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AN EXAMINATION OF CONGRESSIONAL ELECTIONS

BY

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DISSERTATION

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ABSTRACT

This dissertation examines a number of issues that arise in U.S. Congressional elections. In the first chapter, I look at the source congressional campaign contributions. I show that the source of a campaign contribution is an important factor in determining the effect the contribution has. Specifically I find that individual contributions have a greater impact on election results than corporate contributions. I show that the reason for this difference is that in addition to direct spending effects, individual contributions are also a reflection of a candidate's quality and thus contain an indirect quality effect. I then use 3SLS to obtain an estimate of all the effects involved with campaign contributions. The results present a better understanding of the true effects of money in an election.

In the second chapter I look at the dynamics of party spending in congressional campaigns. I examine a model of political parties who must choose how to allocate campaign contributions over elections in several districts in order to maximize the chance that they will control the enacted legislature. The parties must compete in two areas, informed voters who only care about policy and uninformed voters who only care about campaign spending. I find that parties will choose to heavily concentrate their spending in whichever district is most competitive.

In the third chapter I examine the causes of congressional gridlock. I examine a model of two parties that must negotiate in order to choose a policy to enact. The parties compete in elections in two bodies of a legislature and the winning candidates engage in a bargaining process to determine the implemented policy. I find that policy motivation and election uncertainty are the main drivers of gridlock. I also find that compromising can end up hurting a party and helping the non-compromising party. This leads to the possibility of an equilibrium with gridlock even though there are high costs to both parties associated with failing to compromise.

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CHAPTER 1

Average Joe Versus Super PACs: Does the Source of Campaign Contributions Matter?

1.1 Introduction

Spending is a vital part of U.S. elections, with the 2012 Congressional elections alone involving over \$3.5 billion. With so much money involved a natural question that often comes up is how does this spending affect election results. The traditional way this question has been posed has involved the amount of money spent by each candidate but not where that money came from.

Many candidates like to boast that they are running a grassroots campaign, with the implication being that they have the support of the people and therefore can expect to perform better in the election. If this is true then the source of campaign contributions could be an important factor. Because corporations do not have a vote, only contributions from individuals will represent votes during the election. Of course the fraction of voters who contribute to a candidate is relatively small and thus the actual vote share represented by donors may not have a significant effect on the election. However, the actions of donors should be reflective of the actions of voters as well.

In this paper I examine whether the source of campaign contributions plays a role in determining the effect those contributions have on election results. I find that individual contributions have a greater impact than corporate contributions because they represent both money and votes whereas corporate contributions represent only money. I show that there are in fact two separate effects that occur related to campaign contributions. The first effect is the direct spending effects that is a result of increased spending leading to higher vote shares. However, there is also an indirect effect that is contained in individual contributions which involves the relationship between

campaign contributions and candidate quality.

In order to show why the source of a contribution would make a difference, I first propose a theoretical framework in which candidates of differing quality compete in an election. I show that unlike corporate contributions, individual contributions are a reflection of a candidate's quality. Because candidates who are higher quality will attract more contributions, the very fact that a candidate receives a contribution is a reflection of that candidate being of higher quality and thus that candidate should be expected to perform better in the election. This means that individual contributions will lead to a direct spending effect as well as an indirect quality effect whereas corporate contributions will only lead to the direct spending effects. Therefore we should expect individual contributions to be more closely related to a candidate's electoral success.

I then attempt to test this theory using congressional election data from the past 30 years. Empirical estimation of election results is always complicated by problems of endogeneity, particularly with incumbent spending. If an incumbent is in a safe race they will tend to not spend as much as if they were in a close race, leading to an apparently negative relationship. This is a result of incumbent spending and election results being simultaneously determined which leads to biased estimates of the effect of incumbent spending. This is a well documented problem that unfortunately does not have an easy solution. I therefore proceed in two directions. I first look for evidence that the source of campaign contributions is indeed an important factor. I then attempt to estimate the effects of campaign contributions using three stage least squares to overcome the simultaneity problem.

I find that individual contributions do have a significantly larger effect on election results than corporate contributions. I further show that this is very likely a result of a close relationship between individual contributions and candidate quality. I attempt to control for this relationship by including the number of individual donations made to each candidate. Even after controlling for the amount of contributions made to each candidate, the number of donations is highly significant, suggesting that the number of supporters a candidate has will in part predict how well the candidate will do in the election. This new measure gives a way of controlling for candidate quality in a way that is driven by the actions of voters.

My findings have a number of implications. Distinguishing the source of

campaign contributions allows for more accurate estimation of the effects of campaign spending. It also gives a more precise understanding into the true effects of money in elections. While campaign contributions were previously assumed to only affect election results through their spending effects, the results here show that they are also reflective of a candidate's quality and previous estimates have actually been of the combined effects of both spending and quality. This gives a new insight into quantitatively estimating a candidate's quality.

1.2 Conceptual Framework

In order to show why the source of campaign contributions would affect election results, I consider an election with two candidates competing for a Congressional seat. Candidates compete in two dimensions of quality, the quality for voters, q_j , and the quality for corporations, c_j . Quality is defined as a candidate's campaigning skills or any personal characteristics that would make them appealing to individuals or corporations. Quality therefore contains anything that would affect voting behavior other than a candidate's policy positions. Voters and corporations make decisions based on the relative quality of the two candidates. The relative individual quality, $q = q_1 - q_2$ is distributed according to distribution f and the relative corporate quality, $c = c_1 - c_2$, is distributed according to distribution h .

Each individual receives a private signal, s_i , about q . s_i is distributed according to $g(s|q)$ with $E(s_i) = q$. Corporations receive a private signal, r_i about c . r_i is distributed according to $\psi(r|c)$ with $E(r_i) = c$. Individuals make two decisions, how much to contribute to either candidate and who to vote for. Corporations make only one decision, how much to contribute. Individuals and corporations make contribution decisions based on their private signals about relative candidate quality.

Individuals and corporations have utility functions $U_I(q_X, Y_I)$ and $U_C(c_X, Y_C)$ respectively where q_X and c_X are the qualities of the winning candidate and Y_j is the individual or corporation's wealth level. Utility functions are increasing in q_X and Y_j . Election results are uncertain and thus an individual's expected utility will be

$$E(U_I) = P_1 U_I(q_1, Y_I - d) + P_2 U_I(q_2, Y_I - d) \quad (1.1)$$

where P_j is the probability that candidate j wins and d is the amount of contribution the individual makes. I will make two simplifying assumptions about the form of the utility function. The first is that the marginal utility of wealth is independent of the winning candidate and the second is that the difference in utility for two winning candidates is a function of their relative quality, q (or c). This allows the utility functions to be written simply as a function of the relative quality and leads to first order equation for the contribution decision:

$$P'_1 U_I(q, Y_I - d) - U'_I(q, Y_I - d) = 0 \quad (1.2)$$

where P'_1 is the change in candidate 1's probability of winning for an extra contribution and U'_I is the marginal utility of income.

Let $d_I(s)$ be an individual's contribution function and $D_I(q)$ be the net total contributions made to candidate 1. There are a continuum of voters with distribution $g(s|q)$ and therefore $D_I(q) = \int d_I(s)g(s|q)ds$

Corporations make a similar contribution decision based on their private signals of c . Let $d_C(r)$ be a corporation's contribution function, then $D_C(c) = \int d_C(r)\psi(r|c)dr$ is the net total amount contributed by corporations to candidate 1. Finally let $T(q, c) = D_I(q) + D_C(c)$ be the total net amount contributed to candidate 1.

Candidates spend any contributions they received from individuals or corporations on advertising in order to demonstrate to voters the amount of support they received. Because contributions are increasing functions of quality signals, voters can infer that a candidate who received more contributions is more likely to be of higher quality. The amount of individual contributions to each candidate is a function of q and thus if voters could observe the amount of individual contributions to a candidate they would be able to perfectly infer the true relative quality of the candidates. However, voters only observe the total amount of contributions, $T(q, c)$, and which is only a noisy signal of individual quality. Voters use this information to update their beliefs about the candidates' individual quality. Voters form posterior beliefs, $f_p(q)$, through Bayesian updating.

$$f_p(q|s, T) = \frac{g(s|q)f(q)h(D_C^{-1}(T(q, c) - D_I(q)))}{\int g(s|q)f(q)h(D_C^{-1}(T(q, c) - D_I(q)))dq} \quad (1.3)$$

Once voters form their posterior beliefs they then use them to decide which candidate to vote for based on whichever candidate they believe has the higher expected quality. The posterior beliefs are an increasing function of the total amount of spending by each candidate. This is the most commonly understood way that campaign contributions affect election results, higher spending by a candidate leads to higher posterior beliefs and therefore a higher vote share. Thus by receiving contributions from individuals or corporations, candidates are able to convince more voters to vote for them. I will call this the direct spending effect: the increase in a candidate's vote share that results from increased spending.

Definition 1 *Direct Effect:* $\beta_1 = \frac{\partial V_j}{\partial T(q, c)}$

where V_j is candidate j 's vote share. However, the posterior beliefs are also an increasing function of the individual's private signal, s . This means that individuals with higher prior beliefs relative to other individuals will also have higher posterior beliefs. Because the private signals are centered around the true relative quality of the candidates, if a candidate has a higher relative quality voters overall will have higher prior beliefs about that candidate and therefore will also have higher posterior beliefs. Thus as should be expected, a candidate with a higher true individual quality should expect to do better in the election.

The idea that candidate quality will affect election results is not a novel concept. Many papers have attempted to control for candidate when predicting election results. However, what this model predicts is that candidate quality is highly intertwined with the amount of contributions the candidate receives. As mentioned earlier, the true relative quality is contained in the amount of individual contributions. While the voters cannot observe this information before the election, economists after the election are able to observe the amount of contributions from individuals and that amount should be a reflection of candidate quality. This leads to the second effect of campaign contributions which is often overlooked, contributions are themselves an indication of a candidate's quality. I will call this the indirect quality effect: the increase in vote share due to a candidate's quality, being measured

through individual contributions.

Definition 2 *Indirect Effect:* $\beta_2 = \frac{\partial V_j}{\partial D_I(q)} \frac{\partial D_I(q)}{\partial q}$

These two effects could be thought of as follows: the direct effect would be the effect of a candidate who happens to find \$100 on the street and spends it on advertisements. Although no one actually gave the candidate the \$100, voters will think it is a reflection of the candidate's quality and thus be more persuaded to vote for that candidate. The indirect effect would be what would happen if an individual contributed \$100 to a candidate and the candidate then proceeded to throw the money in the trash. Even though the \$100 is not being spent, purely the fact that the individual was willing to contribute it is a reflection of the underlying candidate quality. While this is not perfectly seen by voters as they only observe total contributions, it should be apparent to economists looking at the election results.

Clearly both individual and corporate contributions will contain the direct effect. Contributions from either individuals or corporations will lead to higher spending and since voters cannot distinguish between the source of a contribution, both types of contributions should have the same spending effects. The indirect effects, however, should only be found in individual contributions. Corporate contributions are an indication of the true corporate quality of the candidates but because corporate and individual quality are uncorrelated, this will not have any effect on voters' behavior. Therefore individual contributions should contain both direct and indirect effects while corporate contributions should contain only direct effects. This gives a way to empirically test the setup. Consider a regression of election results based on contributions separated by source:

$$Vote = \alpha_1 Individual + \alpha_2 Corporate + \alpha X + \epsilon \quad (1.4)$$

We should expect to see $\alpha_1 = \beta_1 + \beta_2$ and $\alpha_2 = \beta_1$. If there are indeed indirect effects that reflect a candidate's quality then $\beta_2 > 0$ which means $\alpha_1 > \alpha_2$.

This leads to the main contribution of this paper. While previous papers were attempting to measure the effect of a candidate spending a dollar, by leaving out the indirect quality effect what they are actually measuring is the effect of a candidate raising *and* spending a dollar. Here I expand

upon previous work by separating the direct spending effect (β_1) from the indirect quality effect (β_2). The addition of the indirect effect also adds to the existing candidate quality literature by providing a way to quantitatively measure candidate quality that is derived from the actions of voters and thus represents a more accurate reflection of voter preferences.

1.3 Literature Review

Empirical estimation of spending effects is hampered by a problem of endogeneity. Incumbents who are in safe races have some measure of flexibility over how much they spend. Since fundraising is typically seen as a very unpleasant activity, incumbents who aren't forced to put as much time and effort into fundraising typically will not. The result is that incumbent spending and expected election results are actually being simultaneously determined with incumbents who expect to do well spending relatively little and incumbents who expect to do relative poor spending large amounts. This of course leads to simultaneity bias which causes the estimates for incumbent spending to appear insignificant or in some cases even negative.

This is a well known problem that was first discovered by Jacobson (1978). He found that while challenger spending had a significant effect on election results, the effect of incumbent spending was insignificant. He acknowledged that this was most likely due to endogeneity and attempted to use TSLS as a solution. The instrument he uses is spending by candidates in primary elections, with the idea that spending in primaries will serve to raise name recognition, which will also help the candidate in the general election. The problem with primaries as an instrument is that whether an incumbent runs in a primary is in fact endogenous, with incumbents who are generally vulnerable more likely to face a primary threat. Additionally being in a primary is only weakly correlated with spending amounts. This is reflected in the results of the TSLS, where even after instrumenting the estimates for incumbent spending were insignificant.

Since Jacobson's work many papers have attempted to solve the simultaneity problem; however, most have had little success. The most common approach is to look for better instruments for incumbent spending. Green and Krasno (1988) use spending by the incumbent in the previous election as

an instrument. The reasoning behind the instrument is that previous spending measures a candidate's propensity to raise and spend money but because it is lagged it should have nothing to do with the current election dynamics.

However, Jacobson (1990) and Abramowitz (1991) point out two major shortcomings of this instrument. The first is that there is a high degree of multicollinearity. If an incumbent spends a large amount in the previous election, it is most likely a sign that they are facing a high quality challenger and thus must increase their spending to fend off the challenge. If they are successful then it will serve as a deterrent to future quality challengers and thus in the next election the incumbent should face a lower quality challenger and expect to perform better in the election. Jacobson shows that previous spending is indeed highly correlated with the challenger's vote share in the previous election as well as challenger quality in the current election.

Another potential problem as pointed out by Abramowitz is that the measure they use for the challenger's party strength is the challenger's vote share in the previous election. However, both the lagged incumbent's spending and the lagged challenger's vote share will both be closely related to the incumbent's underlying base of support. This means that there will be a large degree of confounding in the estimates for spending.

In a rebuttal to Jacobson and Abramowitz, Green and Krasno argue that the arguments made do not invalidate lagged spending as an instrument. They point out that multicollinearity would not lead to biased estimates or standard errors. They also argue that if Jacobson's claim that lagged spending is also related to challenger quality and party strength the result would be to understate the true effect of incumbent spending.

Another direction has been to look at survey data as an instrument. Jacobson (1990) uses a survey from *The Washington Post* that asks voters about their ideological and demographical characteristics as well as who they intend to vote for in the election. The advantage of the survey is that respondents were polled at the beginning of the election cycle and again just prior to the election. This allows Jacobson to look at the change in voting intentions over time as a function of the amount of money spent by the candidates. However, even using this survey data Jacobson still finds that challenger spending has a significant effect on changing people's vote but incumbent spending does not.

Abramowitz (1991) attempts to solve the simultaneity problem by using

a measure of elite expectations. He uses published ratings obtained from interviews with campaign experts on the likely outcome of election races. Including these expectations is intended to control for other variables that may be influencing election results but are not included in the analysis. However, after including the expectation ratings, the estimates for spending did not change significantly and the model had the same overall fit, indicating that the results are not due to omitted variables. However, this analysis did not account for the possibility of simultaneity bias.

Gerber (1998) uses state population and candidate wealth levels as instruments for how much a candidate can spend. The reasoning is that candidates in a larger state will have more donors to draw from and that wealthier candidates will have more money to spend on their races. He looks at Senate races and finds that after instrumenting both challenger and incumbent spending is significant and that challenger spending still has a larger effect than incumbent spending. He does not, however, look at House races.

Given the lack of success of instrumental variables, other papers have turned to alternative approaches that don't rely on instruments. Levitt (1994) looks only at races in which the same incumbent ran against the same challenger. By focusing only on repeat matchups, he hopes to control for any unobserved factors that might influence the election. However, his results also found that incumbent spending was insignificant.

Erikson and Palfrey (1998) used a covariance restriction approach to attempt to solve the simultaneity problem. In it they assumed that incumbent spending, challenger spending, and election results are all being simultaneously determined and they assumed that the errors between these equations are uncorrelated, allowing the system to be fully identified. The reasoning for why this would be a valid assumption is that the spending functions are determined by the expected election results but are in fact determined prior to any observed election error. Thus any unforeseen election result cannot affect spending and anything that does affect spending is assumed to do so indirectly through the expected election results.

Using this approach they find that both incumbent and challenger spending have significant effects on election results. However, their analysis is dependent on the assumption that the errors between equations are uncorrelated. Unfortunately, it is difficult to test this assumption to determine if it is violated. If there were some omitted variable, such as candidate quality, that

directly affected both spending and election results then this model would not be valid.

Goidel and Gross (1994) use a three stage least squares approach to estimating spending effects. They construct a model in which candidate quality, incumbent spending, challenger spending, and election results are simultaneously determined and use instruments to estimate the system as a whole. Similar to Green and Krasno they use lagged incumbent and challenger spending as instruments as well as the margin of victory by the incumbent in the previous election. By using 3SLS they are able to use the simultaneity to their advantage to obtain better estimates for the spending effects. They find that both incumbent and challenger spending have significant effects, although the effect of incumbent spending is much smaller than challenger spending.

The vast majority of previous work has only considered the total amount of contributions to each candidate and not where the contributions came from. Only Depken (1998) looks at the difference that a source of a campaign contribution makes and finds that PAC contributions have the largest effect on election results. However, he does nothing to account for the simultaneity problem and he only uses one election year, 1996.

As outlined above, the majority of papers that have investigated spending effects have found that challenger spending has a significant effect while incumbent spending does not. There are two possible explanations for these findings. Either incumbent spending truly has very little effect on election results or the problem of endogeneity has not been sufficiently solved. Given that incumbents raise very large amounts of money, typically much higher amounts than challengers, if the former explanation is true it would mean that incumbents have a long history of wasting their time and effort for very little gain. In addition, incumbents enjoy large advantages in Congress, with re-election rates for incumbents in the House typically around 90%. If spending is not a reason for this advantage, then incumbents must gain an even larger advantage elsewhere. It seems a more likely explanation that incumbents actually know what they are doing and that spending by incumbents should have at least some effect and therefore the endogeneity problem has not been completely overcome.

Candidate quality is another large area of election literature. Candidate quality is a characteristic that would certainly affect election results and thus

most papers agree that candidate quality should be in any model of elections. The problem is generally how to measure candidate quality. Quality is typically a more intrinsic characteristic that is observed by voters through interacting with candidates. It is hard to put into words what would make a good candidate, much less find a good way to quantitatively measure quality.

The most common approach is to use whether candidates held previous office as some measure of their quality. Jacobson (1978) measures challengers by whether or not they have held previous office and incumbents by whether they are chair or ranking member of a subcommittee or are in the party leadership. Green and Krasno (1988) construct an eight point scale of candidate quality. Candidates are assigned points for various characteristics that would be appealing to voters such as holding previous office, celebrity status, and job experience.

Squire (1992) ranks candidates based on holding previous office; however, he assigns points on a scale depending on how prestigious the office held was. He also incorporates the population of constituents that the candidate represented while in office. He also includes a measure of campaigning skill based on media stories about the candidate. He finds that both of these measures affect a candidate's election results. Tillmann (2013) uses the amount of times a candidate was mentioned in the media prior to the election as a measure of quality. The idea is that prominent community members who are mentioned more often are more likely to be higher quality challengers. However, he is not able to account for negative publicity.

The issue with most of these measures of quality is they often rely on arbitrary scales that have been constructed by the economist. While these scales certainly are related to candidate quality, it is impossible to determine how accurate they are in reflecting the voters' true preferences. For example, these scales would most likely rate Barack Obama, a former community organizer with very little experience in the Senate as a rather poor candidate but they would rate Mitt Romney, a former successful governor who is very wealthy and comes from a political family, as a very high quality candidate. But it was Obama who was widely accepted as the better campaigner.

Furthermore these scales are implicitly defining the relative importance of difference characteristics. For example, Green and Krasno assign 1 point to candidates who are currently in office and 1 point to candidates who have previously run for Congress. This implies that voters place equal weight on

each of these two qualities. Whether or not that is an accurate representation of voter preferences is impossible to determine but it is inherently assumed by Green and Krasno and others. Therefore what is missing in the analysis of candidate quality is some measure that is derived from voter actions and thus truly reflects what voters consider a strong or weak candidate.

1.4 Data

I use federally provided election data that includes the percent of the vote by each candidate as well as amount of contributions made to each candidate. The fundraising data includes both the total contributions and donations from individual donors. The difference between the two is what I use for corporate contributions. Note that this definition of corporate contributions includes money spent by supporting super PACs. Thus if an individual made a large donation to a super PAC that supported a certain candidate, it would be counted towards corporate contributions. Individual contributions only include contributions made directly to the candidate's campaigns, which are limited to \$5000 per person.

I use data from House races between 1984 and 2012. I only examine races in which there was a candidate from each major party. I do not use races with third party or independent candidates who captured a significant share of the vote. If a third party or independent candidate received less than 5% of the vote, I ignore that candidate and recalculate the two major party candidate's vote share as a percentage of the remaining vote.

To measure district partisanship I use the Presidential Election results to calculate a partisan voting index for each district. I will also later include the number of individual donations made to each candidate. This is provided in a separate document provided by the FEC that lists every donation made to a candidate that is above \$200 as well as its source. This is obviously not a full list of donations but it is the only available statistic.

I also use information on the cost of television advertising that is published by SQAD in the Media Market Guide. Using the published costs for each media market as well as population information about each district I construct a media cost index that measures how expensive advertising is in each district.

1.5 Individual vs Corporate Contributions

As discussed in the literature review, any estimation of the effects of campaign contributions will be encumbered by the problem of simultaneity. Unfortunately there is no widely accepted solution for this problem as instruments have proven particularly unfruitful. I will therefore proceed in two directions. Since the main concern of this paper is whether the effects of campaign contributions differ based on the source of the contribution, I will first more or less ignore the endogeneity problem and the associated bias.

The estimates for spending effects will be highly suspect and I will thus not focus on obtaining reliable estimates of the spending effects until later. What I will do instead is acknowledge that for regular empirical methods the estimates of spending effects themselves are more than likely to be biased but the relative difference in effects between contribution source may still be of interest. I therefore attempt to find evidence that the source of campaign contributions plays a role in determining their effect despite the presence of endogeneity.

This, however, does not allow me to answer the traditional question in the literature, whether incumbent or challenger spending has a larger effect. Therefore, I will later attempt to account for the simultaneity by using 3SLS to estimate a system of equations involving spending, quality, and election results. This will hopefully allow me to obtain better estimates of the effects involved in campaign contributions.

1.5.1 Open Elections

Since the endogeneity problem is mainly a consequence of incumbents choosing their own spending levels, I first look at open elections where there is no incumbent running for reelection. In these elections there may still be endogeneity. For example a Republican in a very red district will still not have to spend much in order to win. However, due to the lack of incumbents the amount of bias coming from the endogeneity should be much lower in these races. The downside of looking at open elections is that they only comprise a small fraction of elections (13%). In addition they do not provide an answer to the traditional question of the difference between incumbent and challenger spending. However, they should serve to provide an initial test of

whether the source of campaign contributions is important.

Since there is no incumbent or challenger I separate candidates into Democrats and Republicans. To investigate the difference in the source of campaign contributions I separate contributions into individual and corporate. Since previous papers have found that spending has decreasing returns to scale, I use the square root of campaign contributions.

To test for the existence of a separate quality effect I include another regressor, the number of donations from individuals made to each candidate. If spending was the only effect involved then after controlling for the amount of contributions, the number of people who donated to a candidate should not make a difference. However, if individual contributions also include a quality effect then the number of individual donors should be a way to measure at least part of that effect. If a candidate has a higher number of individual donors then it means that more individuals thought highly enough of the candidate to make a contribution. This would suggest that the candidate is more likely to be of higher quality. In this way the number of individual donations will act as a proxy variable for candidate quality.

The FEC only provides a list of every individual donation above \$200. While this certainly leaves out a lot of the contributions, it is the best measure that is available and it should be closely related to the total number of individual contributions. Furthermore, since it leaves out donations under \$200, which most individual contributions will be, if anything this variable will understate the effect.

I must also account for district partisanship, how many voters in each district tend to vote Democratic or Republican. If a district is comprised heavily of Democrats or Republicans then one candidate will be a heavy favorite no matter what the spending levels are. To measure this I include the Cook Partisan Voting Index (PVI) for each district. This is calculated by taking the most recent Democratic Presidential candidate's vote share in each district and subtracting the Democratic candidate's national vote share. Therefore a PVI of 0 would indicate an equal number of Democrats and Republicans in a district, a positive PVI would indicate more Democrats, and a negative PVI would indicate more Republicans.

National party trends tend to have large effects on congressional elections and vary greatly from year to year. For example, almost every Republican received a bump in the vote share in 2010 purely due to an anti-Obama fever.

I therefore include yearly dummies to account for these national trends in each election. Because the sample size is rather large there is a concern that the standard errors may be biased downward due to correlation in the errors between states. I therefore cluster the data by state to obtain more accurate standard errors.

This leads to the following equation for open elections:

$$V = \beta_0 + \beta_1 D_I + \beta_2 D_C + \beta_3 R_I + \beta_4 R_C + \beta_5 D_D + \beta_6 R_D + \beta_7 PVI + \beta_i Year_i + \epsilon \quad (1.5)$$

where V is the Democratic candidate's vote share

D_I and D_C are contributions to the Democratic candidate by individuals and corporations

R_I and R_C are contributions to the Republican candidate by individuals and corporations

D_D and R_D are the number of donations made to the Democratic and Republican candidate, respectively

PVI is the partisan vote index

$Year$ is the yearly dummy

The results in Table 1 indicate that spending has a significant effect for both Democrats and Republicans. There may still be some endogeneity but all estimates are the anticipated sign, which at least means that there are no glaringly obvious contradictions. While this is certainly not a complete validation of the model, open elections seems to at least lessen the immediate problems that are inherent with incumbent elections.

Table 1 also shows that the estimates for individual and corporate contributions appear to be quite different. This is confirmed in Table 2 which shows that the effects of individual contributions are significantly higher than the effects of corporate contributions for both Democrats and Republicans in the House. Although the difference is not significant for the Senate, this is likely due to the smaller sample size. If the only effect involved in campaign contributions was the direct spending effect then the source of a contribution should make no difference. This is therefore the first evidence that suggests there is some other effect involved campaign contributions, in particular something that makes individual contributions seemingly more important.

There are many possible explanations for this difference in effects. It could be that individuals prefer to contribute to candidates who are more likely to

Table 1.1: Open Seat Elections

	Dem Vote
Democrat Individual Contributions	0.016*** (0.0009)
Democrat Corporate Contributions	0.007** (0.002)
Republican Individual Contributions	-0.017*** (0.0008)
Republican Corporate Contributions	-0.009*** (0.001)
Democrat Number Donations	0.007** (0.003)
Republican Number Donations	-0.005* (0.002)
PVI	0.128** (0.0392)
Constant	67.34*** (9.47)
N	611

Contributions are in square root

Dependent variable is Democratic candidate's vote share

Yearly effects included but suppressed

Clustered standard errors in parentheses

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Table 1.2: Test for Individual Effect \neq Outside Effect

Democratic Contributions	
F	7.29
$P(> F)$	0.0078
Republican Contributions	
F	5.81
$P(> F)$	0.0213

win. However, if this is true it would likely be the case for corporations as well and, if anything, it would likely be more so the case for corporations as they would prefer to contribute to winners in order to gain access and influence. Therefore this is probably not the reason for the difference as it would suggest that corporate contributions should have the bigger effect. It could be the case that corporations like to hedge their bets, contributing to both candidates in order to have access to whichever candidate wins. However, the effects are being measured for both candidates and thus this should be accounted for.

An explanation that does seem to make sense is that individual contributions are containing some extra information that isn't contained in corporate contributions. Candidate quality is something that would fit that description. If a candidate receives an abnormally large amount of individual contributions then it is at least in part a signal that the candidate has a large number of supporters and thus is of high quality, which will lead to more votes in the election regardless of spending levels. Corporate contributions, on the other hand, are much less likely to reflect a candidate's quality. A candidate that a corporation finds appealing is not necessarily a candidate that voters will find appealing. This would mean that the reason for the extra effect of individual contributions is that they are not only measuring the spending effects of contributions but they are also indirectly measuring the effects of candidate quality.

1.5.2 Incumbent Elections

Open elections gave an initial look at the effects of campaign contributions. However, they were only a small portion of elections and they didn't examine the difference between incumbent and challenger spending effects. Therefore in order to get a more complete picture I now turn to races that involve an incumbent running for reelection.

OLS

As noted earlier, in these elections there should be a large problem with simultaneity biasing the estimates. For now I will ignore this problem and

continue with OLS in order to compare individual and corporate contributions. Later I will attempt to address the simultaneity problem in order to get more accurate estimates.

The model is very similar to the model of open elections with a few small changes. First, instead of separating candidates by party I separate them into incumbents and challengers, allowing for the possibility that incumbent spending has a different sized effect than challenger spending. Second, freshman and sophomore incumbents tend to be more vulnerable than longer serving incumbents. I will therefore include the number of terms an incumbent has started at the time of the election.

Finally, including yearly effects would then measure if an election is particularly good or bad for incumbents. This is not the desired yearly effect as national waves tend to be more partisan oriented. Even in years where there were a high number of successful challengers, it tends to be because incumbents of a certain party are being ousted. Thus I will include dummy variables that measure if a candidate is a Democrat or a Republican running in each year. This leads to the following model:

$$\begin{aligned} Vote = & \beta_0 + \beta_1 I_I + \beta_2 I_C + \beta_3 C_I + \beta_4 C_C + \beta_5 PVI + \beta_6 Term + \\ & + \beta_{i,D} Dem_i * Year_i + \beta_{i,R} Rep_i * Year_i + \epsilon \quad (1.6) \end{aligned}$$

where *Vote* is the Incumbent candidate's vote share

I_I and I_C are contributions to incumbent by individuals and corporations

C_I and C_C are contributions to challenger by individuals and corporations

PVI is the district partisanship

$Term$ is number of terms incumbent has served

Dem and Rep are dummy variables indicating if the incumbent is a Democrat or a Republican

$Year$ is a dummy variable indicating the year of the election

As seen in Table 3, simultaneity does indeed appear to be a serious problem. The coefficients for incumbent corporate contributions are negative, suggesting that an incumbent who receives more corporate contributions will do worse in the election. This is a very dubious result that if true would mean incumbents have been engaging in self-destructive actions. The more likely explanation is that the coefficients for incumbent spending are being biased

Table 1.3: OLS Results

	Dem Vote
Incumbent Individual Contributions	-0.000887 (0.000986)
Incumbent Corporate Contributions	-0.007355 (0.00718)
Challenger Individual Contributions	-0.0211*** (0.00188)
Challenger Corporate Contributions	-0.00909*** (0.000957)
Incumbent Number Donations	0.00824* (0.00382)
Challenger Number Donations	-0.0474*** (0.00996)
Terms Served	0.0818 (0.0442)
Incumbent PVI	0.218*** (0.0175)
Constant	59.25*** (0.920)
N	3878

Contributions are in square root

Dependent variable is Democratic candidate's vote share

Yearly effects included but suppressed

Clustered standard errors in parentheses

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

downward as a result of the simultaneity.

The estimate for incumbent individual contributions is positive, which doesn't immediately suggest the presence of simultaneity bias. However, the magnitude of the effect, 0.76, is much smaller than the effect of challenger individual contributions, -2.17 . This could mean that challenger spending is more effective than incumbent spending. However, it could also mean that the estimate for incumbent individual contributions is being biased by simultaneity. Given that incumbent corporate contributions are very likely biased, it seems reasonable to think that incumbent individual contributions would be biased as well.

While the estimates for incumbent spending seem to be biased, the estimates for challenger spending are much more believable. The estimates for both challenger individual and corporate contributions are the anticipated sign, a reasonable magnitude, and fairly consistent with previous literature. This suggests that while it is still possible that challenger spending estimates are biased, the amount of bias is likely not as severe as in the estimates for incumbent spending.

This would seem to make sense intuitively. While incumbents have a great deal of flexibility in choosing their spending levels if they are a heavy favorite, challengers will not have that luxury as they will never be considered a favorite against an incumbent. Any candidate who is challenging an incumbent will typically be a heavy underdog and thus will be forced to try to spend as much as possible, regardless of how they expect to do in the election. Although challenger spending may still depend on expected election results as supporters may be more willing to contribute to a candidate who has a fighting chance, the amount of contributions shouldn't depend on election results as much as for incumbents.

The primary question of interest is whether individual contributions have a greater effect than corporate contributions. Although the estimates for incumbent spending are biased, and possibly challenger spending as well, the relevant statistic to answer this question is actually the difference between individual and corporate contribution effects. How this difference is affected by the simultaneity bias is then the important issue. If the simultaneity is biasing individual or corporate contributions more than the other, the difference between the two effects will also be biased. The question is then which type of contribution is more likely to be affected by the simultaneity.

In order to answer this question, remembering the cause of the simultaneity bias is important. Incumbent (and possibly challenger) contributions are being biased because they depend on the expected election results. That is, if an incumbent feels safe, they will not actively seek to raise as many contributions. However, as mentioned in the previous section, corporations may contribute to candidates in order to gain access and influence. If that is the case they would most certainly wish to contribute to safe incumbents as they are almost sure to be betting on the winner. Therefore even if an incumbent is not as actively seeking contributions, they still might receive nearly as many. Individuals, on the other hand, are far less likely to throw money at a candidate unprompted.

This means that the amount of corporate contributions an incumbent receives is likely less influenced by expected election results than individual contributions. Therefore the amount of bias might be slightly less for corporate contributions than for individual contributions. However, the simultaneity is biasing the estimates downwards, which means if the effect of corporate contributions is less biased, the difference between individual and corporate effects would be decreased.

As seen in Table 4, the effects of individual contributions are statistically greater than the effects of corporate contributions for both incumbents and challengers. While the difference may be biased, the bias is most likely causing it to be smaller than the actual difference. Thus if the estimated effects are significantly different, it is even more likely that the true effects are different. This means that although OLS was not helpful in examining the size of contribution effects, the results still seem to support the finding that individual contributions have a greater effect than corporate contributions.

Advertising Costs

So far the results have seemed to indicate that the source of a contribution is important in determining its effect and that individual contributions have a larger effect than corporate contributions. While it is impossible to say with certainty what is causing this difference, one explanation that seems plausible is that individual contributions are serving as an additional signal for how voters will behave in the election. If this is true it would imply that there is actually a separate effect besides the spending effect that is

being contained in the individual contributions. This effect is measuring the indirect effect of a candidate's quality being measured through the amount of individual contributions. In order to test this theory I will examine the effects of advertising costs.

A large portion of campaign expenditures are used to buy television advertisements. Therefore, the effect of campaign spending should rely heavily on the cost of advertising, which vary greatly by congressional district. If the discussed theory is correct then there are two effects involved in campaign contributions, a direct spending effect and an indirect quality effect. Differences in advertising costs would certainly have an impact on the spending effect but they should not have an impact on the quality effect. Thus examining the variation in advertising costs serves as an excellent way of identifying the effects involved with contributions.

The variation in advertising cost is also exogenously determined by the media market in each district and has little to do with elections. However, the analysis may be complicated if the amount of contributions is related to the advertising cost. This would be expected if individuals or corporations contribute strategically based on how effective their contributions will be. If that were the case then candidates in areas with low advertising costs might expect to receive more contributions as those contributions are buying more ads. This, however, turns out not to be true as advertising costs are not related to either individual or corporate contributions. Thus any variation in contribution effects are only due to changes in advertising costs.

In order to incorporate advertising costs I first must measure the cost of advertising in each congressional district. To do this I first find each media market's cost per rating point, which measures how much it costs to reach one percent of the market's audience, from the SQAD market guide handbook. However, some districts are located entirely in one media market while others are spread across multiple markets. I therefore construct a cost index for each district that is a weighted average of advertising costs based on the percentage of the district's population that is in each media market.

I am then interested in whether the effects of both spending and quality are influenced by differences in advertising costs across districts. I therefore include advertising cost interaction terms for both the amount of contributions, both individual and corporate, and the number of individual donations for incumbents and challengers. This leads to the following model:

$$\begin{aligned}
Vote = & \beta_0 + \beta_1 I_I + \beta_2 I_C + \beta_3 C_I + \beta_4 C_C + \beta_5 D_I + \beta_6 D_C + \\
& \beta_7(I_I * Cost) + \beta_8(I_C * Cost) + \beta_9(C_I * Cost) + \beta_{10}(C_C * Cost) \\
& + \beta_{11}(D_I * Cost) + \beta_{12}(D_C * Cost) + \beta_{13}PVI + \\
& + \beta_{14}Term + \beta_{i,D}Dem_i * Year_i + \beta_{i,R}Rep_i * Year_i + \epsilon \quad (1.7)
\end{aligned}$$

where *Cost* is the advertising cost index

If there is indeed an indirect quality effect that doesn't depend on the advertising cost then we should expect $\beta_5, \beta_6 \neq 0$ but $\beta_{11}, \beta_{12} = 0$. On the other hand the direct spending effects should be influenced by the advertising cost, which would mean $\beta_7, \beta_8, \beta_9, \beta_{10} \neq 0$.

As seen in Table 4, this is indeed the case. The interaction terms with the amount of contributions are all significantly different from 0 but the interaction terms with the number of individual donations are not. This does not prove that the difference in contribution source is due to a hidden quality effect but these results are exactly what would be expected if it were the case. The results do indicate that there are indeed two separate effects and that only one of those effects depends on the advertising cost. While there could be other explanations for the effect that doesn't depend on advertising cost, the most likely answer would seem to be that it is somehow reflective of a candidate's quality.

1.5.3 Quantile Regression

To further illustrate the difference between individual and corporate contributions, I now turn to quantile regression. As seen from previous results, there seems to be a large problem with simultaneity biasing the results. This simultaneity is coming from a difference in incumbent behavior for close versus safe races. Incumbents in close races place a great deal of emphasis on fundraising whereas incumbents in safe elections place little importance in it. This would seem to suggest that there may be heterogenous effects of campaign contributions. Along from the fact that safe incumbents don't need the extra fundraising, they could be neglecting to fundraise because spending

Table 1.4: Advertising Costs

House			
Incumbent Vote			
Incumbent Individual Contributions	0.0065*** (0.000725)	Incumbent Individual Contributions * Cost	-0.0310*** (0.00713)
Incumbent Corporate Contributions	-0.0061*** (0.000861)	Incumbent Corporate Contributions * Cost	- 0.0220** (0.00972)
Challenger Individual Contributions	-0.0252*** (0.00102)	Challenger Individual Contributions * Cost	0.0178*** (0.00699)
Challenger Corporate Contributions	-0.00847*** (0.000918)	Challenger Corporate Contributions * Cost	0.0194*** (0.00513)
Incumbent Number Donations	0.00725* (0.00319)	Incumbent Donations * Cost	-7.31e-05 (0.000131)
Challenger Number Donations	-0.0561*** (0.00824)	Challenger Donations * Cost	0.000178 (0.000203)
Term	0.0854 (0.0291)		
PVI	0.193*** (0.0149)		
Constant	54.28*** (1.255)		
<i>N</i>	3878		

Contributions are in square root

Media costs divided by 100

Yearly effects included but suppressed

Clustered standard errors in parentheses

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

in safe elections have a much smaller effect than spending in close elections.

To investigate this possibility I utilize quantile regression to look for heterogeneous effects. I again separate contributions into individual and corporate contributions and I also include the number of individual donations as well as the district partisanship and number of terms served. The quantiles are ordered by incumbent vote share, meaning that low quantiles are those where the incumbent fared the worst and higher quantiles are those where the incumbent fared the best. Note that due to the almost overwhelming incumbency advantage in the House, only the very low quantiles reflect competitive races. The tenth percentile of races featured incumbents earning 52% of the vote and by the 30th percentile incumbents were earning around 60% of the vote, already races that could be deemed uncompetitive.

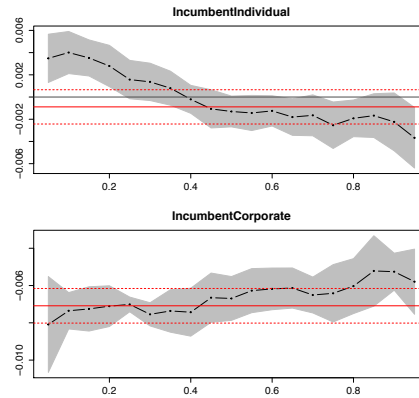


Figure 1.1: Quantile estimates for incumbent contributions

The estimates themselves are still likely biased by simultaneity and thus the magnitudes may not be believable but the relative differences between the quantiles present an interesting phenomenon. The effects of individual contributions are significantly positive for close races but the effect decreases as the race become less competitive, to the point where the effect is not significant past the 30th quantile. The same is true for the effect of the number of incumbent individual donations. However, the opposite is true for incumbent corporate contributions, where the effect increases as the race becomes less competitive.

This is a very intriguing result, and one that would be missed if only looking at the total amount of contributions, even if quantile regression was used as the changes would at least partially cancel out. The difference most

Table 1.5: Quantile Regression

	$\tau = .05$	$\tau = .1$	$\tau = .15$	$\tau = .25$	$\tau = .5$	$\tau = .9$
Incumbent Individual Contributions	0.00349** (0.00134)	0.00401** (0.00143)	0.00352** (0.00127)	0.00157 (0.00114)	-0.00130 (0.00102)	-0.00224 (0.00174)
Incumbent Corporate Contributions	-0.00809*** (0.00116)	-0.00735*** (0.000860)	-0.00725*** (0.000762)	-0.00701*** (0.000685)	-0.00669*** (0.000616)	-0.00526*** (0.00105)
Challenger Individual Contributions	-0.0253*** (0.00184)	-0.0263*** (0.00136)	-0.0267*** (0.00120)	-0.0264*** (0.00108)	-0.0243*** (0.000974)	-0.0162*** (0.00166)
Challenger Corporate Contributions	-0.00801*** (0.00112)	-0.00839*** (0.000825)	-0.00812*** (0.000731)	-0.00837*** (0.000657)	-0.00938*** (0.000591)	-0.00961*** (0.00101)
Incumbent Number Donations	0.000441 (0.000997)	0.000442 (0.000737)	0.000637 (0.000653)	0.000297 (0.000587)	0.000892 (0.000528)	0.00111 (0.000898)
Challenger Number Donations	-0.00845*** (0.00129)	-0.00880*** (0.000953)	-0.00946*** (0.000844)	-0.00974*** (0.000759)	-0.00857*** (0.000683)	-0.00374** (0.00116)
Terms Served	0.0211 (0.0585)	0.0312 (0.0432)	0.0338 (0.0383)	0.0616 (0.0344)	0.0858** (0.0309)	0.0941 (0.0526)
PVI	0.143*** (0.0189)	0.156*** (0.0139)	0.180*** (0.0124)	0.184*** (0.0111)	0.197*** (0.00999)	0.246*** (0.0170)
Constant	53.40*** (1.369)	53.99*** (1.011)	54.46*** (0.896)	57.08*** (0.806)	61.20*** (0.724)	65.54*** (1.232)
N	3878	3878	3878	3878	3878	3878

Standard errors in parentheses

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

likely comes from the strategic behavior of corporations. As mentioned earlier, corporations will be more interested in contributing to candidates who have a better chance of winning so that the corporation has some amount of influence when they are in office. This would imply that in safe elections, corporations will be willing to contribute higher amounts to the incumbent and thus the incumbent corporate contributions should be more closely related to the incumbents vote, leading to a perceived bigger effect.

The results underscore the importance of the source of campaign contributions. Not only are the effects different but the dynamics are different as well. Furthermore, when looking only at the lower quantiles, which represent the close elections, the difference between individual and corporate coefficients is even larger. This also provides a possible explanation as to why previous papers have found insignificant estimates for incumbent spending. The results here suggest that for safe elections spending indeed has an insignificant effect. While the simultaneity bias makes it hard to determine what effects are actually significant, the combined effect does appear to be lower in safe elections. Thus what previous papers have had trouble reconciling is simply the fact that spending effects are heterogenous.

1.6 Estimating Contribution Effects

1.6.1 TSLS

Given the inherent problem of simultaneity, the next logical step is to attempt to use an instrumental variable approach to attempt to obtain more reliable estimates. I will follow Green and Krasno by using lagged incumbent contributions as an instrument and I will separate the contributions into lagged individual contributions and lagged corporate contributions. Lagged contributions are expected to make an acceptable instrument because they measure a candidate's propensity to spend without being related to any current election dynamics.

As mentioned before, the main criticism of this instrument is that it was correlated with Green and Krasno's definition of district partisanship. In this paper district partisanship is calculated using the results of the previous presidential election and not the previous congressional results. The results of the presidential election are completely separate from congressional elections and therefore should be unrelated to the values of the lagged incumbent contributions. This criticism is therefore not a concern for the current setup.

Another concern with the instrument is that how an incumbent performs in the previous election will have an effect on the quality of the challenger in the current election. For example, if an incumbent faced a tough challenger in the previous election but won handily, it may serve as a deterrent to current high quality challengers whereas if an incumbent faced a low quality challenger but barely survived, it might serve as a signal that the incumbent is vulnerable and invite a high quality challenger.

In order to account for this possibility I follow Goidel and Gross (1994) and include the lagged incumbent vote share as well as an interaction term for lagged spending times the lagged vote share. The lagged vote share indicates how well the incumbent performed in the last election, which should serve as a signal of the incumbents vulnerability. Incumbents who did very poorly in the previous election might be more likely to invite a higher quality candidate in the current election. This is especially true if the incumbent performed relatively poorly in an easy race, which should be measured by the interaction term.

The results in Table 6 show that the estimate for incumbent corporate

Table 1.6: TSLS

	House
	Inc Vote
Incumbent Individual Contributions	0.00681 (0.00581)
Incumbent Corporate Contributions	-0.00219 (0.00661)
Challenger Individual Contributions	-0.0235*** (0.00172)
Challenger Corporate Contributions	-0.0107*** (0.00141)
Incumbent Number Donations	0.00813* (0.00376)
Challenger Number Donations	-0.0502*** (0.00901)
Terms Served	0.0791 (0.0399)
Incumbent PVI	0.208*** (0.0210)
Constant	59.14*** (0.825)
N	2667

Contributions are in square root

Dependent variable is incumbent's vote share

Yearly effects included but suppressed

Clustered standard errors in parentheses

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

contributions is still negative even after instrumenting. In addition, the effect of individual contributions is no longer significant. This suggests that the instruments were not successful in overcoming the simultaneity bias.

1.6.2 3SLS

TSLS did not seem to eliminate the simultaneity bias. This is not terribly surprising as the source of the simultaneity was due to the fact that the amount of contributions received depends on the election results. This is not something that can be directly accounted for in TSLS as the dependent variable cannot be used as an instrument. I will therefore turn to 3SLS, which does allow the election result to directly impact the amount of contributions. The problem is ideally suited for 3SLS as the contribution levels and election results as well as candidate quality are all being simultaneously determined. 3SLS will take advantage of the covariance between these equations in order to obtain more accurate estimates of the effects involved. I will therefore use 3SLS to estimate a system of equations involving campaign contributions and election results as well as candidate quality all at the same time.

Quality

Candidate quality is obviously a large determinant of both election results and candidate contributions. As mentioned before there is an extra effect in individual contributions that appears to be related to candidate quality. I will therefore use the number of individual donations made to each candidate as a proxy variable for the quality of that candidate. Candidate quality, and certainly the number of donations, is very likely to be endogenous and therefore I will include equations for both incumbent quality and challenger quality.

There is a large literature that suggests the quality of challengers varies quite a bit.¹ Challenger quality is very likely to be a result of the vulnerability of the incumbent; if an incumbent is perceived as vulnerable it will invite high quality challengers whereas if the incumbent is deemed safe then high quality challengers will wait for a better opportunity. This means that similar to

¹Epstein & Zemsky (1995), Box-Steffensmeier (1996), Green & Krasno (1998b), Goodliffe (2001), Carson, Engstrom, & Roberts (2007)

the previous TSLS model, the previous election results, previous challenger quality, and previous election results times previous challenger quality should determine current challenger quality. These will measure how an incumbent performed in the previous election and thus how vulnerable they will appear.

Challenger quality will also depend largely on expected results in the current election. If an incumbent is in a very safe district, i.e. a Democrat in a very blue district, then they will be unlikely to attract high quality challengers as they will not be considered vulnerable. I therefore include both the partisan voting index to measure district makeup as well as the current election results as a stand in for expected election results. Furthermore, years that are expected to be particularly good years for a party might attract higher quality candidates in that party. I therefore include yearly effects by party.

Finally, when controlling for the amount of contributions, the number of individual donations serves as a proxy for candidate quality. However, on its own the number of donations is also related to the amount of fundraising candidates engage in. This will likely be a strategic decision, with incumbent and challenger fundraising highly correlated. Therefore I will include the number of individual donations made to the incumbent to measure this interaction.

The equation for challenger quality will thus be

$$\begin{aligned} ChalDon = & \beta_0 + \beta_1 Vote + \beta_2 IncDon + \beta_3 LagChalDon + \\ & \beta_4 LagVote * LagChalDon + \beta_5 LagVote + \beta_6 PVI + \beta_7 Term + \\ & + \beta_{iD} Dem * Year + \beta_{iR} Rep * Year + \epsilon \quad (1.8) \end{aligned}$$

and similarly for incumbent quality:

$$\begin{aligned} IncDon = & \beta_0 + \beta_1 Vote + \beta_2 ChalDon + \beta_3 LagIncDon + \\ & \beta_4 LagVote * LagIncDon + \beta_5 LagVote + \beta_6 PVI + \beta_7 Term + \\ & + \beta_{iD} Dem * Year + \beta_{iR} Rep * Year + \epsilon \quad (1.9) \end{aligned}$$

Although a candidate's quality is typically a measure of their underlying characteristics, which shouldn't change from year to year, the number of donations certainly will as it is also related to fundraising. This can also be

thought of as the voters' perceptions of the incumbent's quality from year to year.

Incumbent Contributions

Campaign contributions for incumbents are clearly endogenous, most notably they are dependent on the expected election results. I will therefore include the incumbent vote share in the equation for incumbent contributions. I also include the instruments from the TSLS analysis, lagged contributions, lagged vote share, and lagged contributions times lagged vote share. I also include yearly party dummies, leading to the following equations for incumbent contributions:

$$I_I = \beta_0 + \beta_1 Vote + \beta_2 PVI + \beta_3 Term + \beta_4 C_I + \beta_5 LagVote + \beta_6 LagI_I + \\ + \beta_7 LagI_I * LagVote + \beta_{iD} Dem * Year + \beta_{iR} Rep * Year + \epsilon \quad (1.10)$$

$$I_C = \beta_0 + \beta_1 Vote + \beta_2 PVI + \beta_3 Term + \beta_4 C_C + \beta_5 LagVote + \beta_6 LagI_C + \\ + \beta_7 LagI_C * LagVote + \beta_{iD} Dem * Year + \beta_{iR} Rep * Year + \epsilon \quad (1.11)$$

Challenger Contributions

It is less clear if challenger contributions are endogenous. The previous estimates have been believable and more or less consistent, which may indicate that challenger contributions are exogenous. However, it may still be the case that challenger contributions are endogenous but the amount of bias is simply much smaller than incumbent contributions. Since I am estimating a system of equations anyway, it makes sense to include equations for challenger in case they are in fact endogenous. If they turn out to be exogenous then the coefficients on these equations should be 0 anyway and including the extra equations won't have done any harm.

I therefore model challenger contributions similar to incumbent contributions:

$$C_I = \beta_0 + \beta_1 Vote + \beta_2 PVI + \beta_3 Term + \beta_4 I_I + \beta_5 LagVote + \beta_6 LagC_I + \\ + \beta_7 LagC_I * LagVote + \beta_{iD} Dem * Year + \beta_{iR} Rep * Year + \epsilon \quad (1.12)$$

$$C_C = \beta_0 + \beta_1 Vote + \beta_2 PVI + \beta_3 Term + \beta_4 I_C + \beta_5 LagVote + \beta_6 LagC_C + \\ + \beta_7 LagC_C * LagVote + \beta_{iD} Dem * Year + \beta_{iR} Rep * Year + \epsilon \quad (1.13)$$

Advertising Costs

Previous results have indicated that advertising costs do have an impact on the spending effects of campaign contributions. I therefore wish to incorporate this fact in order to make the most accurate model possible. In order to do this I will divide the amount of contributions for each candidate by the advertising cost before taking the square root. This effectively transforms the variable from amount of money spent by each candidate into the number of television commercials bought by each candidate.

Of course the number of commercials for each candidate should be endogenous for all the same reasons that the amount of contributions is endogenous. However, incorporating the advertising costs should increase the accuracy of estimating any spending effects.

Election

The model for election results is straightforward and similar to previous sections. Incumbent vote share is a function of spending by both candidates, candidate qualities, district partisanship, terms served, the lagged vote and yearly partisan effects:

$$Vote = \beta_0 + \beta_1 I_I + \beta_2 I_C + \beta_3 C_I + \beta_4 C_C + \beta_5 IncDon + \beta_6 ChalDon + \\ + \beta_7 PVI + \beta_8 Term + \beta_9 LagVote + \beta_{i,D} Dem_i * Year_i + \beta_{i,R} Rep_i * Year_i + \epsilon \quad (1.14)$$

Results

The model produces a number of interesting results. Looking first at the spending equations in Table 9, the coefficient on the incumbent vote share is negative in every equation. This confirms the suspicion that spending levels are indeed dependent on the expected election results and that in races where the incumbent is safer, there will be lower levels of spending by both candidates. Furthermore, this is true for both incumbents and challengers. This implies that, as expected, incumbent contributions are indeed endogenous but that challenger contributions are endogenous as well. Previous estimates of challenger contributions were therefore also affected by simultaneity bias and likely unreliable.

A rather interesting result occurs when comparing this effect between individual and corporate contributions for incumbents and challengers. The effect of the expected vote share on individual contributions is higher than the effect on corporate contributions for incumbents but lower for challengers. This means that incumbent corporate contributions are not as influenced by expected election results but challenger corporate contributions are. This is likely a result of strategic behavior by corporations. Corporations are eager to give money to candidates that have a good chance of winning in order to buy influence and access. If an incumbent is safe corporations will be enthusiastic to give the incumbent contributions and much less eager to contribute to the challenger. This would make the drop-off in corporate contributions much steeper for challengers than incumbents.

The main result of interest are the coefficients in the election equation. As seen in Table 9, the estimates for incumbent contributions are positive and significant for both individual and corporate contributions. These are finally estimates of the spending effects that actually make sense, indicating that both incumbent and challenger spending are important factors in determining election results. The estimates of spending effects have increased dramatically after using 3SLS, implying that there was a severe amount of simultaneity bias in previous estimates for both incumbents and challengers.

While previous estimates of spending effect were larger for challengers, after accounting for the simultaneity, the estimates for incumbent and challenger spending effects are not significantly different. The effect of an increase in the square root of individual contributions appears to increase vote

Table 1.7: 3SLS Quality Equations

	Inc Donations	Chal Donations
Incumbent Vote	-0.0531** (0.127)	-0.498*** (0.154)
PVI	-0.155*** (0.0226)	-0.129*** (0.0312)
Term	-0.0142 (0.0287)	0.00110 (0.0189)
Lag Vote	-0.0878* (0.0421)	-0.420*** (0.0585)
Challenger Number Individual Donations	0.299* (0.1413)	
Lag Incumbent Number Donations	-0.849*** (0.226)	
Lag Incumbent Number Donations Times Vote	0.0332*** (0.00265)	
Incumbent Number Individual Donations		0.364*** (0.0483)
Lag Challenger Number Donations		-0.752*** (0.108)
Lag Challenger Number Donations Times Vote		0.0229*** (0.00369)
Constant	9.63 (6.021)	5.671 (4.429)
N	2667	2667

Contributions are in square root

Yearly effects included but suppressed

Standard errors in parentheses

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Table 1.8: 3SLS Spending Equations

	Inc Ind	Inc Corp	Chal Ind	Chal Corp
Inc Vote	-0.0400** (0.0141)	-0.00428 (0.0121)	-0.0771* (0.0322)	-0.160*** (0.0345)
PVI	0.0138*** (0.00302)	0.00206 (0.00256)	-0.00198 (0.00670)	0.0190** (0.00704)
Term	.000197 (0.00288)	0.00640 (0.00280)	-0.00311 (0.00735)	-0.0109 (0.00737)
Challenger Individual Contributions	0.462*** (0.0176)			
Challenger Corporate Contributions		0.380*** (0.0158)		
Incumbent Individual Contributions			0.717*** (0.0260)	
Incumbent Corporate Contributions				0.615*** (0.0241)
Lag Vote	0.0338*** (0.0101)	0.00594 (0.00916)	-0.00104 (0.0207)	0.0590** (0.0227)
Lag Incumbent Individual Contributions	0.404*** (0.0440)			
Lag Incumbent Individual Times Vote	0.00208** (0.000634)			
Lag Incumbent Corporate Contributions		0.426*** (0.0397)		
Lag Incumbent Corporate Times Vote		0.00324*** (0.000596)		
Lag Challenger Individual Contributions			0.272*** (0.0712)	
Lag Challenger Individual Times Vote			-0.00255* (0.00102)	
Lag Challenger Corporate Contributions				0.544*** (0.0881)
Lag Challenger Corporate Times Vote				-0.00581*** (0.00135)
Constant	0.517 (0.303)	0.781** (0.247)	4.431*** (0.584)	4.362*** (0.578)
<i>N</i>	2667	2667	2667	2667

Contributions are in log
Yearly effects included but suppressed
Standard errors in parentheses

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Table 1.9: 3SLS Election Results

	Inc Vote
Incumbent Individual Contributions	5.391*** (0.496)
Incumbent Corporate Contributions	2.668*** (0.314)
Challenger Individual Contributions	-5.991*** (0.878)
Challenger Corporate Contributions	-2.862*** (0.836)
Incumbent Number Individual Donations	0.692*** (0.0828)
Challenger Number Individual Donations	-1.170*** (0.214)
PVI	0.146*** (0.0176)
Term	0.0730 (0.0447)
Constant	41.97*** (2.329)
<i>N</i>	2667

Contributions are in log

Dependent variable is incumbent's vote share

Yearly effects included but suppressed

Standard errors in parentheses

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

share by about 0.22% and an increase in the root of corporate contributions increases vote share by around 0.14%. The average amount of individual contributions is \$513,523 for incumbents and \$219,332 for challengers and the average corporate contributions is \$474,646 for incumbents and \$136,562 for challengers.

This means that on average incumbents would need to raise an extra \$131,824 individual contributions or \$221,704 corporate contributions to win an extra 1% of the vote, while a challenger would need an extra \$75,328 individual contributions or \$104,432 corporate contributions. With the average size of a U.S. congressional district being around 710,000, this translates to a cost per vote for incumbents of around \$18.57 in individual contributions or \$31.23 in corporate contributions and a cost per vote for challengers of around \$10.61 in individual contributions or \$19.23 in corporate contributions.

However, the effects of individual contributions are still significantly larger than the effects of corporate contributions for both incumbents and challengers even after including the number of individual donations. This implies that not all of the extra effect involved in individual contributions has been controlled for. This may be due to the fact that the number of individual donations is actually only those donations that are over \$200. The majority of individual donations are likely under \$200 and thus a large amount of information is left out by not including these donations. Unfortunately, this information is not provided by the FEC.

Nonetheless, the estimated effect of the number of individual donations, which is meant to act as a proxy for candidate quality, is highly significant for both incumbents and challengers. This is after controlling for the amount of contributions, which means how many people supported a candidate is an important prediction of how that candidate can expect to do in the election. Again this implies that there is more to campaign contributions than simply spending effects. Interestingly, this effect is nearly twice as large for challengers as it is for incumbents, implying that it is much more important for challengers to convince voters to support them early on. As mentioned earlier, there is typically a great deal of variation in the quality of challengers, with many papers claiming high quality challengers are in the minority. It is crucial then for challengers who are of high quality to differentiate themselves as one of the few good ones.

The results therefore suggest that the effects of spending are relatively

the same for incumbents and challengers but the effects of quality are much greater for challengers. This is contrary to many previous papers that found that challenger spending has a greater impact than incumbent spending. The findings here present a number of possible explanations for this difference.

The first possibility is that previous papers have not sufficiently accounted for the simultaneity problem and thus led to biased estimates. Most previous work has focused on the use of TSLS, which does not directly allow for contributions to be a function of election results. This has lead to debated instruments that may or may not have solved the endogeneity problem. By using 3SLS, I was able to directly incorporate the effect of election results on campaign contributions and thus obtain more accurate estimates. Previous papers have also failed to account for advertising costs, which as shown in this paper clearly have a large impact on spending effects. By normalizing contributions by advertising costs in a district I have further improved the accuracy of estimated spending effects.

Another explanation for the findings of previous papers is that by not accounting for the source of campaign contributions, they have confused the effects of spending and quality. By only looking at total contributions, previous estimates of spending effect have in fact estimated the effect of spending and quality. As shown here, the quality effect for challengers is greater than for incumbents and thus the previous findings that challenger spending has a greater effect may in fact have been coming from the higher quality effect for challengers.

1.7 Conclusion

This paper has made an important distinction between the source of campaign contributions. I have shown that the source of a contribution is important in determining the effect it will have on an election. Specifically I found that individual contributions have a greater impact on election results than corporate contributions. I also showed that this difference is most likely coming from an indirect effect of quality that is being contained in individual contributions. Not only does this shed new light into the effects of campaign contributions but it also allows for the possibility of quantitatively estimating candidate quality. This is of great empirical importance as it gives a measure

of quality that is derived from voter actions and thus more accurately reflects the preferences of voters.

I then used 3SLS to obtain estimates of the contribution effects that are not hindered by simultaneity bias. The results show that the amount of contributions received by both incumbents and challengers is negatively related with the incumbent's vote share. After controlling for this effect I found that both incumbent and challenger spending have significant effects on the election results. Furthermore, unlike previous papers I find that the direct effects of incumbent and challenger spending are not statistically different. However, the indirect effect of quality is much greater for challengers than incumbents.

The results presented here are important not only in the estimation of election results but also in the understanding of the effects involved. Omission of the quality effect has led to misinterpretations of the previously estimated spending effects. Previous estimates of spending have actually been combining the effects of spending and quality. Only by examining the source of campaign contributions can accurate and precise measurements of the effects be obtained.

CHAPTER 2

Optimal Party Spending in Multiple Elections

2.1 Introduction

Political parties are a major factor in today's elections. With elected officials requiring the support of other politicians to pass laws in bodies such as Congress or Parliament, some coordination and compromise between these officials is necessary. This is where parties come into play. By joining with other like-minded officials politicians are able to pass their preferred laws that they would not have been able to on their own.

Political parties then have a desire to ensure as many of their candidates are elected as possible in order to have their most preferred positions implemented. To this end, parties often contribute campaign contributions to their candidates in order to help them secure a seat in office. But clinching one or two elections is useless if a majority is required to enact new laws. The parties therefore have to determine how to distribute campaign contributions among its candidates in order to win not only a few elections but a majority of them.

Spending in the 2012 presidential election alone totaled more than \$2 billion by the campaigns and outside interest groups. Given the amount of money involved the parties and groups have a great incentive to make sure that every dollar was spent where it would have its greatest effect. Given the extraordinary level of spending in the battleground states of Ohio, Florida, and Virginia, the parties clearly believed that the optimal strategy was to spend most heavily in states that are highly competitive. This is further supported by Figure 2.1, where the majority of states with large Democratic or Republican advantages received no spending by either campaign.¹

¹From CNN, spending by candidates' campaigns only, excluding Super PACs. <http://www.cnn.com/ELECTION/2012/campaign-tracker/>

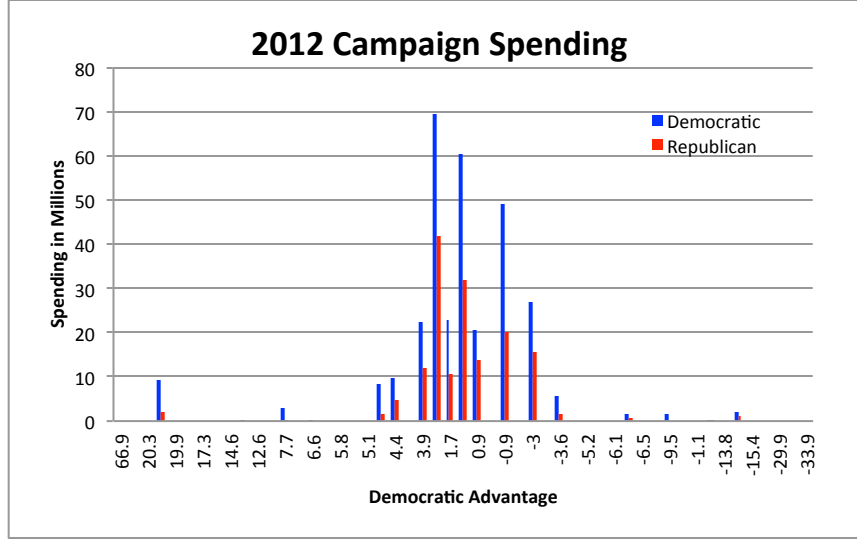


Figure 2.1: Spending by state's political leaning ²

In this paper we examine the strategy of political parties when faced with such a problem. We assume that there are two policy motivated parties, a left party desiring an implemented policy as close to 0 as possible and a right party desiring an implemented policy as close to 1 as possible, each competing to win office motivated candidates in k different districts. The implemented policy is the median policy of the winning candidates.

In each district there are two types of voters, informed and uninformed. The candidates choose a platform position to win informed votes and spend money on advertising in order to win uninformed votes. Parties then contributed campaign contributions in order to convince the candidates to join their party and run on the party's chosen platform. The parties must then decide what positions they want the candidates to choose and how to distribute their spending amongst the districts in order to maximize or minimize the expected implemented policy.

We find that campaign spending is heavily focused in districts that have the most central median voter location. We also find that constraints in the parties' more disadvantaged districts are most often binding, meaning the parties only spend as much as they have to in these districts.

²As defined by Gallup, percent of state's population identifying as leaning Democratic minus percent leaning Republican. <http://www.gallup.com/poll/152438/States-Move-GOP-2011.aspx#3>

2.2 Previous Literature

There have been various explanations for the role of political parties. Levy (2004) poses a model in which candidates are able to commit to only a limited set of policies and political parties increase the set of policies the candidates can commit to, allowing them to offer more attractive policy positions and thus increase their competitiveness. Snyder and Ting (2002) argue that voters are incompletely informed about candidates' platforms and that parties offer a way of providing informative signals about their true position.

Aldrich and McGinnis (1989) examine a model where both voters and political parties contribute to campaigns based on the candidate's platform. They find that the incentive to elicit contributions causes the candidates of both parties to move away from the median location. Wiseman (2006) examines decisions by incumbent and challenger parties on how much costly support to contribute and find that the strategy of the incumbent party depends on the expected competitiveness of the race. He finds that in races that are less politically competitive the candidates will choose more extreme positions and that increasing the amount of party support leads to more centralist positions. Both papers, however, only model races in one district and do not examine the interplay of party candidates in multiple districts.

Snyder (1989) examines the strategic distribution of campaign spending when parties are trying to either maximize their expected number of elections won or maximize the probability of winning a majority of elections. He finds that in symmetric equilibria the parties will spend more in races that are the most competitive.

Krasa and Polborn (2015A, 2015B) look at a model of elections featuring multiple districts where voters care not only about the policy preferences of their elected official but also the enacted policy by the majority party after the election. They find that candidates may be burdened by extreme positions taken by their parties, even if it is not the same position taken by the candidate. They also look at the effect of campaign spending on political polarization and find that while spending does not have an effect in a single district model, moving to model with multiple districts causes campaign spending to influence polarization.

Numerous papers have investigated the effects of campaign spending on

vote share and while some have suggested that challenger spending is more effective than incumbent spending (Abramowitz 1988, Jacobson 1990), Gerber (1998) finds that incumbent and challenger spending are equivalent and both have a significant effect on the incumbent's vote share.

2.3 Model

We assume that there are $j = 1 \dots k$ districts, each with its own distinct median voter location, m_j . In each district there are two candidates running for office that each choose a position, x_{lj}, x_{rj} , and spending level, s_{lj}, s_{rj} .

In each district there are measure 1 informed voters, who vote only on the position of the two candidates, and measure 1 uninformed voters, who vote only on the amount of spending of the two candidates.

The distribution of informed voters' ideal position is

$$g_j(x) = \begin{cases} \frac{1}{2m_j} & : 0 \leq x \leq m_j \\ \frac{1}{2(1-m_j)} & : m_j < x \leq 1 \end{cases} \quad (2.1)$$

Informed voters vote for whichever candidate's position is closest to their ideal point.

The amount of uninformed voters, U_{lj} , for the left candidate is drawn from a Beta distribution with parameters s_{lj} and s_{rj} with the share of uninformed voters for the right candidate being $1 - U_{lj}$. This means that increased spending by a candidate will increase the expected uninformed voters for the candidate in that district but with decreasing returns.

We assume that each candidate has an initial spending level of 1 and thus without any party intervention both candidates would choose $x_{lj} = x_{rj} = m_j$ and $s_{lj} = s_{rj} = 1$ which means the candidates would each win with probability $\frac{1}{2}$ and the winning policies would be m_j . The parties then make an offer to a candidate in each district in the form of campaign contributions, α_{ij} , to be given if the candidate adopts the party's position, which will likely be away from the median voter. Candidates are office motivated, meaning they will only accept the party's offer if it increases their chance of winning.

In uncontested districts, that is a district in which only one party makes an offer to a candidate, if the candidate does accept the party's offer then

the opposing candidate will maximize his chances of winning by moving his position just to the right (left) of x_{lj} (x_{rj}), meaning the party candidate's share of the informed votes will be

$$I_j(x) = \begin{cases} \frac{x}{2m_j} & : 0 \leq x \leq m_j \\ \frac{1-x}{2(1-m_j)} & : m_j < x \leq 1 \end{cases} \quad (2.2)$$

This leads to incentive constraints that the party must satisfy when making an offer to the candidates, specifically

$$1 - F(1 - I_j(x_{lj})) \geq .5 \quad (2.3)$$

where F is the CDF of a Beta distribution with parameters $1 + \alpha_{lj}$ and 1. Since $I_j(x)$ decreases with distance to the median and the expected number of uninformed votes ($\frac{1+\alpha_{lj}}{2+\alpha_{lj}}$) increases with α_{lj} , in order to convince a candidate to support more extreme positions the parties must offer more contributions.

In contested elections, when both candidates support the parties' positions, neither candidate can move their position to win more informed votes, meaning the share of informed voters will be

$$I_j^c(x_{lj}, x_{rj}) = \begin{cases} \frac{.5(x_{lj}+x_{rj})}{2m_j} & : 0 \leq .5(x_{lj} + x_{rj}) \leq m_j \\ 1 + \frac{1-.5(x_{lj}+x_{rj})}{2(1-m_j)} & : m_j < .5(x_{lj} + x_{rj}) \leq 1 \end{cases} \quad (2.4)$$

for the left candidate and $1 - I_j^c(x_{lj}, x_{rj})$ for the right candidate. If one candidate chooses not to accept the party's offer then their optimal position will again be just to the right or left of the opposing party's position, thus the incentive constraint for the left party in contested districts is

$$1 - F_c(1 - I_j^c(x_{lj})) \geq 1 - F_u(1 - I_j^u(x_{rj})) \quad (2.5)$$

where F_c is a Beta($1 + \alpha_{lj}$, $1 + \alpha_{rj}$) distribution and F_u is a Beta(1 , $1 + \alpha_{rj}$) distribution and similarly for the right party.

The parties then choose positions x_{lj} , x_{rj} and contributions α_{lj} , α_{rj} in each district in order to minimize (maximize) the expected implemented policy subject to the incentive constraints and a budget constraint.

2.4 Results

We first look at the case with three districts and median voter locations 0.4, 0.5, and 0.6 and party budgets of 6. As seen in Figure 2.2 the parties spend the most money in the central district followed by the district they have an advantage in. The party positions are $x_l = \{0.3003, 0.3003, 0.3003\}$ and $x_r = \{0.6997, 0.6997, 0.6997\}$, more extreme than any median. This results in each party having a high probability of winning their advantaged district and an equal chance of winning the central district.

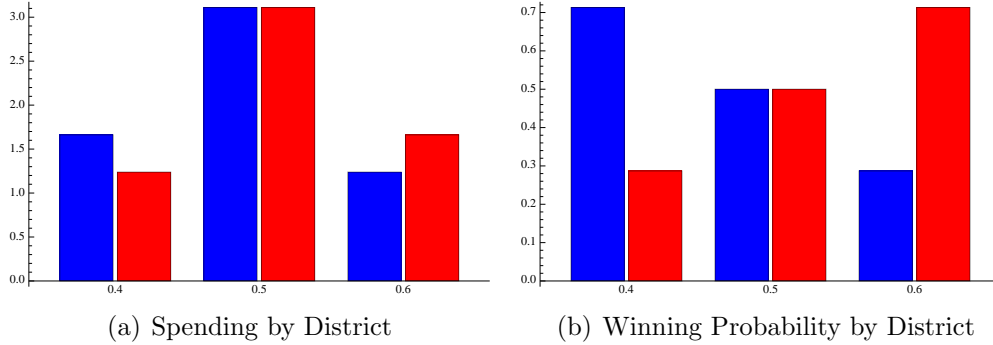


Figure 2.2: Budget = 6

Since there are 6 variables for each party it is impossible to get a good idea of the dynamics in one graph but there are a few that give interesting insights. In Figure 2 we take a look at the expected implemented policy as a function of only x_{l1} , keeping the other variables at their equilibrium level, and it shows a clear unique minimum. This is the same for x_{l2} and x_{l3} , suggesting that this is indeed a unique equilibrium and not a function of the initial conditions.

We then turn our attention to spending. As Figure 3 shows increased spending by the left party in District 1 (left district) decreases the expected implemented policy but at a decreasing rate.

Next we look at increasing the amount of spending in the central district. The central district is the most competitive and as we can see in Figure 2.5 the parties want to spend the most in this district. If the left party wants to increase spending in the central district they must of course decrease spending in one of the extreme districts. We first look at a graph of the expected implemented policy as a function of increasing spending in district 2 and decreasing it by the same amount in district 1. We can see that the

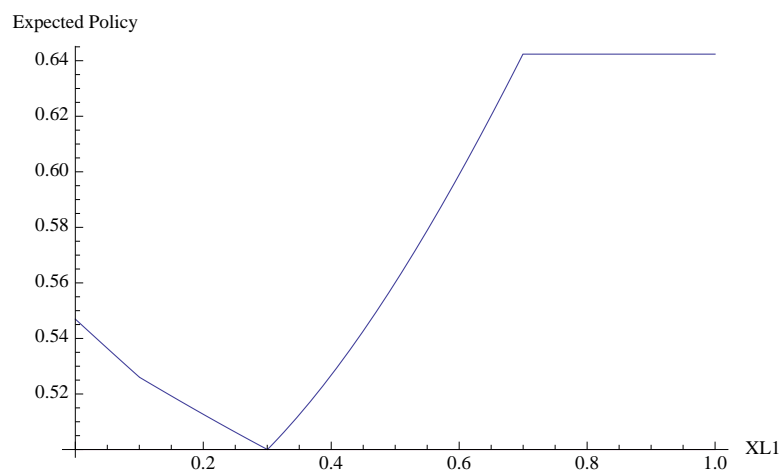


Figure 2.3: Expected policy as function of left party's district 1 position

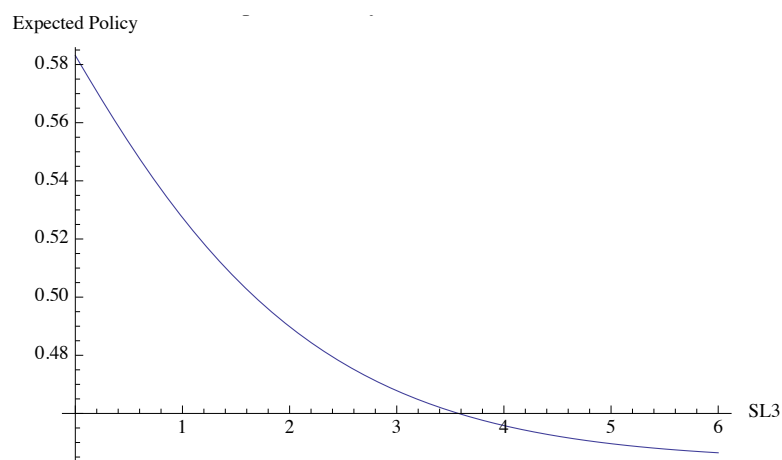


Figure 2.4: Expected policy as function of left party's spending in district 1

equilibrium is in fact a global minimum, meaning the left party would not want to move money from district 1 to district 2. In other words the incentive constraint is not binding for the left party in district 1.

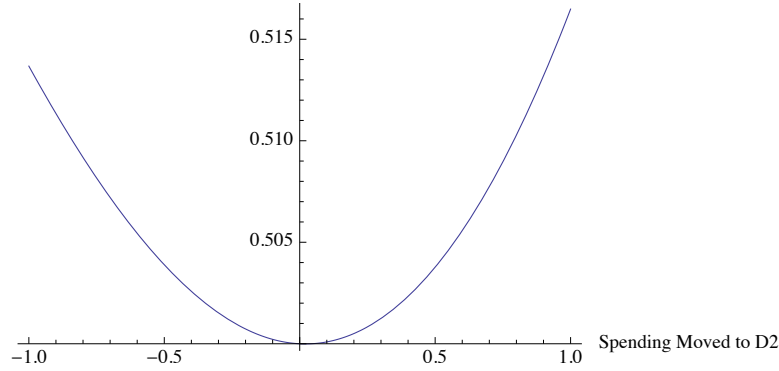


Figure 2.5: Expected Policy after Decreasing (or Increasing) Spending in District 1

This is not, however, the case for district 3. If we look at the same graph for district 3 in Figure 2.6, that is moving money from district 3 to district 2, it is actually decreasing in the amount of money moved. This means that by decreasing the amount of spending in district 3 and increasing it in district 2 the left party could lower the expected implemented policy. This is not an option, however, because of the incentive constraint.

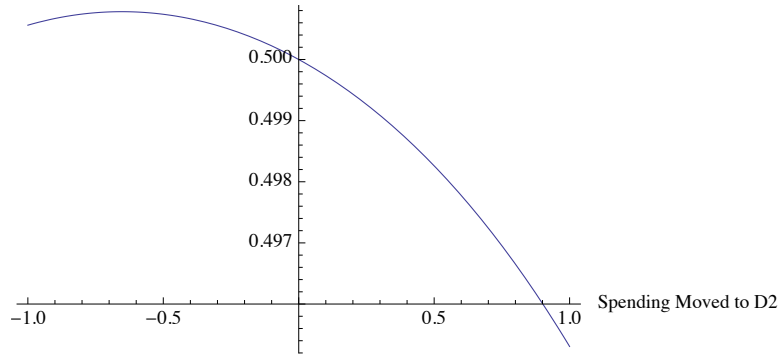


Figure 2.6: Expected Policy after Decreasing (or Increasing) Spending in District 3

All of the above was assuming that the parties compete in all 3 districts. This does not have to be the case, however, as they only need to win two districts in order to gain control of the median position. We therefore look at what would happen if the parties only competed in 2 districts. Of course the parties will each compete in the two districts that are easiest for them

to win, meaning districts 1 and 3 will be uncontested, in that only one party will be competing, and district 2 will be contested by both parties. A couple interesting facets occurs in the uncontested districts. When the left (right) party's candidate chooses a position the independent candidate chooses a position just to the right (left). This means, however, that the parties do not mind losing to the independents since they will end up choosing almost exactly the same policy as the party wanted. This also means that the winning position in district 3, whether won by the right party or the independent, will surely be above 0.5, and since the left party will always choose positions below 0.5, this means that the left party's position in district 1 will never be pivotal as it has no chance of being the median winning position. As seen in Figure 2.7 this means that lowering the position in district 1 will not change the expected implemented policy.

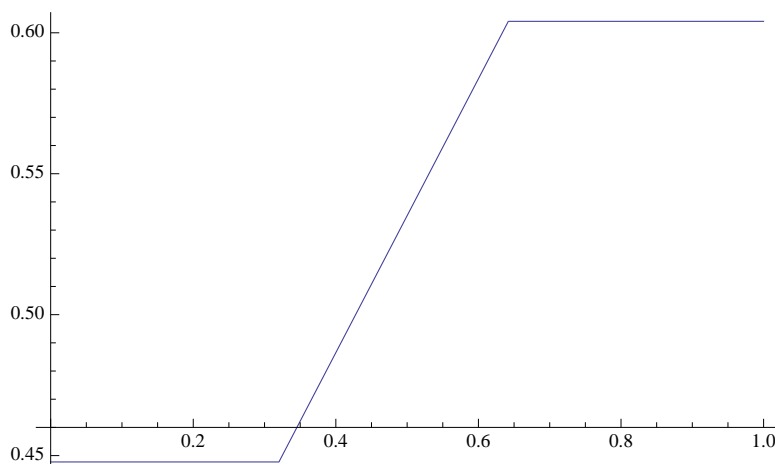


Figure 2.7: Expected policy as function of left party's district 1 position

While changing the position only will not affect the policy it does affect the incentive constraint, meaning the parties will want to choose a position as close to the district's median voter as possible without affecting the implemented policy as this will allow them to spend less in district 1 and more in district 2. The end result is that they choose identical positions in each of the two districts they compete in, 0.325 for the left party and 0.675 for the right. As said before, the parties do not care if they win or lose the uncontested districts. This gives them the advantage of being able to spend less in the uncontested districts and instead focus on the contested central district. This is reflected in the winning probabilities, as the party candidates have

only a 50% chance of winning, the minimum required to satisfy the incentive constraint, in the uncontested districts and in the massive amount of spending, 94.5% of their budget, in district 2.

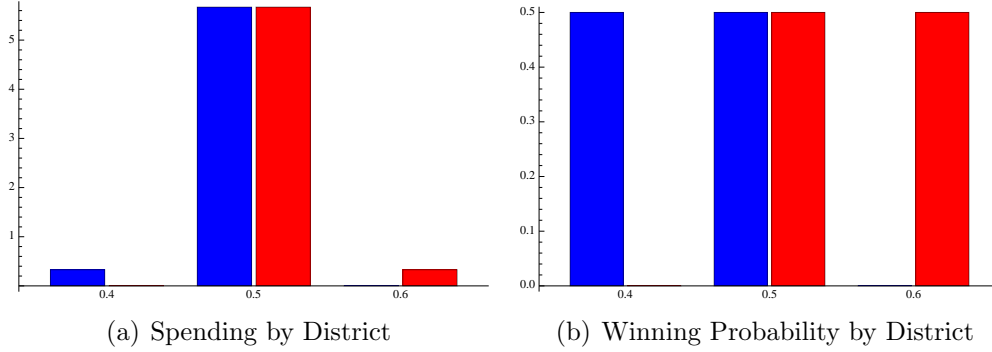


Figure 2.8: Competing in 2 Districts

We then try to determine if the parties will compete in 2 or 3 districts. Of course in any symmetric equilibrium the expected implemented policy is 0.5 so to determine if competing in the third district is advantageous we look at what would happen if the left party competes in 3 districts and the right party competes in only 2. In this case districts 2 and 3 are contested but district 1 is still uncontested, meaning the left party still wants to spend as little in district 1 as possible. The chosen positions are 0.32, 0.32, 0.32 for the left party and 0.64, 0.64 for the right party. The parties again spend a large majority of the spending in the central district, 81% for the left party and 78% for the right party, but interestingly because the right party has a position closer to 0.5 they are the favorite to win the central district.

Despite this, the expected implemented policy is still 0.4477, less than what it would be in a symmetric equilibrium. This means that the left party will want to continue to compete in 3 districts and the right party will want to compete in the third district in order to increase the expected implemented policy back to 0.5.

2.4.1 Triangular Distribution

We finally consider the effect of changing the distribution for uninformed voters from Beta to Triangular. The CDF for the amount of uninformed voters for the left party is then

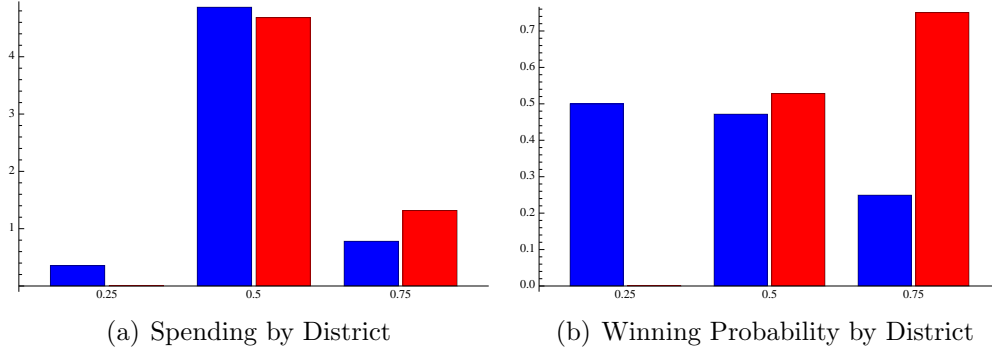


Figure 2.9: Left Competing in 3 districts, Right in 2

$$U_j(x) = \begin{cases} \frac{x^2}{s_j^*} & : 0 \leq x \leq s_j^* \\ 1 - \frac{(1-x)^2}{(1-s_j^*)} & : s_j^* < x \leq 1 \end{cases}$$

Where $s_j^* = \frac{s_{lj}}{s_{lj} + s_{rj}}$ is the fraction of total spending in the district by the left party. The spending results are largely the same, heavily concentrated in the middle district but the probabilities are much more competitive. The difference in the two distributions is that spending in the triangular distribution has a limit to its effectiveness. Even if the left party accounts for 100% of the spending in a district, the expected amount of informed votes for the left party is still only $\frac{2}{3}$. This means that even with infinite spending, the party's can only expect to do so well, given their positions, as shown in Figure 2.11.

This also affects the incentive constraint, as the parties are no longer able to simply buy their way out of any position in their disadvantaged district. This puts increased pressure on the parties to have a more moderate position in those districts and this is reflected in the chosen positions of (0.319, 0.319, 0.475) and (0.681, 0.681, 0.525).

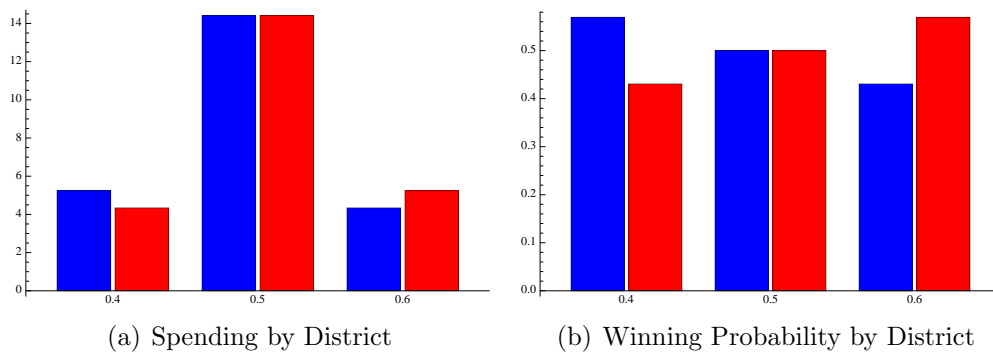


Figure 2.10: Triangular Distribution

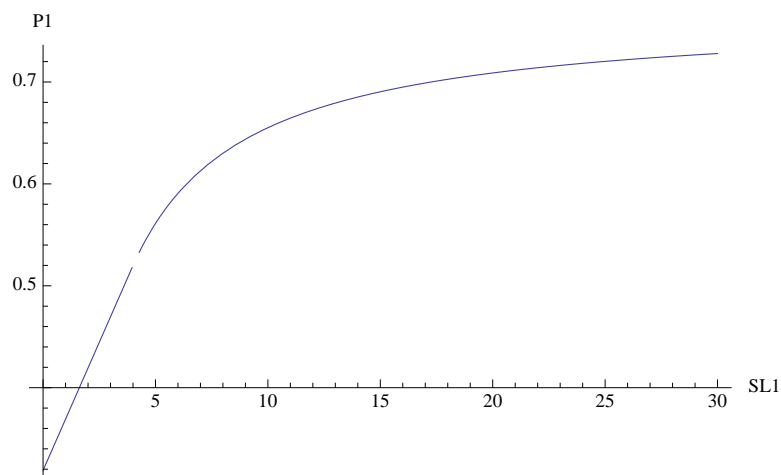


Figure 2.11: Winning Probability for increased spending levels

2.5 Analytical Results

We now try to provide analytical results similar to the findings in the previous sections. Because the model uses the beta distribution, which doesn't have a closed form CDF, the following results will be a bit general.

We restrict our analysis to symmetrical equilibria and focus the analysis from the perspective of the left party with the results for the right party following by symmetry. We will also assume an interior solution in terms of the incentive constraints during the analysis and discuss the impacts of incentive constraints after. The symmetry here is with respect to the advantaged and disadvantaged districts, meaning that the left party's decision in district 1 is analogous to the right party's decision in district 3 as they are the parties' advantaged district. Similarly the left and right party will be at a disadvantage in districts 3 and 1, respectively. District 2, of course, is even for the two parties. This leads to the following symmetry conditions:

$x_{r1} = 1 - x_{l3}, x_{r2} = 1 - x_{l2}, x_{r3} = 1 - x_{l1}, s_{r1} = s_{l3}, s_{r2} = s_{l2}, s_{r3} = s_{l1}, P_1 = 1 - P_3, P_2 = \frac{1}{2}$, where P_i is the probability that the left party will win district i .

Lemma 1 $x_{li} \leq x_{ri}$

Lemma 2 $x_{l1} \leq x_{l2} \leq x_{l3}$ and $x_{r1} \leq x_{r2} \leq x_{r3}$

Lemma 3 $x_{l1} = \min(x_{l2}, x_{r1})$ and $x_{r3} = \max(x_{r2}, x_{l3})$

Proof Case 1: $x_{l2} \leq x_{r1}$

From Theorems 5.1 and 5.2 we know that $x_{l1} \leq x_{l2}, x_{l3}$ and $x_{l1} \leq x_{r1} \leq x_{r2}, x_{r3}$. Therefore x_{l1} will never be the median of any three winning positions. Therefore changing x_{l1} will not affect the implemented policy except through the probability of winning district 1. In that regard, since $x_{l1} \leq x_{r1}$, increasing x_{l1} will always increase the probability that the left party will win district 1. Therefore the left party will want to increase x_{l1} until $x_{l1} = x_{l2}$, at which point increasing x_{l1} any more could affect the implemented policy. Similarly for the right party.

Case 2: $x_{l2} > x_{r1}$ x_{l1} will again never be the median of any three winning positions. Choosing $x_{l1} < x_{r1}$ will therefore not lower the implemented policy no matter who wins. It will, however, decrease the left party's share of

the informed voters and therefore increase the right party's probability of winning district 1. This will increase the expected implemented policy and the left party will therefore increase x_{l1} in order to avoid this.

Theorem 4 (Spending Levels) *If the parties did not have incentive constraints, $s_{l2} \geq s_{l1}$, $s_{l2} \geq s_{l3}$ and $s_{r2} \geq s_{r1}$, $s_{r2} \geq s_{r3}$*

Proof Based on the previous 3 lemmas and eliminating non-symmetric equilibria, there are 3 possible orderings of the party positions:

$$x_{l1} = x_{l2} \leq x_{l3} \leq x_{r1} \leq x_{r2} \leq x_{r3} \quad (2.6)$$

$$x_{l1} = x_{l2} \leq x_{r1} \leq x_{l3} \leq x_{r2} \leq x_{r3} \quad (2.7)$$

$$x_{l1} = x_{r1} \leq x_{l2} \leq x_{r2} \leq x_{l3} \leq x_{r3} \quad (2.8)$$

Let P_i be the left party's probability of winning district i . The 3 possible position orderings leads to 3 possible Lagrangians:

$$\begin{aligned} L = & P_1 P_2 P_3 x_{l2} + P_1 P_2 (1 - P_3) x_{l2} + P_1 (1 - P_2) P_3 x_{l3} + (1 - P_1) P_2 P_3 x_{l3} + \\ & P_1 (1 - P_2) (1 - P_3) x_{r2} + (1 - P_1) P_2 (1 - P_3) x_{r1} + (1 - P_1) (1 - P_2) P_3 x_{r1} + \\ & (1 - P_1) (1 - P_2) (1 - P_3) x_{r2} + \lambda (s_{l1} + s_{l2} + s_{l3} - B_l) \end{aligned}$$

$$\begin{aligned} L = & P_1 P_2 P_3 x_{l2} + P_1 P_2 (1 - P_3) x_{l2} + P_1 (1 - P_2) P_3 x_{l3} + (1 - P_1) P_2 P_3 x_{r1} + \\ & P_1 (1 - P_2) (1 - P_3) x_{r2} + (1 - P_1) P_2 (1 - P_3) x_{r1} + (1 - P_1) (1 - P_2) P_3 x_{l3} + \\ & (1 - P_1) (1 - P_2) (1 - P_3) x_{r2} + \lambda (s_{l1} + s_{l2} + s_{l3} - B_l) \end{aligned}$$

$$\begin{aligned} L = & P_1 P_2 P_3 x_{l2} + P_1 P_2 (1 - P_3) x_{l2} + P_1 (1 - P_2) P_3 x_{r2} + (1 - P_1) P_2 P_3 x_{l2} + \\ & P_1 (1 - P_2) (1 - P_3) x_{r2} + (1 - P_1) P_2 (1 - P_3) x_{l2} + (1 - P_1) (1 - P_2) P_3 x_{r2} + \\ & (1 - P_1) (1 - P_2) (1 - P_3) x_{r2} + \lambda (s_{l1} + s_{l2} + s_{l3} - B_l) \end{aligned}$$

Leading to FOC's:

$$\begin{aligned} \frac{\partial P_1}{\partial s_{l1}} \left[\frac{1}{2} (x_{l2} + x_{l3} - 1) \right] + \lambda &= 0 \\ \frac{\partial P_2}{\partial s_{l2}} [2x_{l3} P_3 (P_3 - P_1) + 2x_{l2} P_1 - (P_1^2 + P_3^2)] + \lambda &= 0 \\ \frac{\partial P_3}{\partial s_{l3}} \left[\frac{1}{2} (x_{l2} + x_{l3} - 1) \right] + \lambda &= 0 \end{aligned}$$

$$\begin{aligned}
\frac{\partial P_1}{\partial s_{l1}}[P_2(x_{l2} - x_{r1})] + \lambda &= 0 \\
\frac{\partial P_2}{\partial s_{l2}}[P_1(x_{l2} - x_{r2}) + P_3(x_{r1} - x_{l3})] + \lambda &= 0 \\
\frac{\partial P_3}{\partial s_{l3}}[P_2(x_{l2} - x_{r1})] + \lambda &= 0
\end{aligned}$$

$$\begin{aligned}
\frac{\partial P_1}{\partial s_{l1}}[0] + \lambda &= 0 \\
\frac{\partial P_2}{\partial s_{l2}}[x_{l2} - x_{r2}] + \lambda &= 0 \\
\frac{\partial P_3}{\partial s_{l3}}[0] + \lambda &= 0
\end{aligned}$$

In all 3 cases these can be written as

$$\begin{aligned}
\frac{\partial P_1}{\partial s_{l1}}[\phi_1] + \lambda &= 0 \\
\frac{\partial P_2}{\partial s_{l2}}[\phi_2] + \lambda &= 0 \\
\frac{\partial P_3}{\partial s_{l3}}[\phi_1] + \lambda &= 0
\end{aligned}$$

This means that $\frac{\partial P_1}{\partial s_{l1}}[\phi_1] = \frac{\partial P_2}{\partial s_{l2}}[\phi_2] = \frac{\partial P_3}{\partial s_{l3}}[\phi_1]$

Furthermore, in each case it can be shown that $|\phi_1| \leq |\phi_2|$, implying that $\frac{\partial P_1}{\partial s_1} \geq \frac{\partial P_2}{\partial s_2}$.

Because the share of uninformed voters comes from a Beta distribution, spending has decreasing returns to scale and therefore if $\frac{\partial P_1}{\partial s_1} (= \frac{\partial P_3}{\partial s_3}) \geq \frac{\partial P_2}{\partial s_2}$ then it must be the case that $s_{l2} \geq s_{l1}$ and $s_{l2} \geq s_{l3}$. Similar results hold for the right party.

This means that the parties have a desire to spend more in the most competitive district. This did not consider the incentive constraints, which may limit the amount of spending the parties can assign to district 2.

2.6 Conclusion

The results consistently point to the same conclusion. In almost every case spending is highest in the central district, often by large amounts. While they do spend some money in outlying districts it is typically only as much as they need to, preferring to spend as much as possible in the battleground areas; making the incentive constraints particularly important in the disadvantaged districts. These results support the common practice of politicians

and parties focusing the majority of their attention on crucial swing states and tending to avoid states that perennially vote the same way.

CHAPTER 3

Congressional Gridlock

3.1 Introduction

Congressional gridlock is a surprisingly common occurrence. Gridlock often carries with it large financial and political costs. These costs typically hurt voters from both parties and a majority of voters are usually opposed to gridlock. Such strong disapproval by voters can then lead to damage to politicians in both parties.

Consider, for example, the 2013 sequestration cuts, which called for budget cuts to both defense and non-defense programs. The design was such that the cuts would be so costly to both Democrats and Republicans that neither party would be willing to let them be enacted. As Senator Mark Warner put it, "Sequestration was set up so it would be so stupid, so draconian, so outside the realm of possibility that no rational people would ever let it happen."¹ However, despite the financial and political costs to both parties, the cuts did go into effect.

Only months later, in October 2013, a government shutdown occurred as a result of Democrats and Republicans failing to come to an agreement on a budget resolution. This led to over 800,000 federal employees being indefinitely furloughed. In 2011, Republicans and Democrats could not agree on how to raise the debt ceiling. Although they eventually reached a compromise on the last day before the deadline, the resulting uncertainty caused S&P to downgrade the federal government's credit rating, leading to severe market crashes.

In all of these cases voters in both parties were hurt by the costs of gridlock. This is shown by numerous polls, where not only did a majority of voters disapprove of the gridlock but a majority of each party disapproved. A

¹<http://www.c-span.org/video/?c4460367/sen-warner-remarks-furloughed-virginians>

March 2013 poll found that 68% of all voters, including 80% of Democrats and 62% of Republicans, thought the sequestration cuts should end.² An October 2013 poll found that 81% of all voters and a majority in each party, 92% of Democrats and 72 % of Republicans, disapproved of the government shutdown.³ In an August 2011 poll, 85% of respondents believed that it would be better for the country if Democrats and Republicans would compromise in order to get things done.⁴

With such large costs associated with gridlock and such clear public opinion against it, there should be enough pressure to convince politicians from both parties to compromise. Politicians should be able to see the clear evidence that voters desire a compromise and be encouraged to avoid gridlock. However, this is clearly not the case as Congressional gridlock is almost a daily occurrence despite the large costs associated with it. This suggests that there is something that is driving politicians to refuse to compromise despite the economic and political costs.

One likely explanation is that candidates are at least partially policy motivated. If politicians were purely driven by maximizing their chances of being elected then they should wish to follow policies that are closely aligned with the preferences of a majority of voters. Given the polling results mentioned earlier, this is clearly not the case. A clear majority of voters disapprove of gridlock and yet politicians are routinely refusing to compromise, which is clearly not in their best political interest.

This suggests that the politicians are at least not purely office motivated and gridlock is a result of strict ideological differences. For example, a large driving force of the gridlock mentioned above was from Tea Party resistance within the Republican party. Tea Party members were so opposed to even moderate compromises that many of them preferred gridlock, even with the associated costs. If a large portion of lawmakers have such dedicated ideological views then they may be willing to risk the ire of voters in order to attempt to get a more preferred policy enacted. If this is happening in both parties then it would be no surprise that there would be some possibility of

²http://www.washingtonpost.com/page/2010-2019/WashingtonPost/2013/03/13/National-Politics/Polling/question_9990.xml?uuid=wxuouSEeKvFZmAnqumyw

³http://www.washingtonpost.com/page/2010-2019/WashingtonPost/2013/10/22/National-Politics/Polling/question_12188.xml?uuid=6OjorDrOEeOw53FheaLCxw

⁴<https://assets.documentcloud.org/documents/229918/the-full-results-from-the-new-york-times-and-cbs.pdf>

gridlock.

Another factor that could contribute to gridlock is uncertainty about upcoming election results. If politicians are policy motivated then they will attempt to negotiate as good of an outcome as they can. This is highly dependent on the current political makeup of Congress. Roughly speaking, the more seats a party has the stronger their position is and therefore the better they can negotiate. However, this changes every 2 years with each election. Depending on the outcome of elections, parties may be in a better bargaining position after the elections and thus may be able to achieve a more desired policy. If parties are sufficiently policy motivated this could provide enough incentive to at least delay negotiations.

This can be seen by looking at the 2012 fiscal cliff negotiations. Both parties thought that they would fare well in the elections and be in a better position in the following Congress. This led to practically no talks between the parties in the months leading up to the November elections despite the existence of a January deadline for an agreement. However, as soon as the election results were announced, both parties began serious negotiations. If election outcomes could be predicted with more or less certainty then there would be no reason to wait.

This paper will seek to understand why we so often see congressional gridlock despite the often high costs associated with failing to reach a compromise. I examine a model of political legislature in which there are two bodies and two political parties. In each body of the legislature there are elections between members of each party. After the elections the winning candidates must enter a bargaining stage to determine what policy will be implemented, with penalties occurring if the two bodies cannot reach an agreement.

I find that the introduction of policy motivated candidates as well as election uncertainty leads to outcomes in which there is a positive probability of gridlock. These outcomes exist despite the fact that gridlock carries with it a cost to all voters and the fact that there are always outcomes that both parties prefer to gridlock. The existence of a high gridlock cost is therefore not necessarily enough to encourage a compromise between the two parties. This may help to explain why we so often see members of Congress failing to reach timely agreements despite their significant costs.

3.2 Literature Review

Gridlock is a result of bargaining that takes place between Democrats and Republicans. This paper will therefore include a bargaining model that occurs after the elections. Bargaining models date back to Rubinstein (1982), who examined a model where two players must come to an agreement on how to divide a pie of a fixed size. He showed that when both players are impatient, the only equilibrium involves an agreement in the first time period. His result suggests that delays in bargaining, and especially inefficient outcomes that result from a failure to reach an agreement, should not happen in equilibrium.

In reality of course, delays and breakdowns in negotiations do occur and this paper deals with such instances. Many authors have proposed other models that seek to explain what would cause breakdowns in negotiations. A topic of interest is often negotiations between unions and strikes, which often result in costly strikes. Haller and Holden (1990) extend the Rubinstein model to allow for status quo agreements to continue during the bargaining process. He finds that in this case equilibria that involve strikes do exist. Furthermore, while the Rubinstein model allows for only a single outcome, their model allows for a range of possible wages to be the outcome of the bargaining. Other authors also find that strikes can occur in equilibrium (see Fernandez and Glazer (1989), Houba and Wen (2008), Merlo and Wilson (1995)).

Another area that sees frequent breakdowns in negotiations is conflicts between nations. Powell (2002 and 2003) explores the bargaining problem in the context of international conflict and looks at the causes of costly wars that result from breakdowns in negotiations. Slantchev (2003a and 2003b) models war as a costly bargaining problem between two nations. Although peace is the Pareto-dominate outcome, there are still cases in which a country will choose to go to war. The decision to go to war, or to stop fighting, largely depends on a countrys ability to impose a cost on the opposing country. These papers suggest that random shocks as well as parties attempting to increase their payoff are common causes of negotiation failures. This will be the case in this paper as well, where gridlock is a result of policy motivated candidates as well as random election uncertainty.

This paper deals in particular with bargaining in legislature, which has also

been covered by many previous papers. Baron and Ferejohn (1989) extend Rubinsteins model to a case with n players and a random recognition rule. They focus on two amendment rules, open and closed, and find that in an open rule, which allows for amendment proposals, the recognized member receives a lower payoff and that delays will occur with positive probability in equilibrium. Many subsequent papers have expanded on this work (see Harrington (1989, 1990), Calvert and Dietz (1996), Baron (1991), Winter (1996), McCarty (1998), Jackson and Moselle (1998)).

Banks and Duggan (1999) investigate a model of collective choice where proposers are randomly recognized and find that if agents are patient enough, there are no stationary equilibrium that involve delay. Similarly, Cho and Duggan (2009) prove that as agents become arbitrarily patient, the set of supportable equilibrium collapses to the median voters ideal point and that any delays will be inconsequential in terms of the final payout.

Kalandrakis (2006) looks at the idea of political power and shows that equilibrium payoffs do not depend on voting rights. In Penn (2009), voters care not only about the utility they receive from todays policy but also the expected utility they would receive if that policy were to be replaced sometime in the future. Morelli (1999) investigates coalitional bargaining in a legislative framework and finds that there is no equilibrium with delays and that the equilibrium does not depend on the identity of the proposer.

A common occurrence in political bargaining as well as in this paper is the existence of deadlines associated with high costs if those deadlines are missed. Many papers have examined the effect of such deadlines on bargaining outcomes. Fershtman and Seidmann (1993) examine a model of endogenous commitment, where the proposal space depends on the actions of participants in previous rounds and find that it leads to delayed agreements. Ma and Manvone (1993) propose a bargaining model with a deadline in which there is a random delay in the transmission of offers, which leads to a positive probability that the deadline will be missed. Sutter et al. (2003) discuss bargaining under time pressure and find that it can lead to high costs and higher rates of rejection. Sutter and Kocher (2006) further this by examining time-dependent payoffs under time pressure and find that it leads to quicker decisions.

This paper will incorporate many elements from the preceding works. It covers both bargaining in the style of dividing a pie as well as the presence

of political elections. There will be a random recognition rule as well as a deadline after which costly penalties will be assigned to both parties.

3.3 Model

There are two bodies of a legislature, the House and the Senate. There is an election in each body followed by a bargaining stage between the winning candidates in each body. During the bargaining stage, the representative from one body proposes a policy, $x_p \in [0, 1]$, which the member of the responding body can either accept or reject. Before the elections there is a random coin toss to determine which body will be the proposer and which will be the responder.

If the proposal is accepted then the policy is enacted and voters receive a utility of $U_i(x_p) + v_j$, where U_i has an ideal point at β_i and v_j is a random valence factor coming from the winning candidates. If the policy is rejected a status quo policy, x_0 , is implemented and voters suffer an additional penalty of t_i , representing the costs of gridlock. Voter's utility in this case is then $U_i(x_0) - t_i + v_j$.

Before the bargaining process there are elections in each body between two candidates. Candidates choose a platform that they will run on in the election, which includes a policy proposal that they would propose if chosen as the proposing body as well as a range of policies that they would accept if chosen as the responding body. If the candidates win they are committed to taking these positions during the bargaining round.

I first assume that candidates are office motivated, meaning they care only about maximizing their probability of winning each election and do not care about the implemented policy. Later I will relax this assumption and instead look at policy motivated candidates. In this case I will assume that in each body there is a Democratic candidate and a Republican candidate. The Democratic candidates have ideal points that are lower than the median House voter, while the Republican candidates have ideal points higher than the median Senate voter. I allow the preferences of each Democratic and Republican candidate to differ in each body although as will be shown later this will have little effect on the resulting equilibrium.

During the election the candidates choose positions that they are com-

mitted to during the bargaining process, either the policy they will propose or the range of policies they would accept. I assume that any time a voter is indifferent between an outcome with compromise and an outcome with gridlock they will vote for the outcome with compromise. I also examine the equilibrium both with and without the existence of individual valence effects. When these do exist, each candidate has an individual valence term, v_i that is revealed after the candidates choose their strategies but before the election are randomly distributed with distribution F and expected value 0.

Each body of the legislature has its own electorate. Each electorate is comprised of voters with ideal points between 0 and 1. The median House and median Senate voters are the voters in the House and Senate, respectively, such that 50% of the electorate in each body has an ideal point lower than the median voter and 50% have an ideal point higher than the median voter. The ideal points of the two median voters are allowed to differ and WLOG I assume that the ideal point of the median House voter is less than or equal to the ideal point of the median Senate voter.

3.3.1 Definition of Equilibria

An equilibrium involves the strategies played by each candidate in each body. Since the candidates will not know before the elections if their body will be the proposing or responding body, they must specify strategies for each case. This means a candidate's election platform includes both the proposals the candidates will make if their body is chosen to be the proposing body as well as the set of proposals that they would accept if their body is chosen to be the responding body.

Since the candidates are choosing strategies in two dimensions, their proposal choices will depend on the acceptance sets of other candidates and vice versa. This means there are many opportunities for multiple equilibria. To eliminate some equilibria I will only consider subgame perfect equilibria. This is in order to eliminate strategies that clearly would not be played on off the equilibrium paths.

For example, if the Republican Senate candidate is currently proposing $x_p = 0.75$ and the Democratic House candidate is only accepting $x_p \leq 0.75$, the Democratic House candidate could change his acceptance set to include

any $x_p \in [0, 1]$ and since both acceptance sets include the Republican Senate candidate's proposal, there would not be a difference in the outcome. However, if the Democratic House candidate did this, then the Republican Senate candidate would change his proposal to something higher, since it will now be accepted by the Democratic House candidate. Therefore, this change would not be subgame perfect.

3.3.2 Equivalence of Equilibria

An equilibrium in this model consists of the candidates specifying both their intended proposals if they are the proposer as well as the set of policies that they would accept if they were the responder. Depending on who wins in the election, one of only two possible policies will be proposed and therefore the policy space can be partitioned into at most three distinct sets. This means that there are a continuum of acceptance sets that would all lead to the same outcome. The only relevant question is whether or not the proposed policy is in the acceptance set of the elected responder.

Because of this, there may appear to be multiple equilibria that yield the same outcome. For example, if the proposed policy turns out to be 0.4 then both acceptance sets $[0.5, 1]$ and $[0.6, 1]$ would lead to gridlock. In order to eliminate the plethora of identical equilibria, I will define a sense of equivalence to refine the set of equilibria.

Definition 1 *Two outcomes are outcome equivalent if for all possible policies, $x_p \in [0, 1]$, they lead to the same probability of x_p being enacted*

This definition implies that any changes to a candidate's acceptance set that do not alter the candidate's winning probabilities and do not affect whether or not the proposed policy will be accepted can be considered as a single equilibrium.

3.4 Office Motivated Candidates

I first consider office motivated candidates, where each of the candidates running for election care only about maximizing their probability of being elected. This means that candidates have no preferences on the implemented

policy and therefore any notion of party affiliation would be purely nominal. Office motivated candidates can thus be thought of as two independent candidates running against each other.

3.4.1 Without Valence

I start with the case of no valence terms. The election results will be known with certainty and therefore the median voters in the House and Senate are able to completely coordinate with each other. Since there are no meaningful parties when the candidates are office motivated, I will refer to the candidates in each body as Candidates A and B. Here, β_H and β_S are the ideal policies of the median House and Senate voter, respectively.

Equilibrium: (Office Motivated Candidates Without Valence)

Any policy, x_p , such that $U_i(x_p) \geq U_i(x_0) - t$ for both of the median voters and such that $\beta_H \leq x_p \leq \beta_S$ can be supported as an equilibrium by the candidates playing the following strategies:

Both candidates in the House propose x_p and accept any proposal $x \leq x_p$

Both candidates in the Senate propose x_p and accept any proposal $x \geq x_p$

Proof Suppose Candidate A in the House wishes to propose another policy. If he proposes $x < x_p$ then no matter who is elected in the Senate the proposal will be rejected and lead to gridlock. This will give the median House voter a utility of $U_H(x_0) - t_H$ if he elects Candidate A and a utility of $U_H(x_p)$ if he elects Candidate B. Since $U_H(x_p) \geq U_H(x_0) - t_H$, he will elect Candidate B.

Now suppose Candidate A proposes a policy, $x > x_p$. In this case, no matter who is elected in the Senate the proposal will be accepted. This will give the median House voter a utility of $U_H(x)$ if Candidate A is elected. However, since $x > x_p \geq \beta_H$, which is the median House voter's ideal point, it must be that $U_H(x) < U_H(x_p)$. Therefore the median House voter will again elect Candidate B.

Now suppose Candidate A wishes to deviate from the equilibrium acceptance set. There are many deviations that would not affect the implemented policy. For example, accepting any policy $x \in [x_p - \epsilon, x_p]$ would still lead to every proposal being accepted and thus would be equivalent to the current

equilibrium. These deviations would not affect the median House voter's utility and therefore wouldn't influence his decision.

Candidate A could change his acceptance set to include some policies $x > x_p$. On the equilibrium path, this would not have any effect since both candidates in the Senate are proposing x_p . However, on the off equilibrium paths, candidates in the Senate could then propose a policy $x > x_p$ and since $x_p \geq \beta_H$, this would lead to a lower utility for the median House voter and thus cause him to elect Candidate B instead.

Candidate A's other option is to change his acceptance set to not include x_p , making the acceptance set equivalent to $[0, \beta_H)$. If Candidate A is elected in this case the proposal by the Senate candidate would be rejected, leading to gridlock. However, since $U_H(x_0) - t_H \leq U_H(x_p)$, this would also lead to a lower utility for the median House voter and thus again lead to Candidate B being elected.

Similarly Candidate B in the House and both candidates in the Senate have no profitable deviations.

In this case, because there is no valence term and therefore there is no uncertainty in the election results, as long as there is some outcome that both median voters prefer to gridlock, they will be able to coordinate in order to avoid gridlock. Furthermore, as the following observation shows, there will always be some policy that can be supported as an equilibrium.

Observation 1 *The set of policies that can be supported as an equilibrium is non-empty as long as $t_H > 0$ or $t_S > 0$*

Proof Any policy that both candidates prefer to gridlock can be supported as an equilibrium, thus it remains to show that if $t_H > 0$ or $t_S > 0$ then there exists a policy that both candidates prefer to gridlock.

If $t_H > 0$ then $U_H(x_0) > U_H(x_0) - t_H$, which means that the median House voter will prefer x_0 to gridlock. Since $U_H(x_p)$ is continuous, there is some $x_p > x_0$ such that $U_H(x_0) > U_H(x_p) > U_H(x_0)$. Since $x_p > x_0$, $U_S(x_p) > U_S(x_0)$ and since $t_S \geq 0$, $U_S(x_0) \geq U_S(x_0) - t_S$. Therefore, both candidates prefer x_p to gridlock.

Similarly, if $t_S > 0$ then there exists some $x_p < x_0$ such that both candidates prefer to gridlock.

This means that there will always be a supported policy and since in any such equilibrium, the candidates propose policies that will always be accepted by the winning candidates, there will never be any outcome that involves gridlock. Note that there is not a unique equilibrium. For each policy that could be supported as an equilibria, there is a continuum of different acceptance sets that the candidates could choose that would lead to the same outcome. For example, if the candidates in the House accepted any $x \in [x_p - \epsilon, x_p]$, this would still lead to x_p being implemented since in equilibrium no policy less than x_p will be proposed by any candidate. These would be considered outcome equivalent and are in effect only a single outcome.

However, even after condensing outcome equivalent equilibria, there are still a continuum of possible equilibria. Any policy that both candidates prefer to gridlock can be supported as an equilibria and as seen in the above observation, this set will always be non-empty.

Since there are multiple equilibria, some will favor the median Senate voter (namely those with $x_p > x_0$), while others will favor the median House voter (those with $x_p < x_0$). However, in every case both median voters prefer x_p to gridlock. This means that the House and Senate median voter are playing a game of Battle of the Sexes.

3.4.2 With Valence

Next I look at the case where each candidate has a private valence term. This valence term is revealed after the candidates choose their election strategy but before the median voters make their election decision. The valence terms of each candidates are only revealed to the median voter in the respective body, meaning the median voters will not be able to completely coordinate between themselves.

In each body let v_A and v_B be the valence for candidates A and B, respectively and let $F(v)$ be the distribution of $v_B - v_A$. I will assume that $F(0) = 0.5$, which means that either candidate has the same probability of having the higher valence draw. For the time being I continue to assume that candidate are office motivated. In this case the equilibrium strategy for the candidates is the same as in the case of no valence terms.

Equilibrium: (Office Motivated Candidates With Valence)

Any policy, x_p , such that $U_i(x_p) \geq U_i(x_0) - t$ for both of the median voters and such that $\beta_H \leq x_p \leq \beta_S$ can be supported as an equilibrium by the candidates playing the following strategies:

Both candidates in the House propose x_p and accept any proposal $x \leq x_p$

Both candidates in the Senate propose x_p and accept any proposal $x \geq x_p$

Proof If both candidates are following the equilibrium then the median House voter will elect whichever candidate has the higher valence draw. This means that Candidate A will be elected if

$$v_B - v_A \leq 0$$

which will happen with probability $F(0) = 0.5$.

Now suppose that Candidate A in the House proposes a policy $x < x_p$. No matter which candidate is elected in the Senate the proposal will be rejected and lead to gridlock. Therefore the median House voter's utility if he elects Candidate A is $U_H(x_0) - t_H + v_A$ and if he elects Candidate B his utility will be $U_H(x_p) + v_B$. He will therefore elect Candidate A if

$$U_H(x_0) - t_H + v_A > U_H(x_p) + v_B$$

or if

$$v_B - v_A < U_H(x_0) - t_H - U_H(x_p)$$

Therefore, the probability of Candidate A being elected is $F(U_H(x_0) - t_H - U_H(x_p))$.

$$U_i(x_p) \geq U_i(x_0) - t \Rightarrow U_H(x_0) - t_H - U_H(x_p) \leq 0$$

which means that $F(U_H(x_0) - t_H - U_H(x_p)) \leq 0.5$. Therefore Candidate A will prefer proposing x_p .

Now suppose that Candidate A in the House proposes a policy $x > x_p$. The proposal will be accepted no matter who wins in the Senate. This means

that the median House voter will receive utility of $U_H(x) + v_A$ if he elects Candidate A and $U_H(x_p) + v_B$ if he elects Candidate B. He will therefore elect Candidate A if

$$U_H(x) + v_A \geq U_H(x_p) + v_B$$

$$\Rightarrow v_B - v_A \geq U_H(x) - U_H(x_p)$$

which means Candidate A will be elected with probability $F(U_H(x) - U_H(x_p))$. However, $x_p \geq \beta_H$, $x > \beta_H$ and therefore $U_H(x) < U_H(x_p)$, which means that $F(U_H(x) - U_H(x_p)) < 0.5$. Therefore, Candidate A will maximize his probability of being elected by proposing x_p .

Now suppose Candidate A wishes to deviate from the equilibrium acceptance set. There are again many deviations that would not affect the implemented policy. The only meaningful changes would be if Candidate A was willing to accept some policies $x > x_p$ or if he was unwilling to accept x_p .

If he accepts policies $x > x_p$ then in the off the equilibrium path outcomes, the Senate candidates would propose a higher policy, which would lead to a lower utility for the median House voter. This would decrease Candidate A's probability of winning. If Candidate A did not accept x_p then any proposal by the Senate candidates would be rejected and lead to gridlock. Since $U_H(x_0) - t_H \leq U_H(x_p)$, this would also lower the median House voter's utility and therefore decrease the probability of Candidate A being elected.

Therefore Candidate A in the House has no profitable deviations in either his proposal or his acceptance set. Similarly, neither Candidate B in the House nor either candidate in the Senate have any profitable deviations.

The results show that whenever candidates are office motivated there will never be an equilibrium that involves gridlock.

3.5 Policy Motivated Candidates

Next I look at the case of policy motivated candidates. This means that in each body there is a Democratic candidate, who wants as low a policy as possible, and a Republican candidate, who wants as high a policy as possible.

I again start with the case where the candidates do not have an individual valence term and then examine the case when they do.

3.5.1 Without Valence

In this case, the equilibrium is as follows:

Equilibrium: (Policy Motivated Candidates Without Valence)

Any policy, x_p , such that $U_i(x_p) \geq U_i(x_0) - t$ for both of the median voters and such that $\beta_H \leq x_p \leq \beta_S$ can be supported as an equilibrium by the candidates playing the following strategies:

The Republican candidate in the House proposes x_p and accepts any $x \geq x_p$

The Democratic candidate in the House proposes x_p and accepts any $x \leq x_p$

The Republican candidate in the Senate proposes x_p and accepts any $x \geq x_p$

The Democratic candidate in the Senate proposes x_p and accepts any $x \leq x_p$

The median House voter elects the Democratic candidate and the median Senate voter elects the Republican candidate

Proof Suppose the Republican House candidate wishes to propose a higher policy. Since the median Senate voter is electing the Republican candidate, the proposal will be accepted. However, this will lead to a lower utility for the median House voter, who will instead elect the Democratic House candidate. If the Democratic House candidate wishes to propose a lower policy, it will be rejected by the Republican Senate candidate and lead to gridlock, which leads to a lower utility for the median House voter and therefore the Republican House candidate will be elected instead.

If a candidate proposes a policy that is not preferred to gridlock by the median voter, then the median voter will simply elect the opposing candidate. If a candidate proposes a policy that is more extreme than the median voter's ideal point then the opposing candidate can propose the median voter's ideal point (or even a policy slightly more preferred by the candidate) and be elected.

If either House candidate changes their acceptance set to not include x_p , it will lead to the Republican candidate's proposal being rejected and therefore gridlock, which will cause the median voter to elect the opposing candidate.

Therefore neither candidate in the House has a profitable deviation and similarly, neither candidate in the Senate has a profitable deviation either.

The results are very similar to the case of office motivated candidates. Namely, as long as the policy is preferred by both candidates, it can be supported as an equilibrium. This also means since there will always be some policies that both median voters prefer to gridlock, there will never be an equilibrium that involves gridlock.

3.5.2 With Valence

Proposals

First consider a House candidate's policy proposal decision. Without valence effects both candidates are proposing x_H .

The Republican candidate has the option of proposing $x_p > x_H$. Any such proposal would certainly be accepted by the Senate median voter since $U_S(x_p) > U_S(x_H)$. Without valence effects, this would lead to the House median voter always electing the Democratic candidate. Now, however, if the valence draw is large enough for the Republican candidate, the House median voter may still elect the Republican candidate even though it would lead to a worse policy for the House median voter. Therefore, the Republican candidate now has an incentive to increase his policy proposal. Specifically, he will consider his expected utility of proposing $x_p = x_R$.

The expected utility depends on whether his proposal of x_R will be accepted by the winning Senate candidate, which depends on both of the Senate candidates acceptance sets. In general this will be an endogenous decision by the Senate candidates but from the House candidate's point of view it can be treated as exogenous. The House Republican candidate's expected utility, and therefore proposal decision, will depend on which proposals will or will not be accepted by the Senate candidates.

Let y_S^D be the highest proposal that is in the Democratic Senate candidates acceptance set and let y_S^R be the lowest proposal that is in the Republican

Senate candidates acceptance set.

The Republican House candidate's expected utility of proposing x_R is
 $EU_R =$

$$\begin{cases} P_H^R(U(x_0) - t_R) + (1 - P_H^R)EU_R(D) & x_R > y_S^D, x_R < y_S^R \\ P_H^R P_S^D U(x_R) + P_H^R P_S^R (U(x_0) - t_R) + (1 - P_H^R)EU_R(D) & x_R \leq y_S^D, x_R < y_S^R \\ P_H^R P_S^D (U(x_0) - t_R) + P_H^R P_S^R U(x_R) + (1 - P_H^R)EU_R(D) & x_R > y_S^D, x_R \geq y_S^R \\ P_H^R U_R(x_R) + (1 - P_H^R)EU_R(D) & x_R \leq y_S^D, x_R \geq y_S^R \end{cases}$$

where P_H^R is the probability of the Republican candidate being elected in the House and $EU_R(D)$ is the Republican's expected utility if the Democrat is elected.

The Democratic candidate in the House previously could not lower his proposed policy or else the median Senate voter would simply elect the Republican and reject the offer. With valence effects, that is not necessarily true. If the Democratic candidate in the House proposes $x_p < x_H$ and if the median Senate voter receives a high enough valence for the Democratic candidate, then he may be willing to accept x_p , even though it is worse than gridlock. This gives the Democratic candidate in the House an incentive to lower his proposal. He will also consider his expected utility of proposing $x_p = x_H$:

$$EU_D = P_H^D P_S^D U_D(x_H) + P_H^D (1 - P_S^D)(U_D(x_0) - t_D) + P_H^R EU_D(R) \quad (3.1)$$

where P_H^D is the probability of the Democratic candidate being elected in the House and $EU_D(R)$ is the Democratic candidate's expected utility if the Republican candidate is elected in the House.

For the median House voter the decision is between electing the Republican or electing the Democrat and having a P_S^R probability of gridlock. The median House voter will therefore vote for the Republican if

$$EU_H(R) + v_R \geq P_S^D U_H(x_H^D) + P_S^R (U_H(x_0) - t_H) + v_D \quad (3.2)$$

Which means that

$$P_H^R = 1 - F(P_S^D U_H(x_H) + P_S^R (U_H(x_0) - t_H) - EU_H(R)) \quad (3.3)$$

where F is the CDF of $v_R - v_D$.

When making his policy decision, the Republican House candidate would like to maximize his expected utility by setting $\frac{\partial EU_R}{\partial x_H^R} = 0$. However, EU_R is very likely discontinuous at the boundaries of the Senate candidate's acceptance sets, namely y_S^D and y_S^R . Because of this, EU_R will not be differentiable at these points and therefore there may be no point such that $\frac{\partial EU_R}{\partial x_H^R} = 0$. Furthermore, even if a policy exists such that $\frac{\partial EU_R}{\partial x_H^R} = 0$, it does not guarantee that it is a global maximum as there could be a jump in utility at y_S^D or y_S^R .

The Republican House candidate must therefore compare multiple policy proposals. Specifically, he will compare the utility from x_p such that $\frac{\partial EU_R}{\partial x_H^R} = 0$ if such a policy exists, y_S^D , and y_S^R . For y_S^D , in order to have the policy accepted, it must be that $x_p \leq y_S^D$ and similarly $x_p \geq y_S^R$ in order to be accepted. This means that the Republican House candidate will need to compare $\lim_{x_p \rightarrow y_S^{D-}} EU_R(x_p)$ and $\lim_{x_p \rightarrow y_S^{R+}} EU_R(x_p)$.

Republican House candidate will therefore propose whichever policy satisfies

$$EU_R(x_p) = \max[EU_R(x^*), \lim_{x_p \rightarrow y_S^{D-}} EU_R(x_p), \lim_{x_p \rightarrow y_S^{R+}} EU_R(x_p)] \quad (3.4)$$

where x^* , if it exists, is such that $\frac{\partial EU_R(x^*)}{\partial x_H^R} = 0$.

The Democratic House candidate must also evaluate potential Senate acceptance sets. However, the Senate Republican candidate's decision can be anticipated. Since $x_H^D < x_H$, the median Senate voter will always prefer gridlock over x_H^D and since the Republican candidate's ideal point is to the right of the median Senate voter, the Republican candidate will also prefer gridlock to x_H^D . This means that if the Republican Senate candidate were to include x_H^D in his acceptance set it would decrease his probability of winning as well as his utility. Therefore, the Republican Senate candidate will always reject x_H^D .

This means that the Democratic House candidate must only consider two

policies: x_p such that $\frac{\partial EU_D}{\partial x_H^D} = 0$ and x_S^D , the lowest policy in the acceptance set of the Senate Democratic candidate. He will therefore choose whichever policy satisfies

$$EU_R(x_p) = \max[EU_D(x^*), \lim_{x_p \rightarrow y_S^{D-}} EU_D(x_p)] \quad (3.5)$$

where x^* , if it exists, is such that $\frac{\partial EU_D(x^*)}{\partial x_H^D} = 0$.

A similar occurrence happens in the Senate, where now the Democratic Senate candidate's expected utility is discontinuous depending on whether or not his proposed policy will be accepted by the House candidates. The Democratic Senate candidate will therefore propose whichever policy satisfies

$$EU_D(x_p) = \max[EU_D(x^*), \lim_{x_p \rightarrow y_H^{R-}} EU_D(x_p), \lim_{x_p \rightarrow y_H^{D+}} EU_D(x_p)] \quad (3.6)$$

where again, x^* , if it exists, is such that $\frac{\partial EU_D(x^*)}{\partial x_S^D} = 0$.

The Republican Senate candidate will only consider the acceptance behavior of the Republican House candidate since the Democratic House candidate will always reject the Republican Senate candidate's proposal. Therefore the Republican Senate candidate will propose whichever policy satisfies

$$EU_R(x_p) = \max[EU_R(x^*), \lim_{x_p \rightarrow y_S^{R+}} EU_R(x_p)]$$

where x^* , if it exists, is such that $\frac{\partial EU_R(x^*)}{\partial x_H^R} = 0$.

Acceptance Sets

First consider the Democratic House candidate's acceptance set decisions. Since $x_S^R \geq x_S$, both the median House voter as well as the Democratic candidate will prefer gridlock to x_S^R . Therefore rejecting x_S^R will increase both the Democratic candidate's probability of winning as well as his utility if he wins. He then has to decide whether to accept x_S^D or not. If $U_D(x_S^D) \geq U_D(x_0) - t_D$ then this is an easy decision. In this case both the Democratic

candidate and the median House voter prefer x_S^D to compromise and therefore the Democratic House candidate will certainly accept it.

If $U_D(x_S^D) < U_D(x_0) - t_D$ then the Democratic candidate must decide whether to accept x_S^D . If he does it will mean a lower utility but if he does not then it will lower his probability of winning. His expected utility if he accepts x_S^D is

$$EU_H^D = P_H^D[P_S^D U_D(x_S^D) + P_S^R(U_D(x_0) - t_D)] + P_H^R EU_H^D(R) \quad (3.7)$$

and his expected utility if he does not accept x_S^D is

$$\hat{EU}_H^D = \hat{P}_H^D[U_D(x_0) - t_D] + \hat{P}_H^R EU_H^D(R) \quad (3.8)$$

where $EU_D(R)$ is the expected utility if the Republican House candidate wins. This depends on the acceptance set of the Republican House candidate, namely whether they are willing to accept x_S^D . If the Republican House candidate is accepting x_S^D then

$$EU_H^D(R) = P_S^D U_D(x_S^D) + P_S^R U_D(x_S^R) \quad (3.9)$$

and if the Republican House candidate is not accepting x_S^D then

$$EU_H^D(R) = P_S^D(U_D(x_0) - t_D) + P_S^R U_D(x_S^R) \quad (3.10)$$

The Democratic House candidate will then accept x_S^D if $EU_H^D \geq \hat{EU}_H^D$.

Turning to the Republican House candidate, who must decide whether or not to accept x_S^D and/or x_S^R . $x_S^R > x_S > x_0$ and therefore the Republican House candidate will certainly prefer x_S^R to gridlock. He must then decide whether or not to accept x_S^D . If he does then his expected utility will be

$$EU_R = P_H^R[P_S^D U_R(x_S^D) + P_S^R U_R(x_S^R)] + P_H^D EU_H^S(D) \quad (3.11)$$

and if he does not then his expected utility will be

$$\hat{EU}_R = \hat{P}_H^R[\hat{P}_S^D(U_R(x_0) - t_R) + \hat{P}_S^R U_R(x_S^R)] + \hat{P}_H^D EU_H^S(D) \quad (3.12)$$

where $EU_H^R(D)$ is the expected utility if the Democratic House candidate wins and depends on whether the Democratic House candidate will accept x_S^D or not as determined above. Note that each candidate's probability of winning will depend on whether or not the Republican House candidate is compromising, so that $P_i^j \neq \hat{P}_i^j$. Specifically, the probabilities depend on the utility of the median House voter. Given the choice between a compromising Republican candidate or the Democratic candidate, the median House voter will elect the Republican with probability

$$P_H^R = 1 - F(P_S^R[U_H(x_0) - t_H - U_H(x_S^R)]) \quad (3.13)$$

and given the choice between a non compromising Republican and the Democrat, the median House voter will elect the Republican with probability

$$\hat{P}_H^R = 1 - F(P_S^D[U_H(x_S^D) - (U_H(x_0) - t_H)] + P_S^R[U_H(x_0) - t_H - U_H(x_S^R)]) \quad (3.14)$$

where F is again the CDF of $v_R - v_D$. The Republican House candidate will then choose to compromise if $EU_R \geq \hat{EU}_R$.

Similarly in the Senate, the Democratic Senate candidate will always be willing to compromise with the Democratic House candidate since $x_H^D < x_0$ and must decide whether to accept x_H^R . The Republican Senate candidate will always reject x_H^D but must decide whether to accept x_H^R .

Equilibrium Criteria

Combining all of the previous findings, an equilibrium must satisfy the following conditions:

1. The Democratic House candidate will propose whichever policy satisfies

$$EU_D(x_p) = \max[EU_D(x^*), \lim_{x_p \rightarrow y_S^D} EU_D(x_p)]$$

where x^* , if it exists, is such that $\frac{\partial EU_D(x^*)}{\partial x_H^D} = 0$.

He will accept any $x_p \leq x_S^D$ if $U_D(x_p) \geq U_D(x_0) - t_D$ or if $U_D(x_p) < U_D(x_0) - t_D$ but $EU_H^D > \hat{EU}_H^D$ and will always reject $x_p \geq x_S^R$

2. The Republican House candidate will propose whichever policy satisfies

$$EU_R(x_p) = \max[EU_R(x^*), \lim_{x_p \rightarrow y_S^D} EU_R(x_p), \lim_{x_p \rightarrow y_S^{R+}} EU_R(x_p)]$$

where x^* , if it exists, is such that $\frac{\partial EU_R(x^*)}{\partial x_H^R} = 0$.

He will accept any $x_p \geq x_S^D$ if $EU_R \geq \hat{EU}_R$ and accept any $x_P \geq x_S^R$ if $EU_H^R < \hat{EU}_H^R$

3. The Democratic Senate candidate will propose whichever policy satisfies

$$EU_D(x_p) = \max[EU_D(x^*), \lim_{x_p \rightarrow y_H^R} EU_D(x_p), \lim_{x_p \rightarrow y_H^{D+}} EU_D(x_p)]$$

where x^* , if it exists, is such that $\frac{\partial EU_D(x^*)}{\partial x_S^D} = 0$.

He will accept any $x_p \leq x_H^R$ if $EU_D \geq \hat{EU}_D$ and accept any $x_P \leq x_H^D$ if $EU_S^D < \hat{EU}_S^D$

4. The Republican Senate candidate will propose whichever policy satisfies

$$EU_R(x_p) = \max[EU_R(x^*), \lim_{x_p \rightarrow y_S^{R+}} EU_R(x_p)]$$

where x^* , if it exists, is such that $\frac{\partial EU_R(x^*)}{\partial x_H^R} = 0$.

He will accept any $x_p \geq x_H^R$ if $U_R(x_p) \geq U_R(x_0) - t_R$ or if $U_R(x_p) < U_R(x_0) - t_R$ but $EU_S^R > \hat{EU}_S^R$ and will always reject $x_p \leq x_D^H$

Findings

An interesting note is that because the expected utilities have discontinuities, the equilibrium is not necessarily unique. If, for example, $\frac{\partial EU_R(x^*)}{\partial x_H^R} = 0$ when the Republican House candidate proposes 0.4 but the Democratic Senate candidate will only accept policies less than or equal to 0.39 then depending on the utility functions, it might be in the Republican House candidate's interest to propose 0.39 instead of 0.4. However, if this is true then if the Democratic Senate candidate is only accepting $x_p \leq 0.38$, the Republican candidate may also wish to propose 0.38. Therefore, similar to the case of office motivated candidates, there could be multiple policies that can be supported as an equilibrium.

This means that it may be possible for candidates to exploit the proposals of other candidates by strategically choosing to only accept certain policies that they know will be proposed. This is not true when candidates are policy motivated but there is no valence term involved. In this case, candidates are unable to deviate from the median voters' ideal positions and so there is no way for candidates to be exploited.

A related result is that a possible equilibrium is for the candidates to continue to propose the median voter's ideal policies, despite the fact that there are valence terms. This is especially likely if the magnitude of the valence terms are approaching 0. This finding differs from most models of policy motivated candidates, such as Groseclose (2001), Kartik and McAfee (2007) Schofield (2003), where the introduction of valence terms will always have the effect of moving the policies away from the median voter's ideal point.

The main point of interest in this paper is to determine why candidates would choose not to compromise, even though there will always be policies that both median voters prefer to gridlock. This suggests that there is something discouraging candidates from compromising, even though it would likely increase their probability of being elected. The reason for this is shown in the next few observations.

Observation 2 *If only one candidate is compromising then that candidate and the candidate of the opposite party in the other body will have a higher probability of winning*

This is a rather interesting result that implies that when one candidate compromises, it can actually end up helping candidates of the other party more than it does their own. Normally the median voters would wish to coordinate in order to elect members of the same party and avoid conflict. If one candidate is compromising then the median voter will want to vote for that candidate. This, however, actually gives an incentive to the other median voter to vote for the candidate in the opposing party. The reason is that if the compromising candidate wins, there will be no conflict no matter who wins in the other body. However, if the compromising candidate loses, the only way to avoid conflict is for the non-compromising candidate's fellow party member in the opposing body to also win.

If, for example, the Democratic candidate is compromising in the House and the Republican candidate wins in the Senate then there will be no conflict no matter who wins in the House. Although this gives the median voters a way to completely eliminate conflict, they still may not do so if the valence draw is extreme enough to sway one or both of them. However, it would generally take a more extreme draw to do so than if no candidates were compromising, so while the probability of conflict is not 0 it has been reduced.

If one of these candidates was willing to compromise, then we would again see the coordination incentives from the previous case. That is, in order to avoid conflict the median voters would have an incentive to vote for whichever candidate is compromising and the member of the opposing party in the other body. This is further seen with the following results:

Observation 3 *If only one candidate compromises and $t \rightarrow \infty$, the probability of the compromising candidate winning goes to 1 and the probability of winning for the candidate of the opposite party in the opposing body also goes to 1*

If $t = \infty$ then even the smallest probability of conflict will outweigh any valence draws for the median voters, meaning they will always try to avoid gridlock with certainty. When no candidates are compromising this becomes impossible as the median voters have no way of coordinating. However if, for example, a candidate in the House is compromising, then the median Senate voter can elect the candidate of the opposing party and ensure there will be no gridlock.

Observation 4 *If only one candidate is compromising, the candidates of the compromising party will receive a lower expected utility than the candidates of the non-compromising party.*

This follows from observation 2. If a Democratic candidate is willing to compromise, then not only will the Republican candidates receive a higher utility due to their policy being implemented rather than gridlock, the Republican candidate also has a higher probability of winning in the opposite body, which further increases the probability that the Republican policy will be implemented.

This does not mean that a compromising candidate will receive a lower utility than if he refused to compromise. By agreeing to compromise, the

candidate helps to eliminate deadweight loss associated with gridlock. This observation simply states that the majority of that increase in social welfare goes to the non-compromising candidates. However, the compromising candidate will still be at least weakly better off than when refusing to compromise.

Observation 5 *If only one candidate is compromising, as $t \rightarrow \infty$, the proposed policy of the opposing party's candidate in the opposite body approaches the candidate's ideal point.*

This again follows from Observation 2. If one candidate is compromising then the median voter in the opposing body will have more incentive to vote for the candidate of the opposing party. As $t \rightarrow \infty$, this will dwarf any other considerations and even if the candidate proposes the most extreme position possible, the median voter will still elect him since it is the only way to avoid gridlock with certainty. The candidate of the non-compromising party is able to exploit this in order to ensure their most preferred policy is enacted.

Note that even though the compromising candidate is being fully exploited for his willingness to compromise, in equilibrium he still does not wish to switch to not compromising as he also wishes to avoid gridlock. Refusing to compromise would lead to a positive probability of gridlock and thus an expected utility of $-\infty$, which is worse than a utility of simply 0.

These results begin to shed some light as to why we might see parties refusing to compromise. When a party does compromise it is actually the non-compromising party that benefits at the compromising party's expense. Of course if both parties desire a compromise then this turns into a game of chicken, where each party is hoping the other party will be the one to blink. It is easy to think that this could lead to problems in a practical setting.

This means that when only one party is compromising, the non-compromising party actually prefers to have a higher penalty. Of course either party could be the one that is compromising, with the parties receiving higher utility if they are the one not compromising and the lowest utility if both parties refuse to compromise. This means that the parties play a game of chicken over who will compromise.

An interesting note here is that aside from the game of chicken being played, there is also a prisoner's dilemma game being played with respect to the proposed policies. Since the utility functions are concave, both parties

would ex ante prefer positions that are closer to the median so that they don't receive a much lower utility should the other party win. In fact the parties receive the highest ex ante utility when both locate at .5. Of course this is not incentive compatible as each party wants to increase their own utility by moving away from the median, which ends up hurting both parties.

3.6 Conclusion

Gridlock is an all too common occurrence. Even in political situations in which upcoming elections would be expected to put enough political pressure on lawmakers to come to an agreement in order to avoid costly delays, there is often failure to reach a settlement in time. These outcomes are not Pareto efficient, suggesting there is something else that is leading to the breakdowns.

I introduce a model that combines bargaining and elections. Candidates and voters must weigh not only the proposals that are made but also the chance that those proposals will be accepted by other candidates. Gridlock leads to a large deadweight loss and thus the large costs associated with gridlock should be enough to encourage voters to elect candidates who will compromise with each other. However, I find that despite the fact that disagreements make voters worse off, in some cases voters will still elect candidates who are unwilling to compromise with each other.

Election uncertainty is a large driving force for these disagreements. When the results of elections are known with certainty, candidates will always propose policies that will be accepted after the elections even when the candidates are policy motivated. However, when a random valence term is introduced to the elections, candidates will have enough opportunity to win despite proposing socially inefficient policies that they will be encouraged to choose more extreme policies. This will in turn lead to a positive probability of gridlock, which will end up hurting all parties involved.

Policy motivation is another factor in gridlock. When candidates are not simply attempting to maximize their chances of being elected but instead care about the policy that will be implemented then they will choose more extreme policies even though it is not in their best political interests. These extreme positions make it much more likely that two candidates who have incompatible views will be elected and lead to gridlock.

This is consistent with observed outcomes. Congressional negotiations almost always grind to a halt in the months or even year preceding an election, especially before presidential elections. Both parties often prefer to wait until after the election in the hopes that they will pick up enough seats in Congress or even the White House in order to be able to negotiate from a stronger position. It is also commonly the more extreme members of a party that are the loudest voices preventing compromises. Members of the Tea Party often openly admit that they would prefer gridlock to a compromise with Democrats.

The results also show that when two parties bargain they end up playing a game of chicken in determining whether to compromise. Although both candidates may be willing to compromise, doing so has the potential to lead to exploitation by the other candidate. Thus while both candidates desire a compromise, they both prefer not to be the party that is compromising. This can lead to a dangerous game played by both parties and leads to a very real chance that an agreement will not be reached, even when the cost of gridlock is extremely high.

This may shed some light on the constant recurrence of Congressional gridlock. The often high costs of gridlock, such as sequestration or government shutdowns, may not actually play as much of a role in the parties' decisions as imagined, which helps explain why high costs alone are not always enough to encourage compromise between the two parties.

CHAPTER 4

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