contribution, there is some less extreme

contribution that would make him indifferent. Since Lemma 2 implies that the good type of Donor would make such a contribution there must be a separating equilibrium in that case.

The conditions determining whether or not the bad type of Donor would make the deviation described above are a simple comparison of the relative electoral and policy effects of the two contributions. The relative electoral effects of contributing everything to the Moderate (i.e., $(c^M, c^A) = (1, 0)$) and contributing everything to the Ally (i.e., $(c^M, c^A) = (0, 1)$) is the ratio of the electoral effects from equation (7). That is, the relative electoral loss associated with contributing to the Moderate versus the Ally is

$$\frac{p(1,0)(b-1)+1}{p(0,1)(b-1)+1} > 1,$$

which corresponds to the maximum possible electoral effect since these are the two most extreme contributions. Furthermore, in the deviation we are describing the Donor knows that a contribution to the Ally induces the belief that he is a bad type and a contribution to the Moderate induces the belief that he is a good type. The relative policy loss of contributing to the Ally versus contributing to the Moderate is therefore,

$$\frac{\bar{x}(B,B)}{\bar{x}(G,B)} > 1.$$

The Donor therefore experiences an electoral loss for contributing to the Moderate and a policy loss for contributing to the Ally. If the electoral loss exceeds the policy loss then the bad type of Donor will not make this deviation and there must be a separating equilibrium.

Proposition 2. *There is a separating equilibrium if and only if the maximum electoral effect is weakly larger than the maximum persuasion effect for the bad type: $\frac{p(1,0)(b-1)+1}{p(0,1)(b-1)+1} \geq \frac{\bar{x}(B,B)}{\bar{x}(G,B)}$. In a separating equilibrium the bad type of Donor contributes its entire budget to the Ally and the good type of Donor's contribution increases the probability of electing the Moderate enough to deter imitation by bad types.*

Importantly, Proposition 2 does not predict that the good type of Donor actually contributes his entire budget to the Moderate in equilibrium. This will typically not be the case. The comparison

between the two most extreme contributions is important only because it establishes that some less extreme contribution could be chosen in a separating equilibrium.

Some additional implications follow immediately from the condition in Proposition 2. The first is that in order to support separating equilibrium through campaign contributions there must exist substantial enough electoral effects as well as meaningful preference divergence between candidates. This is illustrated by inspecting the electoral effect in Proposition 2. As b converges to one (no preference divergence) or as $p(1,0)$ and $p(0,1)$ converge to some common probability (no electoral effects), the ratio of the electoral effects goes to one, which means that any signaling benefit would induce a deviation from the bad type of Donor. Corollary 1 states this result.

Corollary 1. *Separating equilibria do not exist if the preferences of the candidates are too similar (i.e., b close to 1) or as the electoral effect of contributions goes to zero.*

Another implication of Proposition 2 allows us to categorize equilibria by examining the relative size of the electoral and persuasion effects. Most obviously, if the condition from Proposition 2 fails (i.e., the hypothetical persuasion effects dominate the electoral effects) then any equilibrium is a pooling equilibrium. Since the only motivations for the Donor in a pooling equilibrium are *purely electoral*, both types of Donor will maximize their electoral impact by giving their entire budget to the Ally. Additionally, we can consider a slight modification of the electoral condition to consider two different patterns of contributions we may observe in a separating equilibrium. If a stronger version of the conditions in Proposition 2 held and the bad type of Donor would not even be willing to reduce his contributions to zero in order to persuade the politicians, a separating equilibrium may exist in which the good type of Donor signals simply by reducing his contributions to the Ally, which we call *persuasion by moderation*. If this stronger condition does not hold but the conditions in Proposition 2 do hold, then the equilibrium behavior must involve good types contributing to the Moderate, which we refer to as *persuasion by switching sides*.

Corollary 2. *Equilibria to the game fall in one of three categories:*

- **(Persuasion by moderation)** *If the bad type would not strictly prefer to reduce contributions*

to zero in order to persuade the politicians then there is a separating equilibrium in which the good type of Donor reduces his contribution to the Ally without contributing to the Moderate

- **(Persuasion by switching sides)** *If the bad type would reduce contributions to zero in order to persuade the politicians but would not give his whole budget to the Moderate then there is a separating equilibrium in which the good type of Donor contributes to the Moderate.*
- **(Pure electoral motivation)** *If neither of the aforementioned conditions hold, any equilibrium is a pooling equilibrium in which both types of Donor give everything to the Ally.*

Generalizations and extensions

Costly contributions

The baseline model assumes no direct cost of contributions. This omission is instructive because it shows one contrast between our model and other signaling models in the campaign finance literature: the signaling value of campaign finance in our theory comes from the campaign rather than the finances. But of course, in reality, contributions are costly. To ensure that the model's insights are broadly applicable we consider an extension of the model in which contributions also have a direct financial cost. The extended model makes more realistic predictions about the pattern of contributions (e.g., bad types of donors do not always spend their entire budget), but our main argument holds true in the presence of direct costs. Direct costs of contributions do not significantly alter the mechanisms supporting separating equilibrium because these direct costs, unlike the endogenous, indirect costs described above, do not depend on the Donor's type. Specifically, we show that contributions that are more friendly to the Moderate candidate signal favorable information as in the baseline model and that, even in the presence of direct costs, meaningful separating equilibria only exist when there is enough preference divergence between candidates and contributions have large enough electoral effects.

The extended model is similar to the baseline model except that the Donor's utility function incorporates a direct cost of contributions. For simplicity we represent these costs as a fixed marginal

cost $k > 0$, though the analysis easily extends to cases in which the cost is not linear. The Donor's utility function is therefore,

$$u_D(x, c^M, c^A) = -x - k(c^M + c^A). \quad (8)$$

The addition of another parameter limits the tractability of the model under the general distributional assumptions on θ described in the baseline model so we will also add the assumption that prior beliefs about θ follow a Beta distribution with shape parameters $\alpha > 0$ and $\beta > 0$.¹³

The most important consequence of including direct financial costs is that electoral motivations may not drive donors to contribute their entire budget to their preferred candidates. Any differences between the costly contributions model and the baseline model follow from this fact. In fact, if costs are small enough that the bad type of Donor is willing to spend his entire budget on electing the Ally, the conditions needed to support a separating equilibrium are identical to the baseline. Otherwise, we need a way to characterize interior solutions to the electorally motivated Donor's optimization problem. To that end, we assume that $p(c^M, c^A)$ is twice differentiable and that $\frac{\partial^2 p(0, c^A)}{\partial c^A^2} > 0$ for all $c^A \geq 0$.¹⁴

Proposition 3 lists the main result for the model with costly contributions. The bottom line is that the addition of direct costs to contributions does not significantly change the conditions required to support a separating equilibrium to the game. First, the sorting condition of Lemma 2 still holds in the costly contributions game because the direct costs do not depend on whether the Donor is a good type or bad type. Second, even with costly contributions, separating equilibria in this model cannot exist without meaningful electoral costs, illustrating that the electoral and informational effects remain the driving forces in this model. Finally, the conditions determining whether or not a separating equilibrium exists are derived in the same manner as in the baseline model: We ask whether the bad type of Donor, in order to persuade the politicians, would willingly

¹³As we discuss in the Appendix, the results do not rely on the Beta prior when k is not too large but a full characterization of equilibria relies on this distributional assumption.

¹⁴The assumptions from the baseline model additionally imply that $\frac{\partial p(c^M, c^A)}{\partial c^M} > 0$ and $\frac{\partial p(c^M, c^A)}{\partial c^A} < 0$.

contribute his entire budget to the Moderate rather than give his default contribution. If not, we conclude that there must be a separating equilibrium, since some contribution would deter the bad type of Donor from imitating and since the good type of Donor is strictly more willing to help the Moderate. The only thing the addition of costs changes is the value of the bad type's default contribution.

Proposition 3. *Let c^* be the optimal contribution to the Ally for the bad type of Donor in a separating equilibrium to the costly contribution game. If*

$$\bar{x}(B, B) \frac{p(0, c^*)(b-1) + 1}{b} - \bar{x}(0, 1) \frac{p(1, 0)(b-1) + 1}{b} \leq k(c^M + c^A - c^*)$$

then there exists a separating equilibrium in which the bad type of Donor contributes $(0, c^)$ and the good type of Donor contributes some $(\tilde{c}^M, \tilde{c}^A)$ with $p(\tilde{c}^M, \tilde{c}^A) > p(0, c^*)$. There is no separating equilibrium if b is too close to one or if the electoral effects of contributions are too small.*

Proposition 3 should not be taken to mean that costs do not matter at all. They change the pattern of contributions to be more realistic and, in one important way, improve the chances for a separating equilibrium. The way costs might enhance the possibility of information transmission is by further reducing the bad type of Donor's utility for imitating. If the bad type's default contribution is relatively small, a large contribution to the Moderate may help deter imitation by bad types while the electoral and informational effects described above ensure that the good type of Donor is more willing to pay.

Small contributions

So far the paper has focused on contributions that are large in the sense that the Donor anticipates that the contributions will have a measurable effect on the electoral outcome as well as the final policy chosen by the politicians. As we have argued, large contributions make up an increasing share of campaign finance dollars. However, Ansolabehere, de Figueiredo and Snyder (2003) noted the importance of small contributions and use them to argue that most donations are driven

by non-instrumental factors. In this section we conceptualize a small contribution as one of a large number of comparable contributions, with the impact of each one decreasing in the total number of donors. At first glance, it may seem that our model does not apply to small contributions. After all, we require that the electoral effects of contributions are not too small in order for the informational effects to manifest. This argument has merit but overlooks that the informational effects of small contributions also diminish as the number of players grows large.

Example 2 in Appendix B.1.2 uses a numerical example to demonstrate that separating equilibria may still exist as the number of donors increases. However, this feature of Example 2 is not universal. The argument depends on the values of the model parameters and on the specification of how $p(\cdot)$ changes shape as the number of donors increases. The key issue is how quickly persuasion effects go to zero, relative to electoral effects, as the number of donors gets large. If electoral effects diminish very quickly relative to persuasion effects – that is, if the electoral effect of contributions diminishes very quickly but the persuasion effect of an extra signal does not – then separating equilibria will diminish more quickly as the number of donors becomes larger. Conversely, if the electoral effect of contributions diminishes at approximately the same rate (or slower) than the persuasive effect of contributions as the number of donors grows then separating equilibria will still exist in the way we have described above.

Substantively, the import of the many-donor example also depends on the empirical context. For example, in a Presidential election, most Senate elections, or those in highly visible Congressional districts, we see hundreds of donors vying for influence or trying to influence the election outcome. However, in other elections, such as municipal, state legislative, judicial, or even those in certain Congressional districts, the support of one or two key donors, interest groups, or trade associations may have a large effect on the outcome. Thus, one way to discriminate across which modeling context – single (or small number of) donors versus many donors – is through the features of the electoral context of interest.

Discussion

Voter welfare and campaign finance policy

In this section, we discuss the welfare effects of campaign contributions by evaluating equilibrium social welfare compared to a situation in which campaign contributions are not allowed. The most interesting case is that in which the Donor's preferences conflict with those of the public, so we consider a situation in which the public is aligned with the Moderate (i.e., $W(x, \theta) = -(x - \theta)^2$). The evaluation of citizen welfare, much like that of the Donor's decision-making, turns on two factors: the direct electoral effects of contributions and the indirect informational effects. Contributions to the Ally tend to harm the moderate citizen by increasing the probability that the biased candidate takes office. Conversely, contributions to the Moderate benefit the moderate citizen by increasing the probability that the Moderate takes office. Finally, the information provided to candidates in a separating equilibrium benefits the citizen by increasing both candidates' effectiveness in matching policy to the state of the world. This effect is most pronounced when the Moderate is likely to take office. In a pooling equilibrium, the moderate citizen would clearly benefit from eliminating the possibility of political contributions: in such an equilibrium, all contributions go to the Ally and the positive informational effects of contributions are non-existent. The welfare effects of contributions are less clear in a separating equilibrium, and positive and negative effects are both possible for different parameterizations of the model.

In a separating equilibrium, contributions provide some benefit to the citizen by giving politicians better information on which to base policy decisions. The effects of contributions on election probabilities are mixed: in *persuasion by switching sides* equilibrium, the Donor contributes to the Ally when $s_D = B$ and to the Moderate when $s_D = G$. Thus, the citizen's welfare calculation depends on the balance of these electoral distortions and their magnitude relative to the informational benefits of contributions. Example 1 in Appendix B.1.1 shows that, when θ is uniformly distributed and $p(\cdot)$ is a linear probability function, the welfare effect of informative contributions compared to no contributions is sensitive to the model's parameters. In that example, either

scenario may be favorable to the voter, depending on the level of preference divergence between candidates and on the marginal effect of campaign contributions on electoral outcomes.

Some empirical implications

Patterns of contributions. One way our model adds to the campaign finance literature is by offering predictions about the patterns of contributions across parties and candidates. Brunell (2005) offers a rich description of PAC contribution behavior that is consistent with a flexible interpretation of our model. Brunell argues that each PAC has a clear preference about which party controls Congress though they also contribute across party lines at times. The difference in their strategies is seen by looking at the distribution of contributions across different races. When a PAC contributes to their preferred party they do so in a way that is designed to maximize the electoral impact and when they give to the other party they do so in a way that mutes the electoral impact.

Though we do not directly model the distribution of resources across multiple races, Proposition 2 shows that the choice of contributions by the “good” types of donors is essentially driven by choosing the electoral impact. It is reasonable to conceptualize distribution of funds across races as part of choosing that impact. Viewed in this way, a separating equilibrium of our model is partially consistent with Brunell’s observations. When donors contribute to their preferred candidate they tend to be driven by pure electoral motivation so their contributions would be targeted to maximize electoral impact. When donors contribute to the other side, they are driven by non-electoral motivations and in fact they would prefer to minimize the electoral impacts, subject to the constraint that the electoral effect is large enough to deter imitation by bad types of donors. Equilibrium behavior is therefore consistent with Brunell’s argument under some parameters but not others. In some cases, the opportunity cost created by not contributing to the Ally is enough to deter imitation by bad types, so observed contributions from good types of donors would appear to have muted electoral effects. In other cases, where large contributions to the Moderate are necessary to support separating equilibria, it may be hard for analysts to distinguish good types of PACs from bad types who support the other party without other information about the donor group.

Returns to backing a winner. One challenge for both pure electoral motivation models of contributions as well as those based on quid pro quo exchanges is that, at least in the case of firms, there do not seem to be good returns on backing the person who ultimately wins the election (Fowler, Garro and Spenkuch 2018). Existing signaling models in the literature, such as Gordon and Hafer (2005), are more consistent with the data on this point. If the main value of contributions is through signaling, then the returns on those contributions do not depend on who wins the election.

Because our model combines electoral and signaling motivations, different parameterizations of the model produce different predictions about the returns to backing a winner. A pooling equilibrium is similar to a pure electoral model of contributions, so in such an equilibrium positive returns to backing a winner would be expected. In a separating equilibrium, “good” types of firms who contribute to the Moderate expect to be better off if the candidate they backed *loses* the election. In this case, they still benefit from having sent the signal but they do not have to internalize the electoral cost they would have paid if the Moderate also won the election. In contrast, “bad” types of firms still benefit if the Ally wins the election, though they benefit less than a firm who instead backed the Moderate. The average effect of backing a winner depends on the relative balance of good and bad types in the population of donors, and could be very near zero if the proportions are relatively balanced. However, the model suggests that the average treatment effect may mask unobserved heterogeneity between firms.

Relationship between contributions and roll call votes. Though citizens and commentators widely suspect that legislators’ policy choices are influenced by campaign contributions, social scientists have not found much evidence that contributions affect votes on policy. For instance, Ansolabehere, de Figueiredo and Snyder (2003) reviewed the literature and concluded that, in three out of four cases, contributions either had no significant effects or the effects were in the wrong direction (114). Though our model predicts that contributions can influence politicians’ policy choices, that influence depends on two factors that researchers may not observe: the game’s equilibrium and the type of the Donor.

We consider what results would be found by accurately estimating the causal effect of contri-

Equilibrium (type)	Contribution	Predicted Effect of Contributions
Pooling (any type)	Allies	Zero
Restraint (bad type)	Allies	Negative
Restraint (good type)	Allies	Positive
Switching sides (bad type)	Allies	Negative
Switching sides (good type)	Opponents (Moderate)	Positive

Table 1: Predicted causal effect of contributions on a candidate’s policy choice for each equilibrium and type of donor.

butions from the Donor on roll call votes (or some other policy choice). This would measure, for an individual politician, the decisions in favor of the Donor’s policy given contributions from the Donor minus the decision in favor of the Donor given no contributions for the Donor, or a lower level of contributions. Table 1 summarizes the possibilities. In a pooling equilibrium, contributions should have no effect on votes since they convey no information to the candidates. In a *persuasion by moderation* equilibrium, contributions go to allies of the Donor and may have opposite effects depending on their size: “restrained” contributions in smaller amounts have a positive effect on policy choices from the Donor’s perspective. Thus, a regression of policy choices on contribution *amounts* would find effects running in the opposite direction to that desired. In a *persuasion by switching sides* equilibrium, only bad types of donors contribute to allies and these contributions have the “wrong sign” (i.e., contributions would appear to be associated with policy choices unfavorable to the Donor). Contributions to opponents, which signal that the Donor is a good type, have the usual expected effect on policy choice. Thus, if researchers are missing critical information about the model parameters and do not consider what information the donors may possess, it is easy to understand why even studies with otherwise sound research designs would not find consistent evidence of policy influence.

To compound matters, the effects of contributions on policy choices in our model apply to both candidates, not just the recipient. In fact, all effects of contributions in our model are more pronounced when the Moderate wins the election, regardless of which candidate receives the contributions. Thus, we would expect empirical designs to find little or no effects of contributions in cross-sectional comparisons between legislators who receive contributions and those who do not.

Though some of the above empirical implications are particular to our model, the discussion reveals some insights that are generally applicable to informational models and that are not incorporated into current research. First, if the mechanism for policy influence is informational, then the effect of contributions on the recipients behavior may not always be positive. Some contribution amounts must reveal negative policy information and some others must reveal positive policy information, so that the average effect of contributions may be near zero. Second, the informational effects of contributions should apply not just to the recipient of contributions but also to anyone who observes those contributions.

Effects of giving to the other side. An additional implication of our model is that donors should tend to benefit when they contribute to the other side. This correlation should hold regardless of who wins the election, though the effect may be more pronounced when the opposing candidate takes office. Unfortunately this effect may be difficult to identify from data since researchers would require a way to estimate the donor's preferred candidate and exogenous variation in other-side contributions may be more difficult to find than exogenous variation in, say, election outcomes. Despite these challenges, we expect our model will prove useful for organizing empirical findings on the connections between campaign finance and policymaking.

Conclusion

In this paper, we studied how campaign donors, such as an interest group, trade association, or individual "mega-donor," might use campaign contributions to either persuade policymakers to choose policies in line with their interests or influence an election outcome. Our argument shows that campaign contributions as informative signals that alter politician behavior are fundamentally tied to the effect of those contributions on electoral prospects. Importantly, this dynamic does not depend on the costs of political expenditures *per se*, as in much of the previous work on the topic we build upon, but it does depend on endogenous costs that arise due to interaction of the electoral and informational effects of contributions. Thus, our theory points out the value of campaign contributions specifically, relative to other political expenditures.

In addition, our results provide insight into several empirical questions in the study of campaign finance. Our theory aids in understanding patterns of giving in which donors contribute to politicians or parties that hold opposing viewpoints. It also provides insight into why donors may benefit from donations to opposing candidates. We also provide insight into why returns from contributions and the relationship between contributions and roll call votes may be difficult to uncover given what analysts normally observe, as well as novel predictions about what circumstances may allow us to uncover causal effects of interest. Ultimately, our theory suggests that to address the myriad questions about campaign finance we must account for how informational effects of financing are fundamentally intertwined with effects on the campaign.

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A Appendix

A.1 Proofs of in-text results

Lemma 1. *All players' optimal actions depend on their beliefs only through the conditional expectation of the state θ , $\mathbb{E}[\theta|\cdot]$. Furthermore, these expectations, $\mathbb{E}[\theta|s_D]$ and $\mathbb{E}[\theta|s_j, \hat{s}_D(c^M, c^A)]$, are increasing in bad signals observed or inferred: $\mathbb{E}[\theta|B] > \mathbb{E}[\theta|G]$ and $\mathbb{E}[\theta|B, B] > \mathbb{E}[\theta|G, B] = \mathbb{E}[\theta|B, G] > \mathbb{E}[\theta|G, G]$ respectively.*

Proof of Lemma 1. The fact that choices only depend on beliefs through the conditional expectations follows from the proofs of Proposition 1 (in the case of candidate choices) and Proposition 2 (in the case of the Donor) and in-text analysis. The conditional expectations can be expressed in terms of the first three raw moments of f (which all exist since the support is bounded by $[0, 1]$) in the following way:

$$\begin{aligned}\mathbb{E}[\theta|G] &= \int_0^1 \frac{f(\theta)(1-\theta)\theta}{\int_0^1 f(\hat{\theta})(1-\hat{\theta})d\hat{\theta}} d\theta = \frac{1}{1-\mathbb{E}[\theta]} \int_0^1 f(\theta)(1-\theta)\theta d\theta = \frac{\mathbb{E}[\theta] - \mathbb{E}[\theta^2]}{1-\mathbb{E}[\theta]} \\ \mathbb{E}[\theta|B] &= \int_0^1 \frac{f(\theta)\theta^2}{\int_0^1 f(\hat{\theta})\hat{\theta}d\hat{\theta}} d\theta = \frac{1}{\mathbb{E}[\theta]} \int_0^1 f(\theta)\theta^2 d\theta = \frac{\mathbb{E}[\theta^2]}{\mathbb{E}[\theta]} \\ \mathbb{E}[\theta|G, B] &= \int_0^1 \frac{f(\theta)(1-\theta)\theta^2}{\int_0^1 f(\hat{\theta})(1-\hat{\theta})\hat{\theta}d\hat{\theta}} d\theta = \frac{1}{\mathbb{E}[\theta(1-\theta)]} \int_0^1 f(\theta)\theta^2(1-\theta)d\theta = \frac{\mathbb{E}[\theta^2] - \mathbb{E}[\theta^3]}{\mathbb{E}[\theta] - \mathbb{E}[\theta^2]} \\ \mathbb{E}[\theta|G, G] &= \int_0^1 \frac{f(\theta)(1-\theta)^2\theta}{\int_0^1 f(\hat{\theta})(1-\hat{\theta})^2d\hat{\theta}} d\theta = \frac{1}{\mathbb{E}[(1-\hat{\theta})^2]} \int_0^1 f(\theta)(1-\theta)^2\theta d\theta = \frac{\mathbb{E}[\theta^3] - 2\mathbb{E}[\theta^2] + \mathbb{E}[\theta]}{\mathbb{E}[\theta^2] - 2\mathbb{E}[\theta] + 1} \\ \mathbb{E}[\theta|B, B] &= \int_0^1 \frac{f(\theta)\theta^3}{\int_0^1 f(\hat{\theta})\hat{\theta}^2d\hat{\theta}} d\theta = \frac{1}{\mathbb{E}[\theta^2]} \int_0^1 f(\theta)\theta^3 d\theta = \frac{\mathbb{E}[\theta^3]}{\mathbb{E}[\theta^2]}.\end{aligned}$$

Note that the signals are exchangeable so $\mathbb{E}[\theta|G, B] = \mathbb{E}[\theta|B, G]$. The ordering of the conditional expectations follows from the fact that the binomial distribution with a fixed number of trials satisfies the Monotone Likelihood Ratio Property (Milgrom 1981). ■

Proposition 1. *The Moderate candidate sets policy to her expectation of θ given her signal and Donor contributions ($\sigma_M(s_M, (c^M, c^A)) = \mathbb{E}[\theta|s_M, \hat{s}_D(c^M, c^A)]$), and the Ally candidate sets policy*

to her analogous expectation of θ scaled toward zero proportional to her bias b ($\sigma_A(s_A, (c^M, c^A)) = \mathbb{E}[\theta | s_M, \hat{s}_D(c^M, c^A)]/b$). The difference in Moderate and Ally policy choices is therefore increasing in the Ally's bias b and in the expected value of the state θ . Furthermore, the Ally becomes identical to the Moderate as $b \rightarrow 1$ and becomes perfectly aligned with the Donor as $b \rightarrow \infty$.

Proof of Proposition 1. We first prove the result for the Ally. A's expected utility is $-b^2 x_A^2 + 2bx_A \mathbb{E}[\theta | s_A, \hat{s}_D(c^M, c^A)] - \mathbb{E}[\theta^2 | s_A, \hat{s}_D(c^M, c^A)]$. This is concave and the first order condition with respect to x_A is $2b(\mathbb{E}[\theta | s_A, \hat{s}_D(c^M, c^A)] - bx_A) = 0$, which gives $x_A = \mathbb{E}[\theta | s_A, \hat{s}_D(c^M, c^A)]/b$. Setting $b = 1$ yields the result for M . Finally, comparative statics with respect to b and the conditional expectations yield the final two statements in the Proposition. ■

Lemma 2 (Sorting condition). *Let (c^M, c^A) and $(\tilde{c}^M, \tilde{c}^A)$ denote different Donor contribution choices with $p(c^M, c^A) > p(\tilde{c}^M, \tilde{c}^A)$. In any equilibrium, if the bad type of Donor weakly prefers to give (c^M, c^A) over $(\tilde{c}^M, \tilde{c}^A)$ then the good type of Donor strictly prefers to give (c^M, c^A) over $(\tilde{c}^M, \tilde{c}^A)$.*

Proof of Lemma 2. Suppose the bad type of D weakly prefers to give (c^M, c^A) over $(\tilde{c}^M, \tilde{c}^A)$. Then

$$-\bar{x}(\hat{s}_D(c^M, c^A), B) \frac{p(c^M, c^A)(b-1)+1}{b} \geq -\bar{x}(\hat{s}_D(\tilde{c}^M, \tilde{c}^A), B) \frac{p(\tilde{c}^M, \tilde{c}^A)(b-1)+1}{b}$$

which we can rewrite as

$$\frac{\bar{x}(\hat{s}_D(c^M, c^A), B)}{\bar{x}(\hat{s}_D(\tilde{c}^M, \tilde{c}^A), 1)} \leq \frac{p(\tilde{c}^M, \tilde{c}^A)(b-1)+1}{p(c^M, c^A)(b-1)+1}. \quad (9)$$

We prove the lemma by showing that if inequality (9) holds weakly for the bad type then it holds strictly for the good type. That is, inequality (9) implies that

$$\frac{\bar{x}(\hat{s}_D(c^M, c^A), G)}{\bar{x}(\hat{s}_D(\tilde{c}^M, \tilde{c}^A), G)} < \frac{p(\tilde{c}^M, \tilde{c}^A)(b-1)+1}{p(c^M, c^A)(b-1)+1}. \quad (10)$$

Since the right-hand-sides of (9) and (10) do not depend on type it is sufficient to show that

$$\frac{\bar{x}(\hat{s}_D(c^M, c^A), G)}{\bar{x}(\hat{s}_D(\tilde{c}^M, \tilde{c}^A), G)} < \frac{\bar{x}(\hat{s}_D(c^M, c^A), B)}{\bar{x}(\hat{s}_D(\tilde{c}^M, \tilde{c}^A), 1)}. \quad (11)$$

Since $p(c^M, c^A) > p(\tilde{c}^M, \tilde{c}^A)$, if (9) holds it must be the case that $\bar{x}(\hat{s}_D(c^M, c^A), 0) < \bar{x}(\hat{s}_D(\tilde{c}^M, \tilde{c}^A), 0)$. In equilibrium this must mean that the politicians associate (c^M, c^A) with the good type and $(\tilde{c}^M, \tilde{c}^A)$ with the bad type. The inequality (11) then follows from Lemma 5, which can be found in Section A.3 below. This completes the proof. ■

Proposition 2. *There is a separating equilibrium if and only if the maximum electoral effect is weakly larger than the maximum persuasion effect for the bad type: $\frac{p(1,0)(b-1)+1}{p(0,1)(b-1)+1} \geq \frac{\bar{x}(B,B)}{\bar{x}(G,B)}$. In a separating equilibrium the bad type of Donor contributes its entire budget to the Ally and the good type of Donor's contribution increases the probability of electing the Moderate enough to deter imitation by bad types.*

Proof of Proposition 2. Suppose $\frac{p(1,0)(b-1)+1}{p(0,1)(b-1)+1} \geq \frac{\bar{x}(B,B)}{\bar{x}(G,B)}$. In any separating equilibrium the bad type makes the contribution that maximizes its electoral benefit, which is to contribute $(c^M, c^A) = (0, 1)$. Define a function $\Delta(c^M, c^A) = \frac{\bar{x}(B,B)}{\bar{x}(G,B)} - \frac{p(0,1)(b-1)+1}{p(c^M, c^A)(b-1)+1}$ as the increase in expected utility to the bad type from sending (c^M, c^A) instead of $(0, 1)$ assuming the former induces the belief that D is good and the latter induces the belief that D is bad. By continuity of p , Δ is continuous in (c^M, c^A) . A contribution (c^M, c^A) for which $\Delta(c^M, c^A) = 0$ is one that makes the bad type indifferent between contributing $(0, 1)$ and imitating the good type. Since $\frac{\bar{x}(B,B)}{\bar{x}(G,B)} > 1$ we have $\Delta(0, 1) = \frac{\bar{x}(B,B)}{\bar{x}(G,B)} - 1 > 0$. Since $\frac{p(1,0)(b-1)+1}{p(0,1)(b-1)+1} > \frac{\bar{x}(B,B)}{\bar{x}(G,B)}$ we also have $\Delta(0, 1) < 0$. By the intermediate value theorem there must be a contribution (\hat{c}^M, \hat{c}^A) such that $\Delta(\hat{c}^M, \hat{c}^A) = 0$. Since the good type strictly prefers to give this (\hat{c}^M, \hat{c}^A) over $(0, 1)$ by Lemma 2, there is a separating equilibrium in which $\sigma_D(G) = (\hat{c}^M, \hat{c}^A)$ and $\sigma_D(B) = (0, 1)$. The politicians' belief set $\hat{s}_D(c^M, c^A) = B$ if $p(c^M, c^A) < p(\hat{c}^M, \hat{c}^A)$ and $\hat{s}_D(c^M, c^A) = G$ otherwise. Finally, to prove necessity, suppose $\frac{p(1,0)(b-1)+1}{p(0,1)(b-1)+1} < \frac{\bar{x}(B,B)}{\bar{x}(G,B)}$. Since a contribution of $(1, 0)$ maximizes p there must be no contribution that deters the bad type from imitating the good type, which means any equilibrium is pooling. ■

A.2 Costly contributions

The following Lemma shows that the Donor sorting in Lemma 2 also holds in the model with costly contributions. This result is essential, as it was for proving Proposition 2, for the proof of Proposition 3, which shows we can still support a separating equilibrium in a model with costly contributions.

Our first step is to characterize the contribution that would be made by the bad type of Donor in a separating equilibrium. In such an equilibrium, the bad type would take as given that politicians would learn its type and maximize $-\bar{x}(B, B) \frac{p(0, c^A)(b-1)+1}{b} - kc^A$ subject to $0 \leq c^A \leq 1$. Note that c^M is set equal to zero because the optimal choice for the bad type in a separating equilibrium cannot involve contributions to the Moderate. Given the properties of the beta-binomial model and the fact that $\bar{x}(B, B) = \mathbb{E}[\theta | s_D = B]$ (by the law of total expectations), we can set $\bar{x}(B, B) = \frac{\alpha+1}{\alpha+\beta+1}$. Thus, the bad type's contribution maximizes

subject to $0 \leq c^A \leq 1$. An interior solution satisfies the first-order condition¹⁵

$$-\frac{\partial p(0, c^A)}{\partial c^A} = k \frac{b(\alpha + \beta + 1)}{(b-1)(\alpha + 1)}.$$

Naturally, the interior solution is decreasing in contribution costs k and increasing in the Ally's bias b .

When contribution costs are sufficiently small $\left(k \leq -\frac{\partial p(c^M, c^A)}{\partial c^A} \frac{(\alpha+1)(b-1)}{b(\alpha+\beta+1)}\right)$ there is no interior solution and in a separating equilibrium the bad type of D would contribute its entire budget toward electing the Ally. In this case, the main result is identical to the one in the baseline model. To see

¹⁵The second order condition is

$$-\frac{b-1}{b} \frac{\alpha+1}{\alpha+\beta+1} \frac{\partial^2 p(0, c^A)}{\partial c^A^2} < 0$$

which is satisfied when $\frac{\partial^2 p(0, c^A)}{\partial c^A^2} > 0$.

why, recall that Proposition 2 relied on a determination of whether the bad type of Donor would go from giving its whole budget to the Ally to giving its whole budget to the Moderate in order to persuade the politicians and then appealing to continuity to show that some contribution makes the bad type indifferent between separating and imitating. If costs are small enough that the bad type would give its whole budget then we can make the same argument in this case: the comparison is between two contributions with identical direct costs and therefore the bad type's preference depends only on the electoral and persuasion effects as before. The first result establishes that the sorting condition still holds in the model with contribution costs if and only if $b > 1$ and electoral effects of contributions are not zero.

Lemma 3. *Lemma 2 holds in the costly contributions model if and only if $b > 1$ and p is not constant.*

Proof of Lemma 3. We begin by restating Lemma 2: Let (c^M, c^A) and $(\tilde{c}^M, \tilde{c}^A)$ denote different contribution choices with $p(c^M, c^A) > p(\tilde{c}^M, \tilde{c}^A)$. In any equilibrium if the bad type of D weakly prefers to give (c^M, c^A) over $(\tilde{c}^M, \tilde{c}^A)$ then the good type of D strictly prefers to give (c^M, c^A) over $(\tilde{c}^M, \tilde{c}^A)$.

To prove that this also holds in the costly contributions model, note as before that if the bad type is indifferent in equilibrium between (c^M, c^A) and $(\tilde{c}^M, \tilde{c}^A)$ and $p(c^M, c^A) > p(\tilde{c}^M, \tilde{c}^A)$ then it must be the case the $\hat{s}(c^M, c^A) = 0$ and $\hat{s}(\tilde{c}^M, \tilde{c}^A) = 1$. For any type $s_D \in \{G, B\}$, (c^M, c^A) is weakly preferred to $(\tilde{c}^M, \tilde{c}^A)$ if

$$\bar{x}(B, s_D) \frac{p(\tilde{c}^M, \tilde{c}^A)(b-1)+1}{b} - \bar{x}(G, s_D) \frac{p(c^M, c^A)(b-1)+1}{b} \geq k(c^M + c^A) - k(\tilde{c}^M + \tilde{c}^A). \quad (12)$$

The right-hand-side of equation 12 does not depend on G 's type so it is sufficient to prove that

$$\bar{x}(B, G) \frac{p(\tilde{c}^M, \tilde{c}^A)(b-1)+1}{b} - \bar{x}(G, G) \frac{p(c^M, c^A)(b-1)+1}{b} > \bar{x}(B, B) \frac{p(\tilde{c}^M, \tilde{c}^A)(b-1)+1}{b} - \bar{x}(G, B) \frac{p(c^M, c^A)(b-1)+1}{b} \quad (13)$$

which implies that if inequality (12) holds weakly for the bad type then it holds strictly for the

good type. Re-arranging inequality (13) yields

$$\frac{\bar{x}(B, G) - \bar{x}(B, B)}{\bar{x}(G, G) - \bar{x}(G, B)} \leq \frac{p(\tilde{c}^M, \tilde{c}^A)(b-1) + 1}{p(\tilde{c}^M, \tilde{c}^A)(b-1) + 1}. \quad (14)$$

Since $p(c^M, c^A) > p(\tilde{c}^M, \tilde{c}^A)$ we have $\frac{p(\tilde{c}^M, \tilde{c}^A)(b-1) + 1}{p(\tilde{c}^M, \tilde{c}^A)(b-1) + 1} > 1$. Using the beta-binomial properties and substituting the appropriate expectations into equation (6) yields

$$\begin{aligned} \bar{x}(B, G) &= \frac{\alpha}{\alpha + \beta + 1} \frac{\alpha + 2}{\alpha + \beta + 2} + \left(1 - \frac{\alpha}{\alpha + \beta + 1}\right) \frac{\alpha + 1}{\alpha + \beta + 2} = \frac{\alpha}{\alpha + \beta + 1} + \frac{1}{\alpha + \beta + 2} \\ \bar{x}(B, B) &= \frac{\alpha + 1}{\alpha + \beta + 1} \frac{\alpha + 2}{\alpha + \beta + 2} + \left(1 - \frac{\alpha + 1}{\alpha + \beta + 1}\right) \frac{\alpha + 1}{\alpha + \beta + 2} = \frac{\alpha + 1}{\alpha + \beta + 1} \\ \bar{x}(G, G) &= \frac{\alpha}{\alpha + \beta + 1} \frac{\alpha + 1}{\alpha + \beta + 2} + \left(1 - \frac{\alpha}{\alpha + \beta + 1}\right) \frac{\alpha}{\alpha + \beta + 2} = \frac{\alpha}{\alpha + \beta + 1} \\ \bar{x}(G, B) &= \frac{\alpha + 1}{\alpha + \beta + 1} \frac{\alpha + 1}{\alpha + \beta + 2} + \left(1 - \frac{\alpha + 1}{\alpha + \beta + 1}\right) \frac{\alpha}{\alpha + \beta + 2} = \frac{\alpha + 1}{\alpha + \beta + 1} - \frac{1}{\alpha + \beta + 2}. \end{aligned}$$

Therefore

$$\frac{\bar{x}(B, G) - \bar{x}(B, B)}{\bar{x}(G, G) - \bar{x}(G, B)} = \frac{1/\alpha + \beta + 2}{1/\alpha + \beta + 2} = 1,$$

which implies inequality (14). This shows that inequality (12) holds strictly for the good type if it holds weakly for the bad type, which proves the lemma. Note that, if $b = 1$ or or electoral costs are non-existent, both ratios equal one so the strict inequality cannot hold. ■

Proposition 3. *Let c^* be the optimal contribution to the Ally for the bad type of Donor in a separating equilibrium to the costly contribution game. If*

$$\bar{x}(B, B) \frac{p(0, c^*)(b-1) + 1}{b} - \bar{x}(0, 1) \frac{p(1, 0)(b-1) + 1}{b} \leq k(c^M + c^A - c^*)$$

then there exists a separating equilibrium in which the bad type of Donor contributes $(0, c^)$ and the good type of Donor contributes some $(\tilde{c}^M, \tilde{c}^A)$ with $p(\tilde{c}^M, \tilde{c}^A) > p(0, c^*)$. There is no separating equilibrium if b is too close to one or if the electoral effects of contributions are too small.*

Proof of Proposition 3. The proof is nearly identical to the proof of Proposition 2. Suppose

$$\bar{x}(B, B) \frac{p(0, c^*)(b-1)+1}{b} - \bar{x}(G, B) \frac{p(1, 0)(b-1)+1}{b} \leq k(1 - c^*). \quad (15)$$

Recall that in any separating equilibrium the bad type contributes $(0, c^*)$. Define a function $\Delta^*(c^M, c^A) = \bar{x}(B, B) \frac{p(0, c^*)(b-1)+1}{b} - \bar{x}(G, B) \frac{p(c^M, c^A)(b-1)+1}{b} k(c^M + c^A - c^*)$ as the increase in expected utility from deviating to (c^M, c^A) assuming this deviation induces the belief $\hat{s}(c^M, c^A) = 0$. The point at which $\Delta^*(c^M, c^A) = 0$ is the point at which the bad type is indifferent, positive values indicate that the bad type of D would strictly prefer to deviate, and negative values indicate that the bad type of D would not deviate. $\Delta^*(c^M, c^A)$ is continuous in (c^M, c^A) and in $c^M - c^A$, both by continuity of p . The assumption (inequality (15)) gives us $\Delta^*(1, 0) < 0$. Clearly $\Delta^*(0, c^*) > 0$. Thus, by the intermediate value theorem and by continuity of Δ^* with respect to $c^M - c^A$, there must be some contribution $(\tilde{c}^M, \tilde{c}^A)$ such that $\Delta^*(\tilde{c}^M, \tilde{c}^A) = 0$, meaning that bad type is indifferent between contributing $(0, c^*)$ and imitating the good type by giving this contribution. by Lemma 3 this constitutes a separating equilibrium of the game. Furthermore, if inequality (15) holds then there can be no contribution that would deter the bad type from imitating, which means any equilibrium is pooling. ■

A.3 Single crossing proof for general prior

The following lemma is essential to the analysis.

Lemma 4. $\mathbb{E}[\theta | s_D = B, s_M = G]^2 \geq \mathbb{E}[\theta | s_D = s_M = G] \mathbb{E}[\theta | s_D = s_M = B]$.

This Lemma is straightforward to prove for a given distribution. For instance, if f is a Beta distribution with parameters α and β , the expectations are $\frac{\alpha + \mathbb{I}_{(s_D=B)} + \mathbb{I}_{(s_M=B)}}{\alpha + \beta + 2}$ and we have

$$\left(\frac{\alpha + 1}{\alpha + \beta + 2} \right)^2 - \frac{\alpha}{\alpha + \beta + 2} \frac{\alpha + 2}{\alpha + \beta + 2} = \frac{1}{(\alpha + \beta + 2)^2} > 0.$$

A direct argument for general priors is more difficult. We start by noting that, by Theorems 3.1 and 2.6 of Dalal and Hall 1983 and by the fact that the Beta distribution is conjugate to the bi-

nomial distribution which generates our signals, any continuous prior can be arbitrarily closely approximated (in terms of total variation) by a mixture of Beta distributions. Thus, for any $\varepsilon > 0$ there exists a mixture distribution Q on \mathbb{R}_+^2 such that, letting $\phi(\theta|\alpha, \beta)$ denote the beta density and denoting the mixture by

$$f_Q(\theta) = \int \phi(\theta|\alpha, \beta) dQ(\alpha, \beta)$$

with F_Q as the corresponding cdf,

$$\|F - F_Q\|_{TV} < \varepsilon.$$

Furthermore, the posterior expectations taken with respect to F_Q are mixtures of Beta expectations.

We use this fact to prove Lemma 4 below.

Proof of Lemma 4. For any measure F' let $H_{F'} = \mathbb{E}_{F'}[\theta|s_D = B, s_M = G]^2 - \mathbb{E}_{F'}[\theta|s_D = s_M = G]\mathbb{E}_{F'}[\theta|s_D = s_M = B]$. We have:

$$\begin{aligned} H_{F_Q} &= \left[\int \frac{\alpha+1}{\alpha+\beta+2} dQ(\alpha, \beta) \right]^2 - \left[\int \frac{\alpha}{\alpha+\beta+2} dQ(\alpha, \beta) \right] \left[\int \frac{\alpha+2}{\alpha+\beta+2} dQ(\alpha, \beta) \right] \\ &= \int \int \frac{\alpha+1}{\alpha+\beta+2} \frac{\alpha'+1}{\alpha'+\beta'+2} dQ(\alpha, \beta) dQ(\alpha', \beta') - \int \int \frac{\alpha}{\alpha+\beta+2} \frac{\alpha'+2}{\alpha'+\beta'+2} dQ(\alpha, \beta) dQ(\alpha', \beta') \\ &= \int \int \left[\frac{\alpha+1}{\alpha+\beta+2} \frac{\alpha'+1}{\alpha'+\beta'+2} - \frac{\alpha}{\alpha+\beta+2} \frac{\alpha'+2}{\alpha'+\beta'+2} \right] dQ(\alpha, \beta) dQ(\alpha', \beta') \\ &= \int \int \frac{\alpha'}{(\alpha+\beta+2)(\alpha'+\beta'+2)} dQ(\alpha, \beta) dQ(\alpha', \beta') - \int \int \frac{\alpha}{(\alpha+\beta+2)(\alpha'+\beta'+2)} dQ(\alpha, \beta) dQ(\alpha', \beta') \\ &\quad + \int \int \frac{1}{(\alpha+\beta+2)(\alpha'+\beta'+2)} dQ(\alpha, \beta) dQ(\alpha', \beta') \\ &= \int \int \frac{1}{(\alpha+\beta+2)(\alpha'+\beta'+2)} dQ(\alpha, \beta) dQ(\alpha', \beta') > 0. \end{aligned}$$

Let $0 < \varepsilon < \int \int \frac{1}{(\alpha+\beta+2)(\alpha'+\beta'+2)} dQ(\alpha, \beta) dQ(\alpha', \beta')$. By definition of total variation:

$$\left| H_{F_Q} - H_F \right| < \varepsilon,$$

which implies that $\mathbb{E}[\theta|s_D = B, s_M = G]^2 \geq \mathbb{E}[\theta|s_D = s_M = G]\mathbb{E}[\theta|s_D = s_M = B]$. ■

The next Lemma establishes the single crossing condition that supports separating in this game.

Lemma 5. *For any prior belief f we have,*

$$\frac{\bar{x}(G, G)}{\bar{x}(B, G)} < \frac{\bar{x}(G, B)}{\bar{x}(B, B)}.$$

Proof. We have,

$$\frac{\bar{x}(G, G)}{\bar{x}(B, G)} - \frac{\bar{x}(G, B)}{\bar{x}(B, B)} = \frac{\bar{x}(G, G)\bar{x}(B, B) - \bar{x}(G, B)\bar{x}(B, G)}{\bar{x}(B, G)\bar{x}(B, B)}.$$

Since the signal is not perfect the denominator of the expression on the right-hand side is always strictly positive, so the entire expression is negative if,

$$\bar{x}(G, G)\bar{x}(B, B) - \bar{x}(G, B)\bar{x}(B, G) < 0.$$

We have:

$$\begin{aligned} \bar{x}(G, G)\bar{x}(B, B) - \bar{x}(G, B)\bar{x}(B, G) &= \mathbb{E}[\theta|s_D = G] (\mathbb{E}[\theta|s_D = B, s_M = G]^2 - \mathbb{E}[\theta|s_D = s_M = G]\mathbb{E}[\theta|s_D = s_M = B]) \\ &\quad + \mathbb{E}[\theta|s_D = B] (\mathbb{E}[\theta|s_D = s_M = G]\mathbb{E}[\theta|s_D = s_M = B] - \mathbb{E}[\theta|s_D = B, s_M = G]^2) \\ &= (\mathbb{E}[\theta|s_D = G] - \mathbb{E}[\theta|s_D = B]) \end{aligned} \tag{16}$$

$$\times (\mathbb{E}[\theta|s_D = B, s_M = G]^2 - \mathbb{E}[\theta|s_D = s_M = G]\mathbb{E}[\theta|s_D = s_M = B]) \tag{17}$$

The first term $\mathbb{E}[\theta|s_D = G] - \mathbb{E}[\theta|s_D = B] < 0$ (line 16) since $\mathbb{E}[\theta|B] > \mathbb{E}[\theta|B]$. Thus, the entire expression is negative since Lemma 4 shows that $\theta|s_D = B, s_M = G]^2 - \mathbb{E}[\theta|s_D = s_M = G]\mathbb{E}[\theta|s_D = s_M = B] \geq 0$ (line 17). This proves that $\frac{\bar{x}(G, G)}{\bar{x}(B, G)} < \frac{\bar{x}(G, B)}{\bar{x}(B, B)}$. ■