Contribution Limits and Transparency in a Campaign Finance Experiment

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Abstract

We experimentally compare electoral outcomes when donor contribution limits are varied. The effect of contribution limits is studied under three levels of transparency: one where donors' preferences and donations are unobserved by the candidate and public; one where they are observed by the candidate but not the public; and one where they are observed by all. We label them full anonymity (FA), partial anonymity (PA) and no anonymity (NA), respectively. We find that a combination of stricter contribution limits *and* full transparency, our NA condition, is most successful at limiting donors' influence on policy choice. We find that stricter contribution limits improve social welfare. We further find that the partial and no anonymity settings lead to "centrist bias," whereby implemented policies, on average, are more centrist than the candidate's preferences.

Keywords: Campaign Finance Reform; Elections; Political Contributions; Contribution Limits

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1 Introduction

The recent trends in campaign finance legislation have focused on limiting campaign contributions and increasing the amount of transparency in the system. The rationale behind these legislative changes is that limiting the amount of contributions preserves the "one man, one vote" philosophy that underlies democratic elections, while increasing transparency allows voters to see which individuals or organizations may be capturing the politician. Yet, there is little systematic study of these legislative changes and a lack of evidence that suggests both changes are needed to enhance social welfare. We aim to fill this gap by examining how the interaction of contribution limits and transparency affects contributions, candidate policy choices, and social welfare.

The primary motivation for allowing campaign contributions is that these funds make it possible for the candidates to provide information to voters about their qualifications, prior voting records, and/or platforms of the candidates. Advertising may either be directly informative (e.g. Coate 2004a; Coate 2004b; Ashworth 2006) or indirectly informative (Austen-Smith, 1987; Potters, Sloof, and Van Winden, 1997; Sloof 1999; Prat 2002). Directly informative advertising means that the candidate uses the contributions to inform the voters, while indirectly informative advertising means that the campaign contributions collected by the candidate send a signal to the voters about the candidate's qualifications. These theoretical models favor bans or limits on private contributions or advertising, as the benefit from better quality information about the candidate is more than offset by the candidate being captured by the donors.

Theoretical models that favor less restriction on campaign contributions are less common. Aranson and Hinich (1979) find that statutory limits and disclosure work against political competition. Using a model in which contributions do not affect the candidate's probability of winning, they find that the lower the contribution limit is, the smaller is the perceived lead needed for a candidate to receive a contribution advantage. This result occurs because donors want to contribute to the candidate in the lead, both to ensure favors and avoid punishment from the leading candidate.

In addition to providing information about the candidate, campaign contributions make it possible for qualified candidates, particularly underfunded challengers to an incumbent, to run for office. An oft-asked question is whether or not contribution limits enhance the competitiveness of the election. The empirical evidence on this matter, which spans a wide range of elections, is mixed. Bardwell (2003) and Abrams and Settle (2004) argue that *spending* limits for candidates should be increased, on the basis that challengers gain more from a marginal dollar spent than incumbents, though that increase in spending limits may not come through the contribution channel. Gross and Goidel (2001) and Bardwell (2002) show that contribution limits have no effect on candidate spending. Jacobson (1978), Box-Steffensmeier and Dow (1992), and Lott (2006) provide empirical evidence that incumbents benefit from contribution limits and suggest that limits be relaxed or repealed.

On the other hand, Eom and Gross (2006), Stratmann (2006), and Stratmann and Aparicio-Castillo (2006, 2007) all provide evidence that contribution limits decrease the margin by which

a candidate wins an election, and therefore infer that limits increase the competitiveness of the election. Hogan (2005) examines interest group behavior when contribution limits are introduced and finds that if the goal is to decrease issue advertising by interest groups then limits should be increased, while if the goal is to increase interest group involvement in a political party then limits should be decreased. Taking the theoretical and empirical evidence together, the social welfare effects of contribution limits are ambiguous.

Another aspect of campaign finance legislation concerns how transparent donor identities should be. The prevailing attitude today is that the identity of donors should be public, though some suggest that making contributions anonymous to candidates and voters will allow contributions to continue serving their role in information provision while removing the possibility that candidates become captured by large donors. Perhaps the strongest supporters of this system are Ackerman and Ayres (2002), although Aranson and Hinich (1979) and Ayres and Bulow (1998) also support a system of anonymous donations. One concern is whether or not people would still contribute if identities were anonymous. Welch (1974) and Aranson and Hinich (1979) discuss two types of voters, idealistic and *quid pro quo*, and suggest that idealistic voters would continue to donate because they believe that a candidate best represents their ideals. While this would likely lead to smaller aggregate contribution amounts, Abrams and Settle (1976) show that improved mass media outlets (which, at the time, were television and radio broadcasts) allowed candidates to reach a broader audience for less money, allowing the candidates to shift advertising to other venues, such as more door-to-door campaigning. One can imagine that with today's technology candidates could reach an even larger audience of voters at an even lower cost, so less money may be needed for adequate information provision of the candidates' qualifications.

Given that the current policy regarding political contributions is directly opposed to anonymity of donor identities, empirical evidence on the interaction of contribution limits and various levels of transparency is scant.[1] In order to fill that void, we use a laboratory experiment to investigate these interactions. A companion paper, Fang, Shapiro, and Zillante (2013) (hereafter FSZ), uses a laboratory experiment to examine how interactions between transparency of donor identities and the number of donors impact voter and candidate behavior as well as social welfare.[2]

The experimental framework that both FSZ and the current paper use is as follows. There are candidates and donors who have preferences over possible policies. If the implemented policy is different from the most preferred policy for a given agent, this agent experiences quadratic loss. Donors can contribute to the candidate's election fund. The only effect of the contributions is that they increase the candidate's election probability. As in Aranson and Hinich (1979), donors in our

[1] Ayres and Bulow (1998) discuss various attempts at anonymous contribution systems for judicial elections in a dozen U.S. states in the 1970s.

[2] There are very few experimental papers directly on the topic of campaign finance. Houser and Stratmann (2008) examine the role of advertising in publicly and privately financed elections and find that high quality candidates are elected more frequently in publicly financed elections. Grosser, Reuben, and Tymula (2013) examine donations as direct transfers from voters to candidates, and find that the only setting in which candidates do not propose a policy of full redistribution is when donors and candidates play repeatedly.

experiment have two motives to contribute to the candidate. Under the idealistic motive donors contribute because the candidate's views are similar to those of the donor, while under the *quid pro quo* motive donors contribute if they expect the candidate to reciprocate their donations by choosing a more favorable policy.

Three levels of transparency are considered: *full anonymity, partial anonymity*, and *no anonymity*. In full anonymity donors' preferences and the donated amounts are unknown to candidates, to other donors and to the public. In partial anonymity the candidate and other donors, but not the public, know the preferences of all donors, and candidates also observe the amount contributed by each donor prior to choosing a policy.[3] The no anonymity treatment differs from partial anonymity in that the public observes donors' preferences as well. Those public preferences imply that donors are no longer symmetric and donations from donors whose views are less popular among voters will have smaller marginal impact on the election probability. In addition to different transparency levels, the number of donors is varied across treatments. Specifically, treatments with one, two, and three donors are conducted.

The main result of FSZ is that the full anonymity treatments perform best at limiting the donors' influence on policy choices. The no anonymity treatments are better, in general, than partial anonymity treatments, but the former have some limitations. For instance, under no anonymity candidates are more responsive to donations from unpopular donors despite the fact such donations have a lower effect on the candidate's probability of election. Furthermore, donors' preferences have a statistically significant impact on candidate's policy choice.

In this paper we modify the experimental design in FSZ to focus on a different question. We examine the effect of stricter contribution limits on donors' and candidates' behavior as well as electoral outcomes and welfare. We conduct experiments that are similar to the FSZ ones in their transparency level and the number of donors. The difference is that in the new set of experiments the amount that can be donated is *lower* than in FSZ. By comparing new experimental data with the FSZ data we examine the effect of stricter donation limits on political outcomes.

Overall, we find that a combination of stricter contribution limits *and* full transparency, our no anonymity treatment, is successful at limiting donors' influence on policy choice. In particular, under no anonymity with strict donation limits donors' preferences are observed by politicians yet they have no statistically significant impact on a candidate's policy choice. Notably, both factors are required to obtain the effect. Limiting contributions under partial anonymity does not prevent donors from affecting the policy choice. Similarly, no anonymity with generous contribution levels is not as effective at limiting donors' influence either.

We also find that imposing stricter donation limits increases the social welfare as compared to the case of more relaxed limits. However, when comparing welfare with a no donation benchmark the comparison varies depending on the number of donors. In our one-donor treatments, which is

[3]Partial anonymity may arise in a setting in which contributions are made anonymously but there exists some mechanism by which a donor's identity becomes known only to the candidates. For example, this may occur if donors or individuals in donor organizations volunteer their time to the candidate's campaign.

when the difference in contribution limits is the largest in our experiment, stricter donation limits lead to higher welfare than the no-donation benchmark; but in our two-donor treatments, in which the difference in contribution limits in our experiment is more moderate, only the full anonymity treatment improves social welfare over the benchmark. These results suggest that the current trends of reducing contribution limits and increasing transparency are welfare improving relative to a partial anonymity setting (which we believe is closest to the status quo), but social welfare may still be higher in a full anonymity setting. Finally, in the no anonymity and partial anonymity settings stricter limits lead to a "centrist bias" whereby the donations tend to make implemented policies, on average, more centrist than the candidate's preferences.

The theoretical framework and the related experimental design are discussed in Section 2. Section 3 presents detailed results about policy choices, donation decisions, and social welfare. Section 4 concludes.

2 Theoretical Framework and Experimental Design

2.1 Theoretical Framework

Consider a game between a candidate for a political office and his J potential donors. The candidate in question, labeled as Candidate 1 ($C1$), competes with another candidate, labeled as Candidate 2 ($C2$), for political office. In our framework candidates do not compete for donors, as those J donors can only donate to $C1$. This assumption aims to capture the fact that established polictical parties, such as Democrats or Republicans, tend to have large donors who consistently donate to the same party.

We assume that both candidates and J donors have their most preferred policies (MPPs) from the policy space $[\underline{m}, \overline{m}]$. We also assume that voters' preferences uniformly cover the entire spectrum of possible policies. Candidates have an initial probability of election determined by their respective MPPs. Let c_1 and c_2 represent the MPPs of $C1$ and $C2$ respectively, and, without loss of generality, assume $c_1 < c_2$. The initial election probability for $C1$ is equal to the share of voters who prefer the MPP of $C1$ to the MPP of $C2$:

$$\rho_1 = \frac{c_1 + c_2 - 2\underline{m}}{2\left(\overline{m} - \underline{m}\right)}. \tag{1}$$

Donors observe c_1 and c_2 and, depending on the information structure, preferences of other donors. Donors then decide on how much to contribute to $C1$. Donations are not direct transfers to $C1$, but they impact the candidate's election probability. This assumption is consistent with the idea that campaign contributions are used in campaign advertising, and this advertising attracts voters. Donors can donate up to $\bar{d}$, where $\bar{d}$ is determined by the legislature. Let $d_j \leq \bar{d}$ be the amount of donations to Candidate 1 by donor j and r_j be the rate at which donations increase a

candidate's probability of election. Then the updated election probability for $C1$ is:

$$\widehat{\rho}_1 = \rho_1 + \sum_{j=1}^{J} d_j r_j, \tag{2}$$

where $\widehat{\rho}_1 \in [0,1]$ and $\widehat{\rho}_2 = 1 - \widehat{\rho}_1$. The election outcome is then determined according to the updated election probabilities. If $C1$ is elected then the candidate is free to implement a policy $y_1 \in [\underline{m}, \overline{m}]$ and y_1 is not necessarily equal to c_1. If $C2$ is elected then policy $y_2 = c_2$ is implemented.

All participants experience quadratic loss if the implemented policy differs from their own MPP. We bound all payoffs by zero, so that a donor's payoff function is:

$$\Pi_{donor} = \max\left\{w - d_j - (l_j - y_i)^2, 0\right\}, \tag{3}$$

where y_i is a policy implemented by candidate i; w, d_j, and l_j are donor j's initial endowment, total donation, and MPP respectively. As the donation decision is made prior to the election outcome, a donor's objective is to maximize expected utility, which is

$$E\Pi_{donor} = \hat{\rho}_1 \max\left\{w - d_j - (l_j - E(y_1))^2, 0\right\} + (1 - \hat{\rho}_1) \max\left\{w - d_j - (l_j - E(y_2))^2, 0\right\}, \tag{4}$$

where $E(y_i)$ is donor's expectations regarding the policy that will be implemented by candidate i. Equation (4) highlights the trade-offs faced by the donor. First, donations impose a direct cost on donors. Second, if y_1 is closer to l_j than y_2, then contributions benefit the donor because they increase the probability of a more favorable candidate winning the election; in other words, donors have an *idealistic* motive to contribute to the candidate. Finally, if y_1 depends on d_j then there is a *quid pro quo* motive, under which contributions benefit the donor by leading to a more favorable policy choice from the point of view of donor j.

Candidate i has a payoff function:

$$\Pi^i_{candidate} = \begin{cases} B - (c_i - y_i)^2 & \text{if candidate } i \text{ wins} \\ 0 & \text{if candidate } i \text{ loses} \end{cases},$$

where B is the benefit the candidate receives from winning the election.

In a single shot game the candidate has no incentive to choose a policy that differs from his MPP,[4] that is $y_1 = c_1$. Yet, some donors may find it optimal to contribute because of the idealistic motive, as their donations affect the probability that a more preferred candidate wins. It is shown in FSZ that given d_{-j} (or $E[d_{-j}]$ if donors' MPPs are private information) and assuming an interior

[4]We admittedly abstract away from other-regarding behavior in this setting in order to construct a theoretical benchmark.

solution the best response of donor j is:

$$d_j = \frac{w}{2} - \frac{(c_1 - l_j)^2}{2} - \frac{\rho_1}{2r_j} - \frac{\sum_{k \neq j} r_k d_k}{2r_j}. \tag{5}$$

It follows from (5) that in equilibrium donors with higher w, donors with preferences closer to c_1 and donors with a larger impact, r_j, donate more. The last term in (5) is a free-riding effect. If there are other donors who donate more, and these are the donors whose preferences are close to c_1, then donor j will donate less. All these factors are present regardless of whether donor locations are public or private information. However, the strength of the free-riding effect varies depending on the candidate and donors' locations on the policy spectrum. For instance, donor j located close to c_1 will donate less under private information than under public information. This result occurs because under private information other donors cannot free-ride on donor j because they are unaware that j has a strong preference for $C1$, and will have to contribute more, thereby decreasing the optimal d_j. A final remark is that a smaller $\bar{d}$ means lower donations in aggregate as the contribution limit is more likely to be a binding constraint.

In an environment with infinitely repeated interactions candidates might find it optimal to reciprocate donors' contributions, which gives rise to the *quid pro quo* motive in donors' contributions decision. It is argued in the FSZ paper that the donors' behavior, in part, depends on the candidate's responsiveness to donations, which can be measured by $\varepsilon = -\partial(y_1 - l_j)^2/\partial d_j$. Informally, ε is the rate at which donations, d_j, decrease donor j's loss. As expected, a higher responsiveness leads to a higher donation. The candidate's responsiveness depends on the information structure. For instance, when donor preferences are private information the candidate is less likely to respond to donors' contributions.

2.2 Experimental Design

A laboratory experiment is used to study the interaction between transparency levels and contribution limits as there is little available data on individual behavior under different transparency levels. The design is based on the model in Section 2.1 and is similar to the design in FSZ. Each round of a session has two candidates and one to three donors, depending on the treatment. All donors and $C1$ are played by human participants, while $C2$ is computerized. The policy space is over $[0, 300]$. As mentioned earlier, in this paper we focus on interactions of a given candidate and his donors. Each round the MPPs of all donors and c_1 are drawn from $U[0, 150]$ and the MPP of $C2$ is $c_2 = 225$. Thus, both the human candidate and the donors belong to the same half of the policy spectrum while the computer candidate belongs to the other half.

Once the donors and $C1$'s MPPs are drawn an initial probability of election is calculated for $C1$ and $C2$ based on (1). Donors can make donations to $C1$ if they choose and election probabilities are updated according to (2). Donors are given an initial endowment of $w = 9000$ experimental currency units (ECUs) each round but can only donate a maximum of $\bar{d} < 9000$. The value of $\bar{d}$ depends on

the treatment as will be explained later. Candidates always observe updated election probabilities and total donations, though in some treatments they also observe the individual donation amounts made by each donor and individual donors' preferences. Candidates make their policy choice and a winner is randomly determined based on the updated election probabilities.[5] The benefit from winning the election B is set equal to 6000. Donors are given a larger endowment, w, than the candidate's benefit, B, in order to equalize expected payoffs across the types of players as donors are more likely to incur a larger loss if candidates choose policies far from donors' MPPs.

Note that an election outcome is determined by a probabilistic draw rather than having an election with actual participants as voters. This is done for several reasons. Most importantly, it allows us to have full control over how donations impact the election outcome, both within and between different anonymity levels. Further, excluding the voting stage keeps the experimental setup manageable and allows us to focus on our main goal which is studying candidate-donors interactions and the impact of contribution limits. Finally, our research is primarily motivated by elections with large electorate, such as Presidential or Congressional elections. These elections are difficult to implement using participants as voters while retaining a negligible probability that any voter is pivotal.

There are three levels of transparency: full anonymity (FA), partial anonymity (PA), and no anonymity (NA). In FA, candidates and voters know the total donations but neither the individual donor contribution amounts nor the MPPs of the donors. This setting is designed to parallel the full anonymity system proposed in Ackerman and Ayres (2002). In PA, candidates know both the individual contributions and the MPPs of the donors, but voters do not. This setting is akin to the current set of campaign finance laws, which require transparency but also allow donors to conceal their identities from the public through organizations such as 501(c)(4) organizations. In NA, candidates and voters know the individual contribution amounts and MPPs of the donors. Voters negatively react to contributions from donors with unpopular preferences making such donations less influential.[6] This setting is closest to a perfectly enforced set of campaign finance regulations that call for complete transparency regarding contributions.[7]

The difference between the FA and PA treatments is implemented by (a) reporting only total donations in the FA treatment while reporting both total donations and donations by individuals in the PA treatment and (b) concealing donor MPPs in FA and revealing them in PA. In FA and PA donations affect the candidate's probability of winning at the same rate, $r_j = 0.0001$, so that a

[5] We choose to have candidates make policy choices prior to the election winner being announced as we want to have a complete set of policy choices by the human candidate regardless of the election outcome.

[6] There is anecdotal evidence that voters respond negatively to donations from unpopular donors. For instance, "*Colorado's Democratic governor, John Hickenlooper, recently hinted that he would prefer a Bloomberg-funded group ... to stop helping him fight gun-rights activities, saying that folk in his state dislike outside meddling.*" (The Economist, November 2, 2013 "Bye-bye Bloomberg", p. 36).

[7] Proponents of transparency laws in electoral campaigns argue that as long as voters know the identities of candidates' donors they would be able to respond to that information properly. In our setting, voters could expect a more extreme policy implemented after observing large donations from an extreme donor, thereby making donations from extreme donors less influential.

donation of 100 ECUs to $C1$'s campaign causes a one percentage point increase in $C1$'s probability of election. The underlying rationale is that voters are either unaware or do not care about large donors' preferences, making donors symmetric in terms of their impact. In the NA treatment, however, the impact of a donation depends upon the donor's MPP:

$$r_j^{NA} = r_j^{PA} + \frac{1}{600} \cdot \frac{l_j - c_1}{J \cdot \bar{d}}.$$

Thus, if a donor's MPP is more centrist than the candidate's MPP (if $l_j - c_1 > 0$) then the marginal impact of a donation will be greater in NA than in PA or FA, while if the donor's MPP is more extreme (if $l_j - c_1 < 0$) then the impact of the donation will be less. This change in r_j^{NA} captures voters' beliefs that candidates will choose policies closer to the donors' MPPs, and is the only difference between the PA and NA treatments. The particular functional form for r_j^{NA} is chosen for its simplicity as r_j^{NA} does not depend on d_j or d_{-j}.

Among the three transparency levels, partial anonymity has no built-in safeguards to limit donors' influence. The full anonymity setting, in which politicians are unaware of donors' preferences and individually donated amounts, weakens the *quid pro quo* motive. The no anonymity setting, in which donors with unpopular view have lower marginal impact on $\hat{\rho}_1$ does not limit the *quid pro quo* motive but rather limits its ability to induce socially unpopular policies.

Each experimental session consists of a single transparency level (FA, PA, or NA) but the number of donors increases from one to three throughout the session. Thus all subjects participate in three treatments throughout a session – a single transparency level with one, two, and three donors. We refer to the treatments with differing numbers of donors as "phases." Candidates and donors are matched together for the duration of each phase. A candidate-donor pair plays a repeated game with an unknown endpoint, at which time roles are reassigned and those assigned to the role of candidate are matched with two randomly chosen donors for the entire two-donor phase. Finally, all roles are reassigned again and those assigned to the role of candidate are matched with three donors for the duration of the three-donor phase. As explained in Section 2.1, in any equilibrium of a T-period repeated game, where T is known, the candidate should always play $y_1 = c_1$. Thus, the value of T for a given phase is generated randomly to mimic the infinitely repeated game environment.

To facilitate comparison across sessions two features are added. First, for each phase the number of rounds T was determined prior to running sessions and the same number is used in each session. The one-donor phase lasts for 14 rounds, while the two- and three-donor phases last for 12 and 11 rounds respectively. While the same number of rounds is used in all sessions, participants are unaware of the exact number of rounds. Second, the same candidate-donor locations are used for each transparency level. All one-donor treatments use the same pair of candidate-donor locations, all two-donor treatments use the same triple of candidate-two donor locations, and all three-donor treatments use the same quadruple of candidate-three donor locations.

The focus of our paper is the role of contribution limits, with the main difference between treat-

ments in this paper and FSZ being the value of contribution limits. In this paper, the contribution limit is kept constant at 1000 ECUs for each donor regardless of how many donors are in the treatment. In the FSZ-setting the aggregate amount that can be donated is kept constant across treatments, so that $\bar{d} = \frac{3000}{J}$, where J is the number of donors.

In Section 3 shorthand notation is used in referring to the treatments. The transparency level is first, followed by the contribution limit (where 1000 refers to treatments in which $\overline{d} = 1000$ and 3000 refers to treatments in FSZ), and then the number of donors. For example, PA1000-1 refers to the partial anonymity treatment when donations are always capped at 1000 with one donor, whereas NA3000-3 refers to the no anonymity treatment in which the aggregate donation cap is 3000 and there are three donors.

Sessions were conducted using z-Tree (Fischbacher, 2007) at Florida State University's xs/fs laboratory in September 2010 and UNC Charlotte in April 2014. A total of 72 subjects participated in the treatments in which $\overline{d} = 1000$, and 72 participated in the FSZ treatments. Payments averaged about $18.25 for the 90 minute sessions.

2.3 Hypotheses

This section presents hypotheses that describe the anticipated impact of the stricter contribution limits. We use the following mnemonic rule to label hypotheses: C and D correspond to hypotheses with regards to candidates and donors respectively. Letters q and i correspond to donors' *quid pro quo* and *idealistic* motives for donations. Letters A and I specify whether the hypothesis is about aggregate or individual level data, while W stands for welfare.

First, we examine the aggregate effect. We expect that in the 1000 treatments total donations will be lower than in the 3000 treatments simply because there is less money that can be donated. Furthermore, with stricter contribution limits donors are less influential and, therefore, candidates have less incentives to favor them. This, in turn, reduces donors' *quid pro quo* incentives to support their candidate.

Hypothesis (H-AD): *The aggregrate donations in 1000 treatments should be lower than in 3000 treatments.*

Hypothesis (H-AC) *On average, in 1000 treatments the candidates' deviations from their MPPs should be lower.*

Hypothesis (H-ADq): *Quid pro quo donations are lower in the 1000 treatments.*

With regards to the individual-level candidate's behavior the key question is whether donors' preferences have any impact on the policy implemented by C1. A natural conjecture is that in treatments with stricter contribution limits such an impact should be lower.

Hypothesis (H-IC) *In 1000 treatments donors' preferences will have lower impact on the candidate's choice of policy.*

The effect of the NA condition should be to limit socially undesirable influence of extreme donors on chosen policies. In FSZ, however, we do not find strong evidence indicating that extreme donors in NA treatments have no or less (than in PA) influence on the candidate. In this paper we conjecture that the combination of full transparency *and* strict contribution limits can weaken the influence of extreme donors. This conjecture is narrower than **(H-IC)** as it focuses on extreme donors and NA treatments.

Hypothesis (H-NA): *In NA1000 treatments extreme donors will have lower impact on the candidate's choice of policy.*

Next we examine the donor's decision of how much to donate. We conjectured above that stricter contribution limits should decrease the amount donated. The question is what is the main source of this decrease? Recall that there are two reasons to donate: *idealistic* and *quid pro quo*. Lower contribution limits affect the idealistic motivation because they are more likely to become a binding constraint. When $d_j^{optimal} > \bar{d}$ the donor can only donate $\bar{d}$. The *quid pro quo* motive is affected because each individual donor is less influential and the candidate has less incentive to favor a particular donor. When the candidate is less responsive to donations it is optimal for donors to donate less. One can view the idealistic motive as a constitutional right guaranteed by the First Amendment while preventing the *quid pro quo* motive is the goal of campaign finance legislature. Thus, it is important to see which motivation will be primarily affected by the stricter contribution limits.

In the FA setting, where we expect the *quid pro quo* motive to be absent, the only effect of stricter contribution limits is that the donor should donate the largest possible amount, $\bar{d}$, if the interior optimal donation level is above $\bar{d}$. This limit has a negative effect on donations as compared to the 3000 treatments. In the PA and NA settings the effect is less clear. First, as in the FA1000 treatments, it is still more likely that the contribution limit becomes a binding constraint. On the other hand, if donors in the 1000 treatments have pessimistic expectations about their ability to influence a candidate's policy then they will optimally donate less. Both effects have the same sign. However, the former effect is more likely to be observed when donors have preferences similar to c_1, as this is when it is optimal to donate more. The latter effect is more likely to be observed when donors' MPPs are far from c_1.

Hypothesis (H-IDi): *In the 1000 treatments, donors, on an individual level, should donate less. The primary reason is that $\bar{d}$ is more likely to be binding, preventing donors from fully expressing their idealistic support.*

Hypothesis (H-IDq): *In the 1000 treatments, donors, on an individual level, should donate less. The primary reason is that donors do not expect the candidate to favor them as they are less influential.*

The last effect to examine is on welfare, of both the donors and overall society. Following the premise that donations distort implemented policies and this distortion harms welfare then the two hypotheses are:

Hypothesis (H-WD): *In treatments with stricter limits donors are worse off.*

Hypothesis (H-WS): *In treatments with stricter limits social welfare is higher.*

While we use these two hypotheses as our basis, note that in our model the overall picture is more subtle. The optimal social policy in our setup is the median policy of 150 and $C1$ and the donors are located to the left of 150 by design. Thus there are two effects. On one hand, if as the result of donations a more extreme (centrist) candidate picks a less (more) extreme policy it has a positive (negative) effect on welfare. On the other hand, if an extreme (centrist) candidate's chances are boosted too much by the donations that can have a negative (positive) welfare effect *even* if such a candidate implements a more centrist (extreme) policy. Stricter contribution limits impact both positive and negative effects of donations the total impact can be ambiguous. As for donor's welfare the effect is not clear either. This ambiguity occurs because stricter contribution limits restrict a donor's influence, while also preventing them from overspending on political donations.

3 Results

This section presents the experimental results. In what follows, we refer to policy choices by the human candidate from $[0, 49]$ as *extreme* locations, those from $[50, 100]$ as *moderate* locations, and those from $[101, 150]$ as *centrist* locations. Descriptive statistics are presented in Section 3.1. Candidate and donor behavior is studied in Sections 3.2 and 3.3 respectively. Finally, welfare implications are investigated in Section 3.4.

3.1 Aggregated Behavior

Table 1 reports average total contributions and human candidates' response for each of the six treatments. Panel A shows the actual (left columns) and the theoretical (right columns) donation levels. Theoretical donations are calculated under the assumption that donors expect $C1$ to implement c_1 if elected, essentially ignoring the *quid pro quo* motive. Panel B shows the deviations (left column) and absolute deviations (right column) of the implemented policy y_1 from the candidate's MPP. The former measures whether donations result in more centrist or more extreme policies, while the latter measures a candidate's willingness to respond to donations.[8]

[8] In the one-donor NA1000 treatment one subject (ID number 143) assigned to the role of candidate chose a policy above 150 in eight of fourteen elections. These choices greatly skew the results and are not consistent with any theoretical models or the behavior of the other 71 candidates in any treatments. We have excluded the data point from this subject in Table 1.

Panel A: Total Donations						
	Actual			Theoretical		
# of donors:	1	2	3	1	2	3
FA1000	545	959	1498	627	952	1326
FA3000	1397	1599	1645	962	1358	1326
PA1000	610	1133	1543	627	984	1225
PA3000	1735	2209	1666	962	1268	1225
NA1000	541	1048	1546	500	1032	1345
NA3000	1522	1939	2392	944	1250	1345
Panel B: Policy Choices						
	Deviation			|Deviation|		
# of donors:	1	2	3	1	2	3
FA1000	6.37	19.36	11.79	14.51	23.66	12.15
FA3000	4.74	13.90	2.33	9.65	21.73	7.21
PA1000	8.57	-0.75	19.52	16.30	6.15	23.97
PA3000	1.25	-1.13	14.55	10.39	12.06	19.18
NA1000	9.55	0.60	7.94	14.95	8.60	8.36
NA3000	2.86	2.59	24.30	23.95	13.78	27.70

Table 1: Donations and Candidates' Response.

NOTES: The top panel shows total actual donations observed in each treatment as well as equilibrium predictions. The equilibrium is calculated assuming that donors expect the implemented policy to coincide with candidate's preferences. Recall that the aggregate donation amount in treatments with J donors is $1000 \cdot J$ for 1000 treatments and 3000 for 3000 treatments. The bottom panel shows candidate's average, $y_1 - c_1$, and average absolute deviations, $|y_1 - c_1|$, from c_1.

The first result is that in the 1000 treatments, just as in the 3000 treatments, FA leads to the lowest average donations when compared to the theoretical donations. It is also the lowest in absolute number save for when comparing FA1000-1 (545) to NA1000-1 (541). However, the theoretical donations in NA1000-1 are 500 which is less than the 627 in FA1000-1. As previously mentioned, donations can be made for idealistic or *quid pro quo* reasons. As FA substantially weakens the latter reason, it naturally leads to lower donations. A second result is that total donations in 1000 treatments are lower, which is consistent with **(H-AD)**. Finally, donations in the 1000 treatments are, on average, closer to the theoretical prediction than in the 3000 treatments, which is consistent with **(H-ADq)**. Therefore, as conjectured in **(H-ADq)** the treatments with stricter contribution limits decrease the *quid pro quo* motive in donors' decisions.

Panel B of Table 1 shows the candidate's average deviation, $y_1 - c_1$, and average absolute deviation, $|y_1 - c_1|$, from the most preferred policy. By design, preferences of the candidate and all donors were drawn from the range of $[0, 150]$ which is the left half of the policy spectrum $[0, 300]$. Thus, c_1 is always to the *left* of the center of the policy spectrum, and therefore implementing more centrist policies would result in positive deviation, $y_1 - c_1 > 0$, while implementing more extreme policies would result in negative deviation.

Panel B shows that, on average, candidates end up choosing more centrist policies than their original MPP. This is a positive effect of allowing donations, but does not necessarily mean that overall welfare improves. For the case of extreme candidates the positive welfare effect of a more centrist policy can be offset by the increased election probability of the extremist. Notably, the only treatments that lead to the choice of more extreme policy are PA treatments with two donors. This result is notable because all six two-donor treatments had exactly the same combination of candidate-donor preferences. Yet, it is only PA treatments in which candidates' choices are on average more extreme. Furthermore, stricter contribution limits do not eliminate this negative bias.

Finally, the absolute value of deviations, which can be interpreted as a measure of a candidate's responsiveness to donations, are examined. The expected effect is that with lower contribution limits candidates should be less responsive because potential benefits from donors are lower. In terms of averages this effect is not pronounced. In many cases absolute deviations in 1000 treatments are larger than those in 3000 treatments. Thus the evidence supporting **(H-AC)** is at most weak. A particularly surprising finding is that in FA and PA treatments with one donor, which are the treatments with the largest difference between contribution limits, the 1000 treatments have larger average absolute deviations than 3000 treatments. However, in the NA treatments, the 1000 treatments consistently lead to lower absolute deviations than the corresponding 3000 treatments.

Result 1: *Hypotheses **(H-AD)** and **(H-ADq)** are supported by the data. Hypothesis **(H-AC)** does not have strong support by data with one notable exception being NA treatments.*

Result 2: *With the exception of PA treatments candidates tend to choose more centrist policy as compared to their MPPs.*

3.2 Policy Choice

3.2.1 Deviations in Candidates' Policy Choice

Candidate deviations are common and in many instances lead to policies that differ significantly from the candidate's MPP. Candidates choose policies that differ from their MPPs between 36.4% and 71.4% of the time, depending upon the treatment. Using t-tests to compare implemented policies with a candidate's MPP, in one-donor treatments statistically significant deviations by both NA- and PA-candidates are common (9 in NA1000 and 7 in PA1000).[9] For two and three-donor treatments statistically significant deviations are considerably less common in NA (4 in NA1000 and 16 in PA1000). In NA treatments there are four instances when a chosen policy is significantly more extreme than the candidates' preferences as compared to six instances in the PA treatment. Figure 1 shows the average of implemented policies as well as locations of candidates and donors for each treatment and each period.

[9]The t-test result for the hypothesis $y_1 = c_1$ are not reported but available upon request.

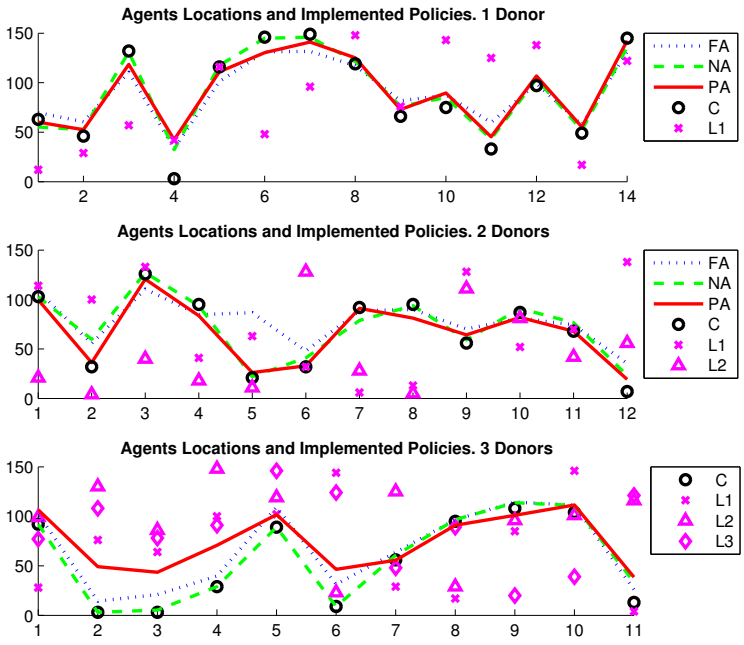

Figure 1: Locations of Donors and Candidates, and the Average Policies Chosen by the Candidate for Each Period.

Given the focus of the paper, next we examine whether there is a statistically significant difference in implemented policies between the 1000 and 3000 treatments. Recall that the experiment is designed such that candidates' and donors' preferences are the same across anonymity levels and contribution limits. For example, in every one donor treatment the first period MPP of the candidate is 63 and the MPP of the donor is 12. Thus, for each period we can compare chosen policies in the 1000 and 3000 treatments and see if the difference is significant.

The results of t-tests are presented in Table 2.[10] The null hypothesis is that, for given preferences, the chosen policy in the 1000 treatment is equal to the chosen policy in the 3000 treatment. The label '0' means that the null cannot be rejected at the 10% level; the label '-1' means that the null is rejected in favor of the hypothesis that the chosen policy in the 1000 treatment is less than in the 3000 treatment; and the label '1' means that the null is rejected in favor of the hypothesis that the chosen policy in the 1000 treatment is greater than in the 3000 treatment.

Table 2 shows that candidates in FA and PA treatments chose different policies between the 1000 and 3000 treatments less than 20% of the time, whereas those in the NA treatment chose different policies 40% of the time (15 out of 37). This result indicates that imposing stricter contribution limits has a stronger impact in NA than in PA or FA. Furthermore, NA1000 treatments are better at limiting monetary influence of donors as compared to NA3000 or PA1000 thereby supporting both **(H-NA)** and **(H-IC)**. Indeed, with two exceptions (1-donor $c_1 = 75$ and $c_1 = 97$), whenever there is a significant difference between the chosen policy in NA1000 and NA3000, its sign consistently indicates that the policy in NA1000 is closer to the candidate's MPP than the policy in NA3000. For example, in treatments with one donor when $c_1 = 146$ and $l_1 = 48$ the implemented policy in NA1000 is significantly higher than in NA3000, which indicates that in 3000 treatments candidates choose policies that are closer to the MPPs of the extreme donor. A similar effect is observed in the two donor phases. When $c_1 = 95$, $l_1 = 13$, and $l_2 = 5$ the policy in the 1000 treatments is significantly greater than the policy in the 3000 treatments, meaning that the influence of extreme donors is limited in NA1000. Notably, NA1000 candidates tend to be less responsive not only to more extreme donors but also to more centrist donors which supports the stronger hypothesis, **(H-IC)**. For instance, in the two-donor phase with $c_1 = 21$, candidates in NA1000 implemented more extreme policies than candidates in NA3000. In contrast, there is no difference between PA1000 and PA3000 choices when $c_1 = 21$. In the one-donor phase with $c_1 = 3$ or $c_1 = 49$ the PA-candidates (but not NA-candidates) implemented less extreme policy thereby favoring less extreme donors. In other words, regardless of whether donors are more or less centrist than the candidate, the donors' impact on policy choice is lower in NA1000 than in NA3000 or PA1000.

The limited ability of donors to impact the policy choice in NA1000 with one and two donors appears to have a spillover effect into the treatment with three donors. Despite NA1000-3 and NA3000-3 being identical, we observe quite a few instances in which policies in the 1000 treatments are significantly lower than those in the 3000 treatments. In our data this occurs when the candidate

[10] As before we exclude subject 143 in 1-donor treatment tests.

1 Donor					2 Donors						3 Donors						
c_1	FA	PA	NA	l_1	c_1	FA	PA	NA	l_1	l_2	c_1	FA	PA	NA	l_1	l_2	l_3
3	0	1	0	42	**7**	0	0	0	138	56	**3**	0	0	-1	76	130	108
33	0	0	0	125	**21**	0	0	-1	63	11	**3**	0	0	-1	64	86	78
46	0	0	0	29	**32**	0	0	0	100	4	**9**	0	1	0	144	23	124
49	0	1	0	17	**32**	0	0	-1	32	128	**13**	0	0	0	4	116	121
63	0	0	0	12	**56**	0	-1	0	128	111	**29**	1	0	-1	100	148	91
66	0	0	0	76	**68**	0	0	0	70	42	**56**	0	0	-1	29	125	48
75	1	0	1	143	**87**	0	0	1	52	81	**89**	1	0	-1	102	119	146
97	0	0	1	138	**92**	0	1	0	6	28	**92**	1	0	0	28	99	77
116	0	0	0	116	**95**	0	0	0	41	18	**95**	1	0	0	17	29	89
119	0	0	0	148	**95**	0	0	1	13	5	**104**	1	0	0	146	101	39
132	0	0	1	57	**103**	0	-1	0	114	21	**108**	1	0	0	85	96	20
145	0	0	0	122	**126**	0	0	1	133	40							
146	0	0	1	48													
149	0	0	1	96													

Table 2: Comparing the chosen policies in 1000 and 3000 treatments.

NOTES: The results of t-tests comparing implemented policies between 1000 and 3000 treatments for each particular candidate's location. An entry of '1' denotes the case where the hypothesis $y_1^{1000} = y_1^{3000}$ is rejected in favor of $y_1^{1000} > y_1^{3000}$ at 10% level; an entry of '-1' denotes the case where the hypothesis $y_1^{1000} = y_1^{3000}$ is rejected in favor of $y_1^{1000} < y_1^{3000}$ at the 10% level, and entry of '0' denotes the case where $y_1^{1000} = y_1^{3000}$ cannot be rejected.

has more extreme preferences, indicating the lesser impact of a donor's preferences on the policy choice in NA1000-3.[11]

We summarize the above results as follows:

Result 3: *The NA data are consistent with **(H-IC)** while the PA data are not. Furthermore, NA data are consistent with **(H-NA)** in that NA1000 successfully limits extreme donors' influence.*

3.2.2 Determinants of Policy Deviations

Next we examine which factors affect a candidate's decision to deviate from the candidate's MPP and, more importantly, whether different factors had different impacts in the 1000 and 3000 treatments. The absolute value of the candidate's deviation, $|y_1 - c_1|$, is used as the dependent variable. Thus, having a given independent variable, say donation amount, that is significant and positive would imply that larger donations increase both the probability of choosing $y_1 \neq c_1$ as well as the size of deviation. To study the difference between 1000 and 3000 treatments we use pooled data from both groups of treatments and add interaction terms with the dummy variable $Is1000$. The variable $Is1000$ is equal to 1 for 1000 treatments and 0 for 3000 treatments. The results of panel-tobit regression are presented in Table 3.

[11] In 3-donor case when $c_1 = 56$ there are both more extreme and more centrist donors than the candidate. However, the average implemented policy in NA1000-3 is 59.67 and NA3000-3 is 82.33, that is, on average the NA1000 candidates do not deviate.

Due to natural differences among the treatments with different numbers of donors, the choice of explanatory variables depends on J. The human candidate's MPP, donation amount(s), and the squared distance(s) between the donors' and the candidate's locations are used in regressions for all numbers of donors. In treatments with $J \geq 2$ we record the relative proximity of donors to c_1 and relative contribution of one donor compared to other donors. First, the candidate is more likely to favor a more generous contributor. Second, reciprocation to a closer donor implies smaller deviation, if at all, whereas reciprocation to a further donor implies a larger deviation. Thus, when $J \geq 2$ we separate variables related to the closest donor (indexed by the label *close*) and variables related to the furthest donor (indexed by the label far). In particular, we include the variable $d_{far} - d_{close}$ which is the difference in donation amount between the donors and is expected to be positive if the aforementioned effects are present. We also include the variable $(l_{far} - c_1)(l_{close} - c_1)$, which is a continuous measure of the relative locations of the candidate and donors. It is negative when the candidate is between the donors and takes its minimum if the candidate location is equidistant to l_{far} and l_{close}. The further the candidate is from the donors the larger is the value of $(l_{far} - c_1)(l_{close} - c_1)$.

1-Donor Treatments Panel A of Table 3 presents the results for 1-donor treatments. In the previous section we found evidence that NA1000 is able to limit the impact that donors' preferences and donations have on policy choices. Panel A of Table 3 further substantiates this finding. The interaction term, $(l_1 - c_1)^2 \cdot Is1000$, is negative and significant in the NA treatment whereas in PA it is positive and insignificant. The term $(l_1 - c_1)^2$ is positive and significant in both PA and NA, meaning that in 3000 treatments candidates are willing to deviate more if their donors are located further away. Adding stricter contribution limits to PA neither removes nor weakens this effect, and therefore in PA **(H-IC)** does not hold. In NA, however, stricter contribution limits make donors' preferences an insignificant factor at the 5% level for the implemented policy. That is, for NA (but not PA) stricter contribution limits do more than reduce the impact of donors' preferences as conjectured in **(H-IC);** they eliminate it. As for FA neither $(l_1 - c_1)^2$ nor the corresponding interaction term are significant which is expected given that they are not observed.

Larger donations lead to smaller deviations in FA and larger deviations in PA and NA. The former result occurs because large donations in FA are more likely to come from a donor with similar preferences and thus the best way to reciprocate is by not deviating. Comparing 1000 and 3000 treatments, the effect of lower contribution limits also varies depending on the anonymity level. In the FA treatment, the sum of the estimated coefficients for d_1 and the interaction term is insignificant (p-value 0.59) meaning that in FA1000 candidates are no longer responding to the amount donated. Intuitively, when the contribution limit is 3000 the donors could send a clearer signal regarding their preferences than when it is only 1000. In the PA and NA treatments both coefficient estimates for d_1 and the interaction term are positive and significant, implying that candidates are more responsive to the same donation amount in the 1000 treatment than in the 3000 treatment. While each dollar donated has the same marginal impact on the election probability,

	FA		PA		NA	
	Coef	**p-value**	**Coef**	**p-value**	**Coef**	**p-value**
Panel A: 1 Donor						
d_1	-0.0075	0.014	0.0031	0.014	0.0065	0.006
$d_1 \cdot Is1000$	0.0042	0.539	0.0096	0.088	0.0129	0.033
$(l_1 - c_1)^2$	0.0015	0.096	0.0017	0.015	0.0029	0.000
$(l_1 - c_1)^2 \cdot Is1000$	-0.0008	0.495	0.0003	0.756	-0.0013	0.234
c_1	-0.2994	0.000	-0.0520	0.275	-0.0893	0.086
$c_1 \cdot Is1000$	0.2006	0.008	-0.1042	0.124	-0.0979	0.176
$(c_1 > l_1)_t$	6.2367	0.306	-1.3466	0.787	13.4086	0.012
$(c_1 > l_1)_t \cdot Is1000$	-1.6031	0.83	4.532377	0.523	-12.2360	0.11
DidCMove_{t-1}	0.2197	0.003	0.1156	0.097	0.1548	0.011
DidCWin_{t-1}	-3.43911	0.322	-7.04	0.023	-5.2623	0.132
Panel B: 2 Donors						
$d_1 + d_2$	-0.0091	0.270	*	*	*	*
$(d_1 + d_2) \cdot Is1000$	-0.0021	0.888	*	*	*	*
$d_{far} - d_{close}$	*	*	0.0058	0.080	0.0072	0.089
$(d_{far} - d_{close}) \cdot Is1000$	*	*	0.0000	0.998	-0.0038	0.653
$(l_{far} - c_1)^2$	-0.0007	0.648	0.0003	0.701	0.0021	0.005
$(l_{far} - c_1)^2 \cdot Is1000$	0.0013	0.514	-0.0013	0.254	-0.0019	0.091
$(l_{close} - c_1)^2$	-0.0004	0.894	0.0028	0.086	-0.0030	0.089
$(l_{close} - c_1)^2 \cdot Is1000$	-0.0015	0.746	0.0018	0.496	0.0064	0.018
$(c_1 - l_{far})(c_1 - l_{close})$	0.0011	0.686	-0.0006	0.651	-0.0044	0.004
$(c_1 - l_{far})(c_1 - l_{close}) \cdot Is1000$	-0.0011	0.759	0.0038	0.081	0.0048	0.037
c_1	-0.1801	0.303	0.0429	0.602	0.1824	0.035
$c_1 \cdot Is1000$	-0.4658	0.051	-0.1988	0.100	-0.2259	0.060
DidCMove_{t-1}	-0.11574	0.330	0.1934	0.102	-0.1891	0.180
DidCWin_{t-1}	-1.3696	0.862	-2.5091	0.535	-12.4703	0.006
Panel C: 3 Donors						
d_{far}	-0.0119	0.253	-0.0241	0.098	-0.0075	0.530
$d_{far} \cdot Is1000$	0.0077	0.534	0.0375	0.072	-0.0182	0.390
d_{close}	-0.0106	0.324	-0.0043	0.756	0.0266	0.081
$d_{close} \cdot Is1000$	0.0089	0.501	-0.0043	0.828	-0.0215	0.267
$(l_{far} - c_1)^2$	-0.0011	0.209	-0.0010	0.418	0.0006	0.572
$(l_{far} - c_1)^2 \cdot Is1000$	0.0012	0.258	0.0010	0.528	-0.0013	0.320
$(l_{close} - c_1)^2$	0.0031	0.116	0.0032	0.305	0.0010	0.682
$(l_{close} - c_1)^2 \cdot Is1000$	-0.0008	0.755	0.0014	0.751	-0.0041	0.299
c_1	-0.1395	0.254	-0.1740	0.312	-0.2452	0.088
$c_1 \cdot Is1000$	0.0592	0.665	-0.2162	0.320	-0.1427	0.435
DidCMove_{t-1}	-0.0658	0.614	-0.1161	0.370	-0.0515	0.683
DidCWin_{t-1}	1.0571	0.829	-10.5051	0.221	-7.3190	0.349

Table 3: The Panel Tobit Regression Analysis of the Candidate Behavior. Dependent variable is $|y_1 - c_1|$.

in PA and NA a donation of, say, 700 out of 1000 leads to larger reciprocation than a donation of 700 out of 3000.

The dummy variable $(c_1 > l_1)_t$ has a predictable zero impact in FA and PA treatments. In the NA treatment it is positive and significant, meaing that when the variable $Is1000 = 0$, i.e. in NA3000, candidates are more responsive to donations from more extreme donors. Given that in the NA setting more extreme donors are less powerful, it is surprising that candidates are more willing to reciprocate to those donors. In FSZ, where we established a similar result, we referred to this effect as a potential weakness of the NA system in its ability to restrict the influence of extreme donors. It turns out that this somewhat counterintuitive and definitely undesirable effect is removed when contributions are limited as in NA1000. The sum of the estimated coefficients on $(c_1 > l_1)_t$ and the interaction term is insignificant (p-value 0.83). This supports **(H-NA)**.

The last noteworthy result which was not part of the initial set of hypotheses concerns the impact of c_1. Whenever c_1 is negative it means that more centrist candidates are deviating less than extreme candidates. Given that extreme (centrist) candidates, if they are to deviate, are more likely to deviate towards more centrist (extreme) policies, a negative coefficient on c_1 generates what we call a *centrist bias*. As more centrist policies are more socially desirable in our framework, having a centrist bias is beneficial for social welfare. It turns out that $c_1 + c_1 \cdot Is1000$ is statistically significant and negative at the 5% level in all three treatments, while c_1 is significant at the 5% level only in FA. Thus, imposing stricter contribution limits introduces a centrist bias into candidates' policy choice, for both PA and NA treatments.

2-Donor Treatments Panel B of Table 3 presents the results for 2-donor treatments. Similar to 1-donor treatments, larger donations imply smaller deviations in FA, though the effect is insignificant, and larger deviations in NA and PA. Recall that for NA and PA the variable $d_{far} - d_{close}$ is used to measure the effect of donations. It is positive which means that, holding donation amount constant, candidates deviate more for donors farther away. Comparing the 1000 and 3000 treatments there is no significant difference between the two as the interaction term is insignificant.

The next result is that similarly to the 1-donor case, NA1000 largely removes donors' preferences as a factor in candidates' decisions. Regardless of whether the distance of the farthest donor, $(l_{far} - c_1)^2$, closest donor, $(l_{close} - c_1)^2$, or relative location of the candidate and donors, $(c_1 - l_{far})(c_1 - l_{close})$ is used, their total impact in 1000 treatments (after adding interaction terms) is insignificant. The 2-donor NA data strongly support **(H-IC)** and **(H-NA)**. As for PA, the distance to the closest donors remains positive and significant, both in 3000 treatments and 1000 treatments. Intuitively, as the closest donor is farther away, both donors are far from the candidate and the positive sign indicates that the candidate is willing to deviate more. In particular, it implies that in the PA treatment having two extreme donors and a moderate or a centrist candidate will lead to a considerably more extreme policy implemented than, for example, in NA. Therefore PA-2 data do not support **(H-IC)**.

Finally, the term $c_1 \cdot Is1000$ is negative in all three treatments and its significance level varies

between 5% and 10%. In FA1000 and PA1000 it leads to statistically significant centrist bias (p-value is 0.001 in NA and 0.08 in PA). In NA, while $c_1 + c_1 \cdot Is1000$ is insignificant, stricter contribution limits cancel the significantly positive effect of c_1. The fact that c_1 changes its impact from positive to insignificant between NA3000 and NA1000 provides further support to (**H-NA**).

3-donor Treatments Panel C of Table 3 presents the results for 3-donor treatments. Recall that donation limits in 3-donor treatments are the same in the 1000 and 3000 treatments. Thus the difference between the two treatments may be attributed to the effect of the prior history rather than a difference in treatment parameters.

Overall, most of the variables, including the interaction terms, are insignificant. There are two reasons for this lack of significance. One is that with three donors the impact and importance of a given donor is diminished, and the second is that given the similarity of the 1000 and 3000 treatments one should expect most of the interaction terms to be insignificant. The most notable exception is that the centrist bias is the centrist bias in PA1000 and NA1000 treatments (p-values of $c_1 + c_1 \cdot Is1000$ are 0.04 and 0.02 respectively). The presence of a centrist bias in 1000 treatments with one and two donors, and its absence in 3000 treatments, seems to be responsible for observing it in 3-donor 1000 treatments as well.

The results about candidate deviations are summarized as follows:

Result 4: *In NA1000 treatments with 1 and 2 donors, donors' preferences have no effect on implmented policy. This is not the case in PA treatments and NA3000. This provides strong support for* ***(H-NA)****.*

Result 5: *Under PA and NA, stricter donation limits introduce a centrist bias. More centrist (extreme) candidates are less (more) likely to deviate.*

3.3 Donations

To study what factors affect donors' decisions as well as the role of contribution limits, a panel-tobit model, with the dependent variable the percentage of contribution limit donated, is estimated. Given that donors could be willing to donate more than the maximum amount, especially in 1000 treatments, two censoring limits are used: 0 and 100. To focus on the difference between 1000 and 3000 treatments the dummy variable $Is1000$, equal to 1 for 1000 treatments, is created and interaction terms with this dummy variable are added. Other factors considered are the distance between the candidate and donor(s), whether the candidate is between donor or not and the marginal impact r_j in NA treatments. Estimation results are presented in Table 4.

The primary hypotheses for this section are **(H-IDi)** and **(H-IDq)** which aimed at separating two possible effects of restricting the contribution limits. First, the donation limit is more likely to be a binding constraint in the 1000 treatments when the idealistic motive to donate is the strongest, i.e. when a donor and a candidate have similar MPPs. Second, in treatments that allow for *quid*

pro quo contributions (PA and NA), stricter donation limits might negatively affect candidates' responsiveness to donations and therefore donors' incentives to donate. Both effects have the same sign. From a social perspective limiting the *quid pro quo* motive is desirable, whereas limiting the idealistic motive can be viewed is not.

To test whether **(H-IDi)** and **(H-IDq)** hold we examine two variables that capture the difference in candidate and donor preferences: $Dist_j$ and $Dist_j \cdot Is1000$. If the interaction term is insignificant, then donors with the same $Dist_j$ in the 3000 and 1000 treatments donate the same percentage of the contribution limit, indicating that donations in the 1000 treatments are lower. When the interaction term is significant and negative then not only do donors in the 1000 treatments donate less in absolute amount but also a lower percentage of the contribution limit. Thus, only the positive values of the interaction term would be consistent with **(H-IDi)**. Insignificant or negative values would indicate a decrease in the *quid pro quo* motive which would support **(H-IDq)**.

Estimation in Table 4 indicates that under the PA and NA condition there is a decline in the *quid pro quo* motive as the interaction term is never significantly positive and is significantly negative in 1-donor treatments. We conclude that **(H-IDq)** is supported by data.

In 1-donor PA and NA treatments, apart from $Dist_{-j}$ the only factor that has a significant effect is ρ_1. While ρ_1 itself is insignificant, its sum with the interaction term is negative and significant at the 1% level. Thus, donors are less willing to donate to more centrist candidates in 1000 treatments. From society's view this is mixed news. Having a more centrist candidate means there is a higher likelihood of having a more extreme donor, indicating that more extreme donors are less willing to donate and influence centrist candidates. On the other hand, it means that centrist, and therefore more socially desirable candidates, receive less support. This effect is absent in the 1-donor FA treatment.

Finally, in FSZ we established that in multiple donor treatments there are strategic effects present between the donors. In PA3000-2, variables related to locations of the other donor and locations of the candidate relative to the donors are significant or marginally significant. The variable, $Dist_{-j}$, for example, is positive and significant, which shows that there is a free-riding effect in donation decisions. Similarly, the dummy variable $Between$, equal to 1 if the candidate is located between two donors and 0 otherwise, is positive and marginally significant. If the candidate is located between two donors they have conflicting interests and we should expect increased competition for the candidate, which is consistent with a positive coefficient for $Between$. Finally, the effect of distance between c_1 and donor $-j$ depends on the value of $Between$. When $Between = 0$ there is no competition effect and the total effect of $Dist_{-j}$ should be and is positive. When $Between = 1$ the competition effect works in the opposite direction and cancels the free-riding effect. This effect is captured by the negative sign of the estimated coefficient for $Dist_{-j} \cdot Between$.

Notably, all these strategic considerations that are present in PA3000-2 are now insignificant in PA1000-2. There is no longer any evidence of either the competition or the free-riding effect. Both $Dist_{-j} + Dist_{-j} \cdot Is1000$ and $Dist_{-j} \cdot Between + Dist_{-j} \cdot Between \cdot Is1000$ are insignificant in

	FA		PA		NA	
	Coef	**p-value**	**Coef**	**p-value**	**Coef**	**p-value**
Panel A: 1 Donor						
$Dist_j$	-0.343	0.009	-0.275	0.063	-0.241	0.069
$Dist_j \cdot Is1000$	-0.278	0.143	-0.490	0.023	-0.418	0.030
ρ_1	-41.200	0.445	-82.296	0.179	-29.963	0.594
$\rho_1 \cdot Is1000$	-5.163	0.947	-104.443	0.241	-239.556	0.004
$c_1 > l_j$	16.421	0.052	-1.280	0.892	-10.519	0.269
$c_1 > l_j \cdot Is1000$	-5.795	0.636	-4.150	0.764	3.849	0.795
r_j	*	*	*	*	-50855	0.588
WinnerL	-4.184	0.496	-20.907	0.002	-2.669	0.653
Is1000	26.149	0.537	88.186	0.059	147.809	0.001
Panel B: 2 Donors						
$Dist_j$	-0.381	0.000	-0.360	0.000	-0.235	0.012
$Dist_j \cdot Is1000$	0.036	0.738	0.087	0.522	0.033	0.773
$Dist_{-j}$	0.037	0.676	0.196	0.080	-0.112	0.317
$Dist_{-j} \cdot Is1000$	0.001	0.991	-0.148	0.222	0.111	0.343
$Dist_{-j} \cdot Between$	-0.171	0.214	-0.443	0.011	-0.077	0.657
$Dist_{-j} \cdot Between \cdot Is1000$	0.101	0.471	0.315	0.081	0.344	0.042
$Between$	1.387	0.836	17.273	0.044	-4.002	0.640
r_j	*	*	*	*	42007	0.391
DidCWin_{t-1}	-3.532	0.297	-10.129	0.025	-2.071	0.637
Panel C: 3 Donors						
$Dist_j$	-0.2426	0.005	-0.395	0.001	-0.207	0.036
$Dist_j \cdot Is1000$	0.1624	0.080	0.025	0.832	-0.558	0.000
$DistFar_{-j}$	-0.0314	0.761	0.085	0.533	-0.076	0.521
$DistFar_{-j} \cdot Is1000$	-0.1747	0.200	-0.160	0.356	0.163	0.295
$DistClose_{-j}$	0.0470	0.668	0.002	0.986	-0.172	0.171
$DistClose_{-j} \cdot Is1000$	0.3655	0.005	0.252	0.122	0.448	0.003
$Between$	4.9062	0.274	1.458	0.799	0.154	0.977
ρ_1	-40.9458	0.451	-51.2443	0.472	-141.4	0.049
$\rho_1 \cdot Is1000$	52.4603	0.017	113.205	0.000	63.4	0.003
r_j	*	*	*	*	-20218.4	0.828
DidCWin_{t-1}	-6.476	0.086	-14.412	0.004	-1.797	0.693

Table 4: Fixed-effect panel estimation of donors' behavior.

NOTES: The panel tobit estimation of donors' behavior. The dependent variable is donation of donor j as a percentage of total donatable endowment. Independent variables are $Dist_j = |l_j - c_1|$; $Dist_{-j} = |l_{-j} - c_1|$; $DistFar_{-j} = \max_{k \neq j} |l_k - c_1|$ and $DistClose_{-j} = \min_{k \neq j} |l_k - c_1|$; $Is1000$ is a dummy variable equal to 1 for 1000 treatments ρ_1 is the initial election probability; $Between$ is equal to 1 if the candidate is located between donors; $c_1 > l_j$ is equal to 1 when donor j is to the left of the candidate; DidCWin_{t-1} is equal to 1 if the candidate won the election last period. Finally, r_j is the marginal impact of donor j's contributions.

PA1000-2. This result suggests that the location of the other donor as well as the relative locations of candidates and donors is no longer a factor in donation decisions in 1000 treatments.

Our main findings on donor behavior are as follows:

Result 6: *For PA and NA treatments, the decline in donations comes from the decrease in the ability to achieve the quid pro quo motive* ***(H-IDq)****. The only treatment which is consistent with* ***(H-IDi)*** *is FA-2.*

Result 7: *Having stricter contribution limits removed all strategic effects that were present in the two and three donor PA3000 treatments.*

3.4 Welfare

In this section we calculate and compare social welfare and donor welfare under two scenarios. The first scenario is a hypothetical benchmark where donations are not allowed and the elected candidate always chooses his most preferred policy. The second scenario is based on the outcomes observed in our experiment. When calculating social welfare we assume that voters' most preferred policies are uniformly distributed on the interval $[0, 300]$ and that voters' utilities are the same as donors' utilities, as specified in (3). In particular, voters' payoffs are bounded by zero and are calculated *ex-ante*. That is, if the election probability of $C1$ is $\hat{\rho}_1$ and a voter's MPP is μ_i then that voter's expected utility is

$$\hat{\rho}_1 \cdot \max\left\{9000 - (y_1 - \mu_i)^2, 0\right\} + (1 - \hat{\rho}_1) \cdot \max\left\{9000 - (225 - \mu_i)^2, 0\right\}. \tag{6}$$

In the benchmark when donations are prohibited, $\hat{\rho}_1 = \rho_1$ as determined by (1), and $y_1 = c_1$.

	1 donor		2 donors		3 donor	
	Observed	Benchmark	Observed	Benchmark	Observed	Benchmark
FA1000	**3633**	3594	**3605**	3536	**3446**	3432
FA3000	**3607**	3594	**3547**	3536	3373	**3432**
PA1000	**3622**	3594	3508	**3536**	**3522**	3432
PA3000	3578	**3594**	3464	**3536**	**3457**	3432
NA1000	**3611**	3594	3494	**3536**	3386	**3432**
NA3000	3589	**3594**	3514	**3536**	**3506**	3432

Table 5: Average Voter Welfare and the No Donation Benchmark by Treatment.

In our framework, donations can impact social welfare via two effects: by altering the probability of elections and influencing the implemented policy. When $y_1 = c_1$ and $c_2 = 225$, as in our setting, the first effect will decrease voters' welfare when $c_1 \in [0, 75]$ and will increase it when $c_1 \in [75, 150]$. The second effect will be beneficial for welfare if $y_1 > c_1$ and detrimental if $y_1 < c_1$. Clearly, the two effects can work in different directions, such as when an extreme candidate chooses a moderate policy because of donations.

Table 5 shows average voter welfare by treatment and number of donors. We boldface the number that is larger than its counterpart in each treatment. The first finding is that in all 1-donor 1000 treatments the observed welfare is greater than the benchmark. This is in sharp contrast with 1-donor 3000 treatments where social welfare decreases in PA and NA. The major source of welfare gain comes from donors' limited ability to support extreme candidates in 1000 treatments. Another result worth noting is that welfare in 1000 treatments is greater than welfare in 3000 treatments for every anonymity level, confirming (**H-WS)** in the one donor treatment. Not only is welfare in the 1000 treatments higher than in the 3000 treatments, it is higher than in the no-donation benchmark for every campaign finance system. In the two donor case it is the anonymity level that determines the welfare impact and not donation limits. Both 1000 and 3000 treatments have a positive welfare effect under the FA system and negative welfare effect under the NA and PA systems. As in 1-donor case, the social welfare in 1000 treatments is greater than in 3000 treatments for every anonymity level. This further substantiates **(H-WS)**.

With three donors the outcome is different. First, the FA system is no longer welfare-improving, generating a very small welfare increase in FA1000 and a substantial welfare decrease in FA3000. PA with three donors improves welfare regardless of whether the contribution limit is 1000 or 3000. As for NA, there is a substantial difference between the 1000 and 3000 treatments. In 3000 treatments donors were donating more and candidates were more willing to deviate (and the deviation sign was usually positive), whereas in 1000 treatments donations and deviations were considerably lower. As a result, in NA3000 welfare is much larger than in NA1000 and larger than in the benchmark. This difference between 3-donor treatments in NA is most likely due to the impact of prior play in the experiment. We already discussed that NA1000 is fairly successful at limiting the effect of money and, in particular, donors are used to donating less in one and two donor treatments and they continue to donate less than their 3000 counterparts in the 3-donor treatment. We believe that this is more than just an artifact of our experimental design. The impact of any campaign finance reform is, in part, determined by voters' prior habits regarding political contributions.

	1 donor		2 donors		3 donor	
	Observed	Benchmark	Observed	Benchmark	Observed	Benchmark
FA1000	**3472**	3439	**2878**	2648	**3222**	2626
FA3000	3339	**3439**	**2889**	2648	**3153**	2626
PA1000	**3592**	3439	**3205**	2648	**3614**	2626
PA3000	**3526**	3439	**3550**	2648	**3412**	2626
NA1000	**3492**	3439	**3075**	2648	**3264**	2626
NA3000	**3442**	3439	**3529**	2648	**3779**	2626

Table 6: Average Donor Welfare and the No Donation Benchmark by Treatment.

Table 6 shows donors' expected welfare in different treatments. Donors benefit greatly from the institution of political contributions. The ability to increase election chances of a preferred candidate as well as the ability to influence an implementation of more favorable policies by far

outweighs the cost of donations. Comparing 1000 and 3000 treatments, there is some consistency across anonymity levels with regards to which one is better for donors. In the 1-donor case, 1000 treatments are better for donors. In the 3000 treatments donors seem to spend more than would be justified by a candidate's response and they are unable to do so in 1000 treatments. In the case of 2-donors, the 1000 condition is worse than the 3000 condition. In 3000 treatments, donors' ability to contribute too much is limited compared to the 1-donor treatment. At the same time the amount of resources available to support the candidate is still higher than in the 1000 treatment. Furthermore, as we have seen in PA3000-2 and NA3000-2, candidates are more willing to deviate thereby improving social welfare. Thus, **(H-WD)** hold in 2-donor treatments but not in 1 donor treatments.

Result 8: *Hypothesis **(H-WS)** is supported by data. Stricter donation limits are welfare improving regardless of the campaign finance system.*

Result 9: *Hypothesis **(H-WD)** holds for 2-donor treatments but not 1-donor treatments. In 1-donor treatments stricter limits make donors better off as they prevent over-contribution.*

Result 10: *Compared to the benchmark, stricter contribution limits are welfare improving in the 1-donor treatment regardless of the campaign finance system. In the 2-donor treatment, stricter contribution limits only improve welfare relative to the benchmark in the FA system.*

4 Conclusion

With expenditures on political campaigns increasing each election cycle, campaign finance reform is a topic under consideration by many scholars. Current legislation favors stricter contribution limits and increased transparency of donor identities. While there a number of studies that examine the effect of contribution limits, examining the interaction of contribution limits and transparency levels is more difficult due to the difficulty in controlling for transparency levels. To study this issue we use a laboratory experiment in which the transparency levels and contribution limits are varied.

Our results suggest that stricter contribution limits either improve or have no effect on welfare relative to the more relaxed contribution limits. Welfare improvement occurs in the partial anonymity and no anonymity settings, while stricter limits have no significant effect in the full anonymity setting. This welfare gain occurs because candidates, responding to the decreased donation amounts, deviate less from their most preferred policies under stricter contribution limits. These deviations are less pronounced for those candidates who have more socially desirable policy positions, meaning that the candidates who do deviate, those towards the extremes of the policy spectrum, are more likely to choose policy towards the center to placate donors, in turn benefiting voters. These welfare gains are absent in the fully anonymous setting because candidates did not deviate much under either strict or relaxed contribution limits.

The results of this paper and a companion paper, Fang, Shapiro, and Zillante (2013), suggest that full anonymity should lead to the greatest social welfare and that contribution limits play little to no role in attaining that welfare level. However, this recommendation comes with an important caveat, that donor identities must be kept from both voters *AND* candidates. Our results suggest that our partial anonymity setting, in which candidates are able to learn the identities of donors but voters are not, leads to the lowest welfare. In light of those comments, the current trend of increasing transparency and reducing contribution limits may lead to slightly lower welfare than a system of full anonymity, but may have less chance of devolving into a system of partial anonymity.

As our goal was to investigate the effects of contribution limits and transparency, there are many important issues that we did not tackle with our laboratory experiments. One is the effect that contribution limits have on incumbency advantage; it may be that increasing the contribution limit fosters more electoral competition when one candidate has an incumbency advantage. Another is that all participants were fully informed about the most preferred policy of the candidates, so the role of contributions as information provision was not present. These extensions can be incorporated into future work to provide a richer discussion of the effects of contribution limits in the electoral process.

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