Rational Models of Political Behavior: The Effects of Opinion, Information, and Procedures

Thesis by

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To my parents.

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Abstract

In order to recommend policies that promote representative government, political scientists and politicians must understand how changes to the current political environment affect political behavior. This dissertation analyzes how both opinion and policies affect political behavior in the context of voting, campaign competition, and committees. Rational models of political behavior are used to formulate hypotheses of political behavior and action. Testing models of political behavior the author employs a wealth of methodological knowledge and expertise in national surveys, survey experiments, laboratory experiments, computer simulations, and regression analysis. Results indicate that rational models of political behavior can be used to develop accurate hypotheses of political behavior. The conclusion of the second and third chapters is that voter opinions about the integrity of the election process are significantly affected by decisions at the election administration level and the outcome of elections. In laboratory experiments involving multimember committees results show that committee procedures similar to Roberts' Rules of Order reveal information held by biased, privately informed experts. Additionally, information aggregation is higher in multimember committees with heterogeneous preferences when committee procedures allow for the formation of an expert's reputation. The fifth chapter presents empirical results that suggest individual campaign contributions are positively and significantly affected by a candidate's association with specific types of social organizations. Finally, the sixth chapter presents results that show back-loaded primary calendars are more likely to lead to greater interparty competition and more extreme general election candidates.

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Chapter 1

Introduction

This thesis uses laboratory experiments, survey experiments, nationally representative surveys, and theory to investigate and test rational models of political behavior.

The beginning of my dissertation focuses on the confidence American voters have in the election process. The second chapter builds on the literature that investigates citizen and voter trust in government, and analyzes the topic of voter confidence in the American electoral process. The data comes from two national telephone surveys where voters were asked the confidence they have that their vote for president in the 2004 election was recorded as intended. Preliminary evidence suggests that confidence in the electoral process affects voter turnout. The subsequent examination estimates the level of voter confidence and analyzes the characteristics that influence the likelihood that a voter is confident that their ballot was recorded accurately. The analysis indicates significant differences in the level of voter confidence along both racial and partisan lines. Finally, voter familiarity with the electoral process and the specific technology the voter uses are found to significantly affect the level of voter confidence.

The third chapter continues to develop and refine the concept of voter confidence. One of the consistent findings of the voter confidence research literature is that in recent elections, relative to Democrats, Republican voters tend to be more confident that their ballots are counted correctly. However, it is the case that, in terms of the outcomes of the 2000 and 2004 elections at the national level, Republicans were victorious. Research also suggests that, in the 2004 election, voters who cast a paper ballot are more confident relative to those who vote using an electronic device. Although these results fit nicely into the 2000 and 2004 elections, this chapter argues that future research of voter confidence should interpret voter confidence within the context of the election. The particular context of the 2006 election, gives rise to two testable hypotheses. The first hypothesis is that a winner's effect exists where following the election voters who cast their ballot for the winning candidate are more confident that their vote was counted accurately. The second hypothesis is that voter access to a voter-verified paper audit trail (VVPAT) device leads to higher rates of confidence among electronic voters. Using a panel dataset containing self-reported confidence levels before and

after the 2006 election, empirical evidence supports the conclusion that voter confidence is influenced by the context of the election. First, evidence suggests a positive and significant winner's effect; following the 2006 election voter confidence is higher for individuals who voted for the winning candidate. Second, empirical results support the conclusion that voters who cast ballots on an electronic voting machine with a VVPAT device exhibit higher rates of confidence when compared to electronic voters who do not have access to VVPAT devices. Finally, when measuring the change in confidence rates before and after the election, there is no evidence of a significant difference in the change in the confidence rates between electronic voters with access to a VVPAT device and voters who cast a paper ballot.

The fourth chapter uses laboratory experiments to investigate information revelation in multimember committees. This chapter analyzes the ability of committees to gather information and select a single decision when faced with uncertainty about the consequences of their choice. Whether in Congress or the local school board, committee member preferences are in general heterogeneous and individual members often possess uncertainty over the mapping of decisions to outcomes; i.e., committee members are uncertain of their own preferences. Often in such cases of uncertainty, the committee relies on information provided by self-interested experts. Using an experimental design we test the hypothesis that committee procedures similar to Robert's Rules of Order transmit information from self-interested experts to a committee comprised of members with uncertain and heterogeneous preferences. This committee design is found to reveal information despite self-interested experts who possess incentives to manipulate the committee decision; however, expert recommendations are not fully revealing. Furthermore, committee procedures that facilitate the development of expert reputations improve information revelation in the context of Robert's Rules of Order.

The fifth chapter considers the effect of candidate association with nonprofit charities on individual campaign contributions. This chapter is motivated by the resource literature in political science which contends that income largely explains individual political contributions (Brady, Verba, and Schlozman 1995). Challenging this finding, two hypotheses are proposed that suggest a candidate's association with social organizations can significantly affect campaign contributions. The first hypothesis proposes that by developing an association with charity organizations, candidates can increase the likelihood of individual contributions. The second hypothesis posits that the effect of candidate association on campaign contributions is not uniform across all charities. Survey experiments test these hypotheses when American citizens have low levels of candidate information, and candidates choose to associate with nonpartisan humanitarian or medical charities. The primary result is that candidates can use charity organizations to increase campaign contributions, but the significance of this result varies between charity organizations. Candidate association with a medical charity is found to have a positive and significant effect on the likelihood of contributing, and

this effect is independent of the amount an individual donates to charity. Alternatively, candidate association with humanitarian charities is not found to have a significant effect on contributions, but individuals who make larger charitable donations are more likely to contribute to a candidate who associates with humanitarian charities.

The sixth and final chapter studies optimal candidate location in a multicandidate, sequential election. The motivation for this chapter is based in research that finds multicandidate competition in presidential elections prevents convergence to the median voter (Coleman 1971; Aranson and Ordeshook 1972). This chapter considers the largely ignored research question of election rules and institutions that affect winnowing; i.e., the process by which candidates voluntarily exit the race. The primary hypothesis of this paper is, does the cost to compete in later primaries winnow the field of candidates? A model of candidate winnowing is developed in the context of a two-round primary followed by a general election, where after the first primary all candidates must pay a common, fixed cost or be eliminated from the nomination process. Multiple subgame perfect Nash equilibria are found to exist where winnowing occurs. Conditions are established for the existence of a unique equilibrium strategy profile where after the first primary losing candidates exit and winning candidates remain in the election. Results show that the existence and uniqueness of this equilibrium is more likely to occur when the primary calendar is front-loaded. Additionally, in a back-loaded primary calendar the winnowing of only losing candidates is a unique equilibrium when voters place little salience upon the ideological dimension. Finally, under the assumption candidates are restricted by their primary platforms, analytic and simulation results show that when winnowing fails to occur candidate platforms are more extreme.

The following chapter was written in association with R. Michael Alvarez and Thad Hall. All authors contributed equally to the following chapter.

Chapter 2

Are Americans Confident Their Ballots Are Counted?

Are Americans Confident Their Ballots Are Counted?

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Building on the literature that investigates citizen and voter trust in government, we analyze the topic of voter confidence in the American electoral process. Our data comes from two national telephone surveys where voters were asked the confidence they have that their vote for president in the 2004 election was recorded as intended. We present preliminary evidence that suggests confidence in the electoral process affects voter turnout. We then examine voter responses to determine the overall level of voter confidence and analyze the characteristics that influence the likelihood a voter is confident that their ballot was recorded accurately. Our analyses indicate significant differences in the level of voter confidence along both racial and partisan lines. Finally, we find voter familiarity with the electoral process, opinions about the electoral process in other voting precincts, and both general opinions about voting technology and the specific technology the voter uses significantly affect the level of voter confidence.

The issue of trust and confidence in the electoral process looms large in the United States in the wake of a recent string of disputed and contested federal elections, beginning in 2000 with studies of procedural irregularities, mistakes, and problems associated with the counting and recounting of ballots in Florida and other states (e.g., Caltech/ MIT Voting Technology Project 2001; Wand et al. 2001). Efforts to reform the electoral system include passage of the "Help America Vote Act" in 2002 and the introduction of the "Voter Confidence and Increased Accessibility Act" in 2005 (HR550). However, questions persist about the degree of confidence and trust that American citizens and voters have in their electoral process, given that problems again arose in the 2004 presidential election in a number of states (including the pivotal state of Ohio) and in the recent 2006 midterm election (especially in Sarasota County, FL).[1] Reflecting the apprehension about how problems in the American electoral process might affect confidence and trust in the electoral process, some prominent policy reports have raised concerns about declining voter confidence. For example, the 2001 report from a commission chaired by former Presidents Carter and Ford was titled "To Assure Pride and Confidence in the Electoral Process" (NCFER 2001) and the report of a subsequent commission, chaired by President Carter and former Secretary of State Baker, was itself titled "Building Confidence in U.S. Elections" (CFER 2005).[2]

Previous research on governmental trust focuses on the broad issue of whether or not citizens trust the government to act in the citizens' best interest. This line of research has centered on three distinct research questions. First, there have been studies that investigate the origins of trust, or distrust; in other words, the identification of which citizen attributes determine whether or not they trust government. This literature has examined a wide variety of possible covariates of trust in government and has generally concluded that trust in government is tied closely with the political orientations and evaluations of citizens (Bowler and Donovan 2002; Brewer and Sigelman 2002; Citrin and Luks 2001; Cook and

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[1]See, for example, Herron et al. (2006) and Stewart (2006).

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Gronke 2005; Stokes 1962). Additionally, findings by Abramson (1983), Hetherington (1998), and Brewer and Sigelman (2002) suggest that social situations and demographic attributes may influence individual levels of trust.[3]

Second, research has examined how trust in government has varied over time. In particular, this question has been a focus of research in the United States. Scholars have examined the apparent decline in the overall level of American trust in government, reflected in the American National Election Survey time series of questions on this topic. Although much has been written about the decline of trust in government, its origins, and the consequences, a common theme emerges from this research (cf., Citrin 1974; Miller 1974a, 1974b): changes in trust in government are related to changes in the political environment and citizen evaluations of that environment, no matter what we make of the broader implications of these changes (Chanley, Randolph, and Rahn 2000; Cook and Gronke 2005).

Third, research on trust in government has looked at the consequences of trust or distrust. Here, the research literature has studied various outcome variables, testing hypotheses where trust (or distrust) in government might be consequential for political behavior and attitudes. These studies include examinations of the connection between government trust and political engagement, voting behavior, compliance, cooperation, and social capital (see Levi and Stoker 2000). The results of these studies tend to support the theory that an individual's trust in government does not effect voter turnout decisions (Bendor, Diermeier, and Ting 2003; Rosenstone and Hansen 1993). However, Hetherington (1999) finds that, although trust in government may not effect turnout decisions, it has a significant effect on voter choice: voters that distrust their government are likely to vote against incumbents.

Historically, the literature on trust in government and on campaigns and elections has taken the trust or confidence that citizens and voters have in the electoral process for granted. Here we define trust in the electoral process as the confidence that voters have that their ballot is counted as intended. For the remainder of this article we use the term "confidence" to refer to a voter's confidence that their ballot was counted as intended. Researching voter confidence in the electoral process is distinct from

previous studies on governmental trust since there is no reason to suspect a priori that individuals who lack confidence in the electoral system comprise a subset of those who lack trust in government. For instance, voters may not possess confidence in the voting technology used to cast a ballot but trust their elected officials completely. Alternatively, voters may believe that the electoral process is fair and accurate but simultaneously hold the belief that all politicians are crooks. Research in the area of voter confidence is relatively new and consists primarily of published statistics on voter confidence rates.[4] Scholarly work on the topic of voter confidence has largely focused on problems relating to voting technology within specific geographic locations (Atkeson and Saunders 2007; Bullock, Hood, and Clark 2005; Magleby, Monson, and Patterson 2007). We differentiate our work from these previous works by considering the confidence of the American voting population in the electoral process. It is our belief that, in the age of national news programs and the internet, voter opinions about confidence may be formed at the national level. The simple fact that there is so little academic research on voter confidence provides one important justification for our work.

Most of the past research on trust has focused on the generic question of trust in government, though there have been some studies of trust in specific democratic institutions, such as trust in Congress or congressional representatives (Bianco 1994; Fenno 1978; Hetherington 1998) or across a number of democratic institutions, often studied as a combinatorial scale (Brehm and Rahn 1997; Cook and Gronke 2005). Although our research has the specificity associated with some of this newer work that tries to differentiate trust in government across institutional branches (but which often aggregates across the institutions), we focus not on democratic institutions but on the democratic process. Some argue that it is best to compare opinions about existing democratic institutions to alternative forms of government, but in the present context we prefer to focus only on confidence in the existing electoral process and not hypothetical alternatives.[5] Although recent

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[3]The effect of demographic traits upon individual trust is the subject of some debate as Stokes (1962), Citrin and Lukes (2001), and Cook and Gronke (2005) find demographic characteristics have a marginal effect on trust.

[4]Hasen (2005) provides some statistics on voter confidence in his work. CNN exit polls report voter confidence rates in 2004 and 2006. MacManus (2003) estimates Florida voter confidence following the 2002 election. The Winston Group conducted a survey in April 2004 and reported voter confidence across voting technology. See http://www.itaa.org/es/release.cfm?ID=577.

[5]Linz (1988) argues that analyzing the legitimacy of a democratic government only makes sense when comparing the legitimacy of a democratic government relative to alternative forms of government.

TABLE 1a Correlation between Confidence and Likelihood of Voting

	Already Voted	Absolutely Certain Will Vote	Probably Vote	50-50 or Less
Not at all confident	4% (2)	8% (43)	16% (20)	16% (11)
Not too confident	9% (4)	11% (59)	19% (23)	30% (19)
Somewhat confident	20% (10)	19% (106)	32% (39)	23% (15)
Very confident	68% (34)	62% (340)	33% (41)	31% (20)
Total	100% (50)	100% (548)	100% (123)	100% (65)

research on eliciting expectations and opinions about future events is promising (Manski 2004), it still is difficult to assess the reliability of survey responses to hypothetical questions.[6]

Despite the fact that previous research has found little relationship between trust in government and a voter's turnout decision (Citrin 1974; Rosenstone and Hansen 1993), Hetherington (1999) finds trust in government may affect vote choice. Similar to Hetherington, we suspect a voter's perception of confidence about past elections may influence voter behavior. However, we expect voters who lack confidence in the 2004 election to be less likely to vote in the 2006 election. Thus, an additional motivation for our work is that we hypothesize voter beliefs about the questions "do voters have confidence in the election process?" and "do voters trust government?" may trigger different voter behavior.

To help motivate our research, we begin with a preliminary analysis of new data collected from a telephone survey fielded October 26–31, 2006. We present evidence that supports our hypothesis that voters who are less confident in past elections are less likely to vote in future elections. This survey was conducted by International Communications Research, who administered the questionnaire to randomly selected participants interviewed by telephone.[7] We asked 1,084 respondents two questions:

(1) I'd like you to rate the chances that you will vote in the 2006 elections. Are you absolutely certain to vote, will you probably vote, are the chances 50-50 or less, or have you already voted?

(2) How confident are you that your ballot in the November of 2004 presidential contest between George Bush and John Kerry was counted as you intended? Would you say you are very confident, somewhat confident, not too confident, or not at all confident?

The results in Table 1a are weighted using population weights provided by International Communication Research. Table 1a depicts a clear relationship between voter confidence about past elections and the likelihood of voting in future elections; individuals with higher levels of confidence in their ballot for the 2004 election are more likely to vote in the 2006 election. In Table 1b we divide respondents into two categories; likely voters, who respond as either already voted or absolutely certain of voting, and possible voters, who responded as being probable or having a chance of 50–50 or less of voting. Classifying respondents into these two categories again shows a positive relationship between confidence and the likelihood of voting. Furthermore, when specifying a regression model with the four categories of likelihood of voting as the dependent variable and controlling for variables such as confidence, party identification, education, employment status, gender, race, and age, the estimated coefficient for confidence is both positive and significant.[8] Tables 1a and 1b are far from a definitive study, but these tables suggest a strong relationship between voter confidence and future turnout decisions. We think the relationship identified above between confidence in the electoral process and political participation gives important empirical and normative justifications for the more detailed research we report below on the confidence of voters in the electoral process.

The remainder of the analysis reported in this article investigates the confidence American *voters* have that

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[6]As Manski (2004) points out, much care is needed to design survey questions to measure expectations and opinions about hypothetical future events. Working to insure intrapersonal comparability is difficult, as is insuring that the question itself allows respondents to reveal the full extent of their uncertainty about future events. Measuring hypothetical future scenarios in opinion surveys involves complex survey questions (e.g., Manski 2004) or multiple survey questions (e.g., Alvarez and Franklin 1994), and it is unclear what analytic gain might be produced by querying voters about their relative confidence in the current electoral system, relative to ones that the voter may have no information about or experience with.

[7]Additional information regarding the survey methodology of International Communications Research is provided in Appendix A at http://journalofpolitics.org/.

[8]See Appendix D at http://journalofpolitics.org for more detail about the model specification and a table containing the estimated coefficients.

TABLE 1b   Collapsed Analysis of the Correlation between Confidence and Likelihood of Voting

	Likely Voter[a,c]	Possible Voter,[b,c]
Not at all confident	8% (45)	16% (31)
Not too confident	11% (63)	22% (42)
Somewhat confident	19% (116)	29% (54)
Very confident	63% (374)	33% (61)
Total	100% (598)	100% (188)

[a]Respondents who report having voted early or absolutely certain will vote.
[b]Respondents who report being probable to vote or reporting a 50% chance or less they will vote.
[c]Probability the proportion of possible voters who respond as being not confident is equal to the proportion of likely voters who respond as being not confident is less than 1% ($t = 5.2$).

their presidential vote in the 2004 election was recorded as intended. We study only voters in this article for a number of reasons. First, we suspect (and leave for future research) that voters and nonvoters are likely to be different in what factors influence perceptions of confidence in the electoral process; specifically, we expect that, for voters, the voting experience, such as the voting technology used to cast the ballot, significantly affects confidence. Second, we are interested in determining the roles of various voting technologies upon confidence. In many cases we think nonvoters will be unable to accurately report the particular voting technology used in their area. Finally, the dependent variable in our analysis is the confidence the voter has that their ballot for president in the 2004 election was counted as intended. We leave for future research the development of appropriate survey questions that can assess the hypothetical level of confidence that a nonvoter might have had, were they to have participated in some past election.

The goal of this article is to test a series of hypotheses regarding what attributes influence voter confidence. We hypothesize that those historical attempts such as Jim Crow laws and what some have alleged as recent attempts to disenfranchise black voters in Ohio will result in African Americans being less confident than whites.[9] Second, we analyze the effect of partisanship upon voter confidence. Given the political environment in which our data was collected we hypothesize that Republicans are more confident

than Democrats. Third, we investigate how voting technology affects voter confidence. This question is particularly timely as today's electoral environment is witness to large scale changes in the voting technology and debate over the introduction of new voting technologies. Here we hypothesize that voters who use electronic voting technologies are less confident, given the negative media coverage of these voting systems. Fourth, we consider whether knowledge of events (good or bad) from other voting precincts affects an individual's likelihood of confidence; which we call a contamination effect. More specifically, we analyze whether voter perceptions of the voting technologies *they do not use* affects their confidence. Given the recent deluge of media attention focusing upon the difficulties and problems with electronic ballots, we hypothesize that negative opinions about electronic ballots affect the confidence of those who do not use electronic ballots.[10] Finally, we are interested in determining the role familiarity with the voting process (especially a voter's level of past participation) has upon a voter's likelihood of confidence. We hypothesize that familiarity breeds confidence; ceteris paribus individuals who vote more are more likely to be confident. If confidence influences turnout decisions as we hypothesize above and we show familiarity leads to increased levels of confidence, then when considered jointly these two relationships may help explain why voting is considered by some to be habit forming (Gerber, Green, and Shachar 2003).

Confidence in the Election Process

The analysis reported in the rest of this article is based on the responses of 2,793 voters gathered in two separate surveys. Opinions regarding the 2004 presidential election were collected from 1,326 voters in the first survey (March 9–15, 2005) and 1,467 voters in the second survey (January 18–24, 2006). Although minor differences exist between the two survey formats, the questions of interest in these analyses were consistent. International Communications Research administered the questionnaire to randomly selected participants and conducted the interviews over the telephone.[11]

[9]Previous research by Bullock, Hood, and Clark (2005) finds black voters in the state of Georgia are less confident relative to white voters. As to research that indicates that nonwhites might have been disproportionately affected by administrative or voting system problems in recent presidential election cycles, see Sinclair and Alvarez (2004) and Tomz and Van Houweling (2003).

[10]For a more systematic analysis of media coverage of the electronic voting debate, see Hall (2005) and Alvarez and Hall (2008).

[11]Additional information regarding the survey methodology of International Communications Research as well as the weighted survey marginals is provided in the online appendix.

TABLE 2   Confidence of White and African American Voters

Confidence	Whites[a]	African Americans[a]	Total
Not at all confident	3.5% (85)	15.9% (47)	4.8% (132)
Not too confident	5.0% (124)	16.5% (48)	6.3% (172)
Somewhat confident	21.8% (532)	37.3% (110)	23.4% (642)
Very confident	68.7% (1,681)	29.7% (87)	64.5% (1,768)
Don't Know/Refused	1.0% (24)	0.6% (2)	1.0% (26)
Total	100% (2,446)	100% (294)	100% (2,739)

[a]Ignoring the don't know/refused responses, the probability that the proportion of African Americans who respond as being not confident is equal to the proportion of whites who respond as being not confident is less than 1% ($t = 7.6$).

The dependent variable of our study is a survey question asked of voters in order to determine their level of confidence in their vote being recorded correctly: "How confident are you that your ballot for president in the 2004 election was counted as you intended?" Respondents were asked to select one of the following options: very confident, somewhat confident, not too confident, and not at all confident. We recoded the responses into the variable *confidence* where a very confident response takes a value of three, a somewhat confident response takes a value of two, a not-too-confident response takes a value of one, and a not-at-all-confident response takes a value of zero.

We examine the question of voter confidence using both descriptive and regression analyses. The table in the next section examines the overall confidence level among white and African American voters. To isolate the effect of a single socioeconomic or political attribute upon a voter's confidence, we then estimate a multiple logistic regression model where confidence is an ordinal dependent variable with very confident responses coded as a three and not at all confident responses coded as a zero. In order to facilitate interpretation of the logit coefficients, a table of first differences is provided.

Confidence in Voting: A Descriptive Analysis

We present in Table 2 the summary statistics for confidence of white and African American individuals who reported voting in the 2004 election. The results in Table 2 are weighted using population weights provided by International Communication Research.

Table 2 reports approximately 11% of voters in our sample are either not at all confident or not too confident that the electoral system counted their ballots correctly during the 2004 election. This figure is comparable to the 9% of CNN exit poll respondents who answered a similar question following the November 2004 election.[12] Extrapolating the results of our sample to the 123.5 million voters in the 2004 election implies approximately 13 million voters were not confident their 2004 ballot was counted as intended.[13] Although some may debate the substantive significance of 11%, the results presented in Table 2 show African Americans appear to be far less confident in the electoral system. African American voters are significantly less likely to express either a somewhat confident or very confident response in the electoral system as compared to white voters, ($t = 5.8$). Given the preliminary results suggesting a relationship between confidence and turnout, lower confidence rates among African American voters relative to whites in 2004 may lead to lower turnout rates among previous African American voters relative to whites in 2008. Finally, the large differences between African American and white voter confidence rates suggest that the factors which determine voter confidence may vary substantially depending upon a voter's race.

Logistic Regression Results

In order to investigate the five primary hypotheses, we estimate a model using the ordinal measure confidence as the dependent variable, where higher values of the dependent variable correspond to a voter who is more confident that their vote for President in the 2004 election was counted as intended. As the dependent variable in this analysis involves an ordinal choice, we use an ordinal logit

[12]The CNN 2004 exit poll numbers can be viewed at the following website: http://www.cnn.com/ELECTION/2004/pages/results/states/US/P/00/epolls.0.html.

[13]The total turnout figure was obtained from a website maintained by Michael McDonald http://elections.gmu.edu/Voter_Turnout_2004.htm.

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TABLE 3 Ordinal Logit Coefficient Estimates for Confidence: Combined Data, White Model, African American Model

Variable	African American & White		White	
	β_F	Standard Error	β_C	Standard Error
Age	.14	.04[†]	.14	.04[†]
Male	.40	.09[†]	.41	.10[†]
log(Education)	.66	.09[†]	.70	.10[†]
Not employed	−.21	.10[†]	−.24	.11[†]
City	−.15	.10	−.14	.10
Republican	1.31	.12[†]	1.35	.13[†]
Independent	.33	.10[†]	.37	.11[†]
E-voter	−.53	.13[†]	−.67	.14[†]
Lever	−.34	.15[†]	−.41	.15[†]
Punch card	−.22	.13	−.29	.14[†]
Absentee	−.60	.15[†]	−.67	.16[†]
E-opinion	.11	.04[†]	.12	.04[†]
E-voter opinion	.50	.08[†]	.56	.08[†]
Race	−.95	.16[†]	—	—
Constant 1	−2.49	.23	−2.57	.25
Constant 2	−1.56	.22	−1.60	.24
Constant 3	.22	.21	.22	.23
Observations		2,594		2,403
Full vs. null model χ^2 test statistic[a]		311		242

[a]This is a test of model significance. We present the χ^2 test statistic when testing if the model presents a significant improvement over that predicted by a model comprised solely of the intercept terms.
[†]Indicates significance at 95% level.

model to produce estimates for the various independent variables. The regression analysis will continue to focus upon the central questions: (1) Does race affect the likelihood of confidence, (2) What role does partisanship have in determining confidence, (3) How do the various voting technologies affect the likelihood of voter confidence, (4) Do voter perceptions about elections outside their own precinct affect confidence, that is does a contamination effect exist, and (5) Is there a corresponding increase in the likelihood of confidence when a voter's familiarity with the electoral process increases?

Before we consider the estimated coefficients, it is necessary to describe the measures taken to avoid problems associated with possible heterogeneity between the two surveys. Using a likelihood ratio test, we tested for heterogeneity between the two surveys and reject the hypothesis that there are significant differences between the two surveys ($\chi^2 = 10$ d.f.$= 13$).[14]

[14]The likelihood ratio test consisted of specifying one model in which the estimates for the coefficients were obtained from the pooled data and a second model in which each survey produced separate estimates for the coefficients. A comparison of the two log-likelihoods produces a statistically insignificant chi-square test statistic, allowing us to reject the hypothesis that there are significant differences between the surveys.

Below, we present the estimated models, pooling the data from both surveys.

We are also concerned about heterogeneity arising from differences in confidence between white and African American voters. Prior research in the trust in government literature identifies minorities as being less trusting in government than whites (Abramson 1983; Brewer and Sigelman 2002; Michelson 2001). In addition, evidence suggests nonwhites have been disproportionately affected by the recent spate of election difficulties (Alvarez and Hall 2004; Tomz and Van Houweling 2003). Given these previous findings and the survey marginals presented in Table 2, we tested for heterogeneity between white and African American voters in their confidence.

We estimate a logit model pooling across white and African American voters into a single sample while controlling for differences between the races with a single indicator variable. As we show in the first column of Table 3, the coefficient for race is negative and significant in the β_F model, suggesting that African American voters are less confident than white voters, ceteris paribus. We suspect the significant difference in confidence rates between the races is based upon two factors. First, confidence rates may

be affected by the historical differences brought on by past efforts on the part of white voters to disenfranchise African Americans via methods such as Jim Crowe laws (e.g., Keyssar 2000). Second, a perception may exist (whether accurate or not) among the African American and white communities that particular events surrounding the 2000 and 2004 elections were an organized effort to discriminate against African Americans.[15]

The second step in our analysis of the difference between white and African American voter confidence was to test for parametric heterogeneity; that is, is it appropriate for us to pool white and African American voters into a single sample or do the available covariates associated with confidence differ in statistically significant ways for whites and African Americans? Testing the difference in the likelihood ratios for a model that accounts for individual race effects against a nested model without race effects produces a chi-square test statistic of 28 (13 degrees of freedom), which is significant at the 99% confidence level. Given this result, the data indicate that whites and African Americans have different determinants of confidence, and it is appropriate to model them independently. Unfortunately, in the two surveys we analyze here, we lack sufficient variation across African American voters (191 observations) to produce meaningful estimates for an ordered logit model specific to African American voters.

The difference in confidence and the heterogeneity in the data based upon minority status raise both normative and positive concerns related to participation. Given the historical disenfranchisement of African American voters, any factor that reduces the confidence of this group of voters is troubling since we hypothesize that reducing African American confidence may reduce African American turnout. If the electorate believes minority ballots are not being counted properly, this view may negatively affect the perceived legitimacy of our elected officials among all Democrats regardless of race.

We focus the remainder of our results upon the β_C model, which is shown in the second column of Table 3 (ordinal logistic regression estimates for a sample constrained to only white voters). This model fit statistic is highly significant, and the model produces a set of coefficient estimates that are generally statistically significant, which in most cases are signed consistently with our hypothesized expectations.

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The logistic regression coefficients from the β_C model were transformed into first differences and are presented in Table 4, estimated using CLARIFY (King, Tomz, and Wittenberg 2000). The values in Table 4 indicate how a change in a specific attribute will alter the probability of a white voter being confident, holding the other attributes at the median response level.[16] The effect of a coefficient in Table 3 can be observed in Table 4 as a general rightward or leftward shift in the distribution of the estimated likelihood of the various confidence levels. A variable with a positive effect upon confidence will increase the estimated likelihood a voter is very confident and *vice versa* for a variable with a negative effect upon confidence.

A brief example will help to elucidate the table of first differences. In Table 4, the figures at the top represent the probability that a hypothetical white voter who possesses the median sample attributes is not at all confident, not too confident, somewhat confident, or very confident that their vote was recorded as intended. Suppose we are interested in comparing the probabilities of confidence for a typical white Republican voter with a typical white Democrat voter. In Table 4 we see that a switch from *Democrat* to *Republican* will increase the probability a white voter is very confident by 24 points; from .63 to .87. Similarly, changing the voting technology utilized from *paper/optical scan* to *absentee* increases the estimated probability that a white voter who possesses the other median characteristics is not too confident by four points; from .05 to .09.

Citrin (1974) finds that Democrats (Republicans) exhibit higher levels of trust in government when a Democrat (Republican) holds the presidential office. Additionally, the Florida recount in 2000 and the electoral difficulties encountered in Ohio during the 2004 election are examples of election controversies with strong partisan overtones. Finding Citrin's result plausible within the context of confidence and recent experiences at the polls, we anticipate that, when Republican and Democrat confidence rates are compared, Republicans will be more confident.[17]

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[15]See, for example, "The Long Shadow of Jim Crow: Voter Intimidation and Suppression in America Today." A Report by PFAW Foundation and NAACP http://www.pfaw.org/pfaw/general/default.aspx?oid=16367.

[16]In some cases such as voter technology the modal response is used. For a listing of the "median" response values see footnotes to Table 4. Note, we do not report the significance of the differences since each of the variables reported in Table 4 was found to be significant using the ordinal logit model which generated the first differences.

[17]We specified a model in which we test for a winner's effect at the state level where an individual was considered a winner at the state level if following the election the governor's mansion and state legislature were controlled by the same party. However, we found no evidence of a winner's effect at the state level.

TABLE 4   First Differences for the White Voters[a]; Model β_C [13]

	Not at all Confident	Not too Confident	Somewhat Confident	Very Confident[c]
Median white voter	3.5	5.2	28.3	63.0
Voter characteristics				
Male	−1	−2	−6	+9
Not employed	+1	+1	+4	−6
City	+1	+1	+2	−4
Republican	−3	−4	−17	+24
Independent	−1	−1	−6	+8
E-voter	+3	+4	+9	−16
Lever	+2	+2	+6	−10
Punch card	+1	+2	+4	−7
Absentee	+3	+4	+9	−16
E-opinion[b]	0	−1	−2	+3
E-voter opinion[b]	−4	−5	−4	+13
No H.S. Degree	+7	+6	+5	−18
H.S. Degree	+2	+2	+3	−7
Some College	−	−	−	−
Vocational School	−1	−1	−3	+5
College Degree	−2	−2	−5	+9
Advanced Degree	−2	−3	−7	+12
Age 18–29	+1	+1	+4	−6
Age 30–39	0	+1	+2	−3
Age 40–49	−	−	−	−
Age 50–65	0	−1	−2	+3
Age 66+	−1	−1	−4	+6

[a]Holding all responses at the median characteristic: age 40–49, female, some college, paper ballot, does not live in a large city, Democrat, employed and media effect of −.14.
[b]The first difference for media effect is computed by increasing the median response one unit.
[c]The total change in estimated confidence resulting from a change in voter characteristics must sum to zero across the four confidence categories. As the distribution of voters across the four confidence categories is skewed toward the right (very confident), any change in voter characteristics which results in a change in confidence is likely to affect the probability of a very confident response differently than a not at all, not too, or somewhat confident responses.

As expected, the β_C model ascribes a powerful effect to political identification on a voter's likelihood of confidence. The distribution of the estimated confidence level shifts right for Republican voters when compared to Democratic voters. This shift in the distribution is best seen by the fact that white Republican voters are 24 points more likely to be very confident in the electoral process than their Democratic counterparts. Even independent voters are estimated to be 8 points more likely to be very confident in their vote being counted correctly when compared to Democrats. Similar to past work (Bowler and Donovan 2002; Citrin 1974), we assume that Republicans should be more confident due to a winner's effect from the 2000 and 2004 elections.

The inquiry into the effect of voting technology upon a voter's confidence is appropriate given the shift away from traditional voting technologies toward electronic voting machines (Alvarez and Hall 2005, 2008). Yet debate exists regarding the desirability of this shift toward electronic voting as shown by New Mexico's decision to implement a statewide paper ballot system as a replacement for various electronic voting technologies used in counties throughout the state, and by the debates that have occurred in other states like California, Florida, Maryland and Ohio about electronic voting machines.

Information regarding the technology used to cast a ballot was obtained through two questions. First, voters were asked if they voted at their local precinct, by absentee ballot, or in early voting. If an individual responded "yes" to voting by absentee ballot, then we coded their voting technology as absentee. Given the small numbers and variety of voting technologies employed by early voters, Tables 3 and 4 do not provide a measure of the confidence

level of early voters.[18] Individuals who responded "yes" to voting at their local precinct were asked an additional follow-up question regarding the method by which they cast their ballot.[19] The respondents who voted at their local precincts were given the following choices regarding the voting technology used at their polling site: electronic voting, punch cards, levers, paper/optical scan, other.

There is one primary conclusion that we wish to highlight when we evaluate the coefficients and first differences associated with the voting technology variables found in Tables 3 and 4. The mode of voting—precinct-based voting compared to absentee voting—makes a difference in a voter's level of expressed confidence. Under most circumstances voting by any technology other than a paper ballot cast in a voting precinct appears to reduce the confidence of white voters.[20] Paper absentee ballots and precinct-cast electronic ballots appear to have the largest negative effect on confidence; precinct-cast lever and punch card technologies exert a smaller yet still significant negative effect upon confidence. The estimated signs for the voting technology coefficients found in Table 4 appear reasonable when compared to results obtained from a study conducted by The Winston Group in April 2004. The Winston Group did not find a significant difference in confidence rates between lever and paper voters but found that punch card and electronic voters were less confident relative to those individuals who vote via paper ballot.[21]

A current trend among state election officials is to relax the conditions under which one can obtain an absentee ballot. During the 2004 election 26 states did not place geographic or immobility restrictions upon the ability of voters to cast absentee ballots. This trend is based upon the belief that all-mail voting systems, such as that employed in Oregon, increase voter turnout (Alvarez and Hall 2004; Burchett and Southwell 2000). Given the effect of the coefficient *absentee* on a voter's confidence and the hypothesized relationship between confidence and turnout, it is unclear in elections which experi-

ence traditionally high turnout that a switch to all-mail voting systems will increase voter turnout.[22] Though it is possible that voters may view all-mail voting systems as distinct from an absentee ballot, we think the negative and significant coefficient for *absentee* requires additional study into voter confidence in all-mail voting systems.[23]

Given the current nationwide trend to shift away from traditional voting technologies and towards electronic precinct-based voting, one of the more interesting results found in the β_C model is the negative coefficient of electronic precinct voting on confidence. There are three possible sources of voter skepticism concerning electronic precinct voting: (1) Voters are undergoing a transition period in which they need to become familiar with the operation and security features of the new voting technology; (2) Voters simply do not trust the "black box" nature of electronic voting and cannot be convinced that electronic precinct voting is as accurate and provides similar levels of protection against fraud relative to paper ballots; or (3) Voters have seen or heard media reports regarding the controversy about electronic precinct voting and may be concerned about the susceptibility of electronic voting machines to failure or fraud.

Additional research is needed in order to determine whether the negative estimate for the *e-voter* coefficient is a transitory effect brought on by the media and/or implementation of a new voting technology or what voters view as a fundamental deficiency associated with electronic precinct voting.[24] If voters persistently view electronic precinct voting as inferior in some aspect to paper precinct ballots, then election officials may have little choice but to slow the transition to electronic precinct voting. However, if the negative coefficient for *e-voter* is simply the reflection of a transition period of voters becoming adjusted to a new voting technology, then perhaps election officials should conduct education campaigns focusing upon the operation, security, and accuracy of the electronic precinct voting technologies.

After the 2000 election many punch card voters may have reduced the confidence they placed in the

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[18]Additionally, we exclude individuals who responded voting by "other" method; this category contained nine respondents.

[19]This question was not asked of absentee or early voters.

[20]We show later that a significant difference in confidence does not exist between individuals who cast a paper ballot and those individuals who cast an electronic ballot while holding positive opinions about e-voting.

[21]Marginals taken from a press release by the Information Technology Association of America. The paper can be found at http://www.itaa.org/es/release.cfm?ID=577.

[22]There is a literature suggesting that all-mail voting does not increase turnout (Jacoby 1996; Ornstein 1996).

[23]Our sample has too few respondents from the state of Oregon to perform a meaningful analysis of this question.

[24]Eliminating the control variable for media bias and rerunning the model produces a negative and statistically significant estimate for the *e-voter* coefficient. However, the estimated change in likelihood of confidence for a white voter is reduced to a negative five points when evaluating the effect of casting an electronic ballot versus a paper ballot.

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punch card ballot because of the postelection focus upon hanging chads. Thus, we find it reasonable that voters associate a lower degree of confidence with the punch card technology relative to paper ballots. In response to the 2000 election, government officials sped up the retirement of punch card voting systems, replacing them in many voting districts with electronic voting technology (Alvarez and Hall 2005). Unfortunately, our results show that in the short run this move from punch card to electronic ballots may not have improved voter confidence; at least among white voters.

We develop the variables *e-opinion* and *e-voter opinion* to evaluate how events outside a voter's own personal voting experience affect their likelihood of confidence; we call this a contamination effect. We use voter opinion about electronic voting as a proxy for evaluating the effect of outside events upon confidence since less than a quarter of respondents voted electronically. We think the large amount of media attention upon electronic voting before and after the 2004 election allowed most voters to form perceptions about electronic voting. If the variable *e-opinion* significantly affects a voter's likelihood of confidence, then we think this is evidence which suggests voter confidence may be affected by events that occur outside the voter's own poll experience.

We estimate the variables *e-opinion* and *e-voter opinion* from the responses to four questions which seek voter opinion about electronic voting. We asked respondents four questions focusing on voter beliefs about the ease of fraud, level of accuracy, potential for machine failure, and advantages to the disabled associated with electronic voting.[25] Performing a factor analysis of the four electronic voting questions, we identify one principal component and use those results to produce a factor score to summarize each voter's opinions about electronic voting. We include this variable on the right-hand side of our logit model under the variable name *e-opinion*: this variable takes a value from −2.75 to 2.3 where a negative value implies less approval or comfort in electronic voting and a positive value implies greater approval or comfort with electronic voting. We also include a variable we call *e-voter opinion,* which interacts the variable *e-opinion* by the binary e-voter variable (*e-voter opinion* is zero for non-e-voters).[26] The

interaction variable *e-voter opinion* is included to control for the possibility that beliefs about electronic voting may have a different effect on confidence for those who use electronic voting devices.

The significance of the estimated coefficient on *e-opinion* implies a voter's negative assessment of events in other voting precincts negatively affect a voter's confidence. A white voter who does not cast an electronic ballot but has a negative opinion about e-voting, *e-opinion* = −2, is about 11 points less likely to be very confident relative to a white voter with a positive opinion about e-voting, *e-opinion* = 2. Thus, we identify what we think is a contamination effect on voter confidence: voters who are less confident about the election process outside of their own voting precinct will also be less likely to be confident in their own voting precinct. As expected, individuals who vote using electronic ballots and hold negative opinions about electronic voting are ceteris paribus less likely to be confident than non-e-voters. However, we note that the confidence rates of e-voters who have positive opinions regarding electronic voting are equivalent to that of paper voters with neutral opinions regarding electronic voting. We think that the finding of a contamination effect allows for the possibility that the media may influence voter confidence: analysis of the media's influence upon voter confidence is one interesting question to be studied in future research (e.g., Alvarez and Hall 2008).

The final hypothesis we test is whether a voter's familiarity or degree of past participation with the electoral system affects the likelihood of confidence. We suspect voter familiarity with the voting process is an important determinant of voter confidence and expect a positive relationship between voter confidence and familiarity. Although we did not directly ask respondents questions regarding familiarity with the voting system, we follow the literature on turnout and use *education* and *age* as proxies for voter familiarity with the electoral system. Campbell et al. (1960), Wolfinger and Rosenstone (1980), and Blais and Dobrzynska (1998) find higher levels of education coincide with higher voting rates, and thus through higher turnout rates, highly educated individuals should have greater familiarity with the electoral process. Similarly, research by Wolfinger and Rosenstone (1980), Miller and Shanks (1996), and Matsusaka and Palda (1999) suggest a positive relationship between age and the likelihood of voting. Additionally, older voters are more likely to possess greater familiarity with the electoral process by the mere fact that older voters have had more opportunities for interaction with the voting process than

[25]The precise questions asked of the respondents can be found in the Appendix.

[26]The variable *e-voters opinion* appears to be an adequate control for *e-opinion* since if we drop e-voters from the β_C model then our estimate on *e-opinion* does not change.

younger voters. We test for the effect of familiarity on a voter's confidence by estimating the effects of age and education upon a voter's likelihood of confidence. If familiarity with the electoral process has an effect upon voter confidence, we would expect estimated coefficients for *education* and *age* to be both positive and significant in the β_C model.

Respondents' education was classified into six different levels, as seen in Table 4, and these levels were assigned values 1–6 (with 6 representing an advanced degree) with the log of these values used to compute the log of education variable. Table 4 reports how the likelihood of confidence changes with each additional level of educational achievement, holding all other responses at the median level. The effect of education on a white voter's confidence is positive and statistically significant.

In our regression analysis the variable *age* contains five age categories with *age* taking values 1–5 where 1 identifies a voter aged 18–29 and 5 a voter aged 66 and older. We note that the estimate for the *age* coefficient is both positive and significant in the β_A model. Additionally, Table 4 shows that older white voters appear more confident than younger white voters. However, there is the possibility that, relative to younger individuals, older individuals may be less likely to vote if they lack confidence in the electoral process. Thus, it is possible the positive affect we attribute to age is really a result of self-selection. We think that the magnitude and significance of the estimated coefficients for *age* and *education* are large enough to be robust even with minor self-selection problems. Thus, we conclude that voter familiarity with the electoral system appears to have a positive affect upon voter confidence. The potential for self-selection highlighted in this section shows the need for additional research that investigates how behavior may vary across groups in the presence of low confidence.

Conclusions

How confident voters are that their ballots are counted correctly is a normative issue within a representative democracy as a lack of confidence threatens the perceived legitimacy of an elected government. Furthermore, we believe the issue of voter confidence is not only normative, and we present data supporting the hypothesis that voter confidence has a significant effect upon political participation. Specifically, we find a positive relation-

ship between voter turnout and confidence; more confident voters are more likely to turnout to vote. Although we leave greater investigation of this topic to future research, we think that the study of the relationship between voter confidence and political participation may provide a better understanding of voter behavior in representative democracy.

Our analyses indicate that a significant difference in confidence exists along racial lines, as the proportion of the African American voters who are confident that their vote for President in the 2004 election was counted as intended is significantly lower than the proportion of white voters who are similarly confident. One-third of African American respondents reported a lack of confidence in the electoral system but less than 10% of white respondents reported a lack of confidence in the electoral system. When combined with our results regarding political participation, our analysis showing that African Americans are significantly less confident than whites raises serious normative concerns regarding the representation of the African American community in the American democratic process.

We conclude that both political affiliation and voter familiarity with the electoral process, as measured by education and age, exert a significant influence upon confidence. We think that white Republicans are more confident than white Democrats due to a winner's effect stemming from the 2000 and 2004 national elections. We find that increased levels of voter familiarity result in a higher likelihood of confidence, which pending additional research on confidence and voter turnout may give justification to the argument that voting is habit forming (e.g., Gerber, Green, and Shachar 2003). Although most of the coefficients on the demographic variables in our model have signs similar to those found in studies on trust in government, our research differs from past research on trust in government, as we find a strong and direct relationship between party identification and voter confidence.

We find that the probability of a voter being confident is significantly affected by the voting technology; with white voters who cast their ballot via a paper precinct technology being more likely to be confident than white voters who cast their ballot via punch card, lever, or electronic precinct voting technologies. We present additional evidence supporting the conclusion that the confidence rate among white voters using absentee ballots is significantly lower when compared to a paper/optical scan ballot technology. One very productive avenue of future research will be to look more specifically at

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individual voting technologies, and to study whether different types of electronic precinct voting technologies, for example, may produce a voting experience that leads to greater voter satisfaction and confidence than other precinct voting systems.[27]

Because there is little extant research on the confidence of voters and citizens in the American electoral process, we see four major questions needing additional research and a host of additional questions that can be evaluated while investigating the big four. First, does a relationship exist between a voter's confidence in the electoral process and their likelihood of voting? Second, what are the characteristics that influence the confidence of nonvoters, and are nonvoters less confident than voters? Third, what are the key attributes of confidence for minorities? Fourth, among all eligible voters lacking confidence in the voting system, does their likelihood of participation in the electoral process vary by race, party identification, or age? When do voters appraise their confidence in the electoral process and how do the media effect this appraisal? Finally, do voters cast a ballot believing it will not be counted as intended or do voters develop this opinion after election results are observed? Only after we have better understood the confidence of voters and citizens in the electoral process, can we assess the affect of recent events—and recent reform efforts—on the perceptions and behavior of Americans.

Acknowledgments

[27]There is new promising research in this direction, for example recent work by Herrnson et al. (2008) or Goler, Selker, and Wilde (2006). More research of this type is necessary in this area; unfortunately the limited extent of our survey data does not give us the opportunity to examine specific makes or models of voting technologies.

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Chapter 3

The Winner's Effect: Post-Election Voter Confidence Levels

3.1 Motivation

There has been a common assumption permeating conversations in recent election cycles about the conduct of elections in the United States—that voters lack confidence in the process. The confidence of voters in the election process is seen as an important indicator of the quality of election administration, as well as a critical normative issue that may influence the basic legitimacy of the democratic process in the United States. But while this is a common assumption, the few studies that have been done so far on this topic have typically found that in recent election cycles most Americans and American voters are confident in the process (Alvarez and Hall 2004, 2008; Hasen 2005; Atkeson and Saunders 2007; Bullock, Hood and Clark 2005; Hall, Monson, and Patterson 2007, 2008; Alvarez, Hall, and Llewellyn 2007, 2008). But these studies have all found that there are important factors that help us understand how confidence varies across voters; such as partisanship, race, and ethnicity, and how a voter interacts with election officials and pollworkers.

Typically past studies of voter confidence generally agree on two findings. First, voters who self-identify as Republicans are more confident that their vote was counted accurately relative to voters who self-identify as independents or Democrats (Alvarez and Hall 2008; Alvarez, Hall, and Llewellyn 2007, 2008; Atkeson and Saunders 2007; Bullock, Hood and Clark 2005; Hall, Monson, and Patterson 2007; Magelby, Monson, and Patterson 2007). Second, voters who cast an electronic ballot are less confident relative to voters who cast a paper ballot (Atkeson and Saunders 2007; Alvarez, Hall, and Llewellyn 2008). In the context of the 2004 election, these findings are appropriate given concern raised by minority and civil rights groups regarding the counting of Democratic precincts in Ohio and media coverage of problems associated with nonverifiable voting technologies in parts of California and Ohio during the 2004 primaries and general election (e.g., Alvarez and Hall 2008).

In this paper we study the 2006 mid-term election, because it provides two new contexts in which to evaluate voter confidence. For the first time since academics began studying voter confidence, in 2006 the Democrats achieved widespread national success by capturing control of the U.S. House and Senate. Second, following the 2004 election many election officials installed voter verified paper audit trail (VVPAT) devices on electronic voting machines to enhance the ability to conduct post-election audits.[1] Thus, the 2004 election allows us to differentiate between electronic voting without a VVPAT device and electronic voting with a VVPAT device. We hypothesize that voter confidence is dynamic and that the context of an election or voting method affects voter perceptions of confidence. Thus, we argue voter confidence can only be fully understood in light of the issues surrounding the election, such as recent changes in election administration or the election outcome.

In the context of political efficacy and general perceptions of the political system, previous research finds that voters who cast their ballot for the winning candidate tend to have higher levels of efficacy relative to voters who supported the losing candidate (Ginsberg and Weissberg 1978; Clarke and Acock 1989; Craig, Niemi, and Silver 1990; Anderson and Tverdova 2001; Anderson and LoTempio 2002; Banducci and Karp 2003).[2] We hypothesize that a similar relationship exists for how confident voters are in the election process, where individuals who vote for winning candidates are more confident relative to individuals who vote for losing candidates. At the party level, support for our hypothesis comes from Alvarez, Hall, and Llewellyn (2008), who summarize their findings by hypothesizing that partisan differences in voter confidence may be due to the outcomes of the 2000 and 2004 elections. The first hypothesis that we test is that a winner's effect exists. A winner's effect exists if, following an election, voters who voted for the winning candidate are more confident that their ballot was counted correctly relative to voters who voted for the losing candidate.[3] We test this hypothesis by analyzing post-election survey data and panel data from two surveys of voters conducted before and after the 2006 general election. We investigate the existence of a winner's effect by controlling for individual vote choice and election results at the house district and state levels.

Theoretical hypotheses that confidence affects political action date back to the mid-20th century (Stokes 1962). In the context of political efficacy, empirical evidence suggesting a negative relationship between voter perceptions of confidence and turnout have been found by Rosenstone and Hansen (1993), and in the specific context of voter confidence by Alvarez, et al. (2008). Due to the nature

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[1] See Alvarez and Hall (2008) and Herrnson et al. (2008a, 2008b) for a discussion of this issue.

[2] Prior to the 2000 election the political efficacy literature investigated broad questions such as the erosion of political efficacy during the last half of the 20th century (Dalton 2004) and the comparison of trust in government across regimes and countries (Inglehart 1997). More specific inquires into questions surrounding political efficacy focus upon voter trust in particular democratic institutions such as elected officials and Congress (Fenno 1978; Hetherington 1998). However, the literature on trust in government takes the confidence that citizens and voters have in the electoral process for granted. The distinction between the trust in government literature and studies investigating the confidence voters and citizens have in the electoral process is important, as a priori there is no reason to suspect that one group is a subset of the other.

[3] Our hypothesis that a winner's effect exists is compatible with voter behavior where ex post voters may rationalize their vote choice and turnout decision by updating their beliefs over the accuracy of the electoral system.

of American elections, the potential for a winner's effect based on voter perceptions of confidence is particularly troubling. High-profile, two-candidate elections in the United States always contain a winning and losing candidate, where the losing candidate is excluded from government. If election results affect voter confidence, then voters who support the losing candidate may be more likely to question the process used to elect officials, the legitimacy of the elected government, or be less likely to participate in future elections.[4] For instance, some voters in the United States perceived the Bush Administration as illegitimate following the 2000 and 2004 elections (Craig, Niemi, and Silver 2006). Given America's penchant for plurality voting, if a winner's effect exists, then regardless of the measures taken by election administrators, a group of voters may always exist who question the accuracy of the election process and the legitimacy of certain politicians.

Through specific challenges to the accuracy and reliability of a voting device, voter perceptions of an election's legitimacy may be challenged through voting technology (Saltman 2006). Following the 2004 election, in response to voting rights groups' concerns over the accuracy of the voting process, 18 states passed legislation requiring a verifiable paper audit trail. For precincts using an electronic voting technology, this legislation requires that a VVPAT device be attached to the voting technology. The second hypothesis analyzed is that legislation leading to a greater number of VVPAT devices will produce observable differences in the confidence rates of those electronic voters who have access to VVPAT devices and those who do not. Although a 2006 survey of voters in Franklin County, Ohio did not find that the presence of a VVPAT device significantly altered voter confidence (Magelby et al. 2007), we anticipate that, when analyzing a national sample, the presence of a VVPAT will increase voter confidence because the voter can know that a durable, independent record of their vote exists. Although Atkeson and Saunders (2007) find that voting devices that produce a paper trail lead to greater voter confidence, we differentiate our work by focusing on the effect of independent recording on the confidence of electronic voters.[5]

Furthermore, the second hypothesis addresses a debate within the election administration community over what is the "best" voting technology: paper or electronic voting technologies. Following the 2000 election, government officials largely agreed that certain voting technologies needed replacement. The newly created Election Assistance Commission (EAC) was charged by the Help America Vote Act (HAVA) with the task to "establish a program to provide funds to States to replace punch card voting systems" However, when the EAC was created, officials did not unanimously agree on the voting technology that should replace punch cards. The debate over the replacement technology has settled upon two choices: a paper-based ballot such as an optical scan ballot or an electronic ballot. Proponents of the paper-based technology lauded the fact that paper ballots facilitate re-

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[4]See Nadeau and Blais (1993) for a similar argument, as well as a summary of the normative democratic theory questions raised by possible winner's effects.

[5]For a comprehensive analysis of the features of various voting technologies and the operations of VVPAT systems, see Herrnson et al. (2008).

counts and audits but proponents of the electronic ballot touted its superior efficiency, control over the ballot box, and advantages for disabled voters (Alvarez and Hall 2008). To date, the debate over paper versus electronic ballots continues and is evidenced by Georgia being the first state to move to all-electronic voting in 2002 and New Mexico's decision to move away from electronic ballots to statewide optical scan balloting in 2006 (Atkeson, Alvarez, and Hall 2007). Although the evidence from Franklin County, Ohio, during the 2004 Presidential election suggests the need to consider the administrative impact of electronic voting (Highton 2006), we limit our discussion to the consideration of technological effects on voter confidence in the electoral process.

3.2   Confidence in the Election Process

The data analyzed in this article comes from the 2006 Cooperative Congressional Election Study (CCES), a collaborative research effort with 39 universities and over 100 political scientists participating.[6] The 2006 CCES was a national stratified sample survey of registered and unregistered adults with a sample size of approximately 40,000; registered voters were over-sampled in order to produce similar rates of voting and nonvoting participants. In order to attain a nationally representative sample, a random subsample was first selected from the 2004 American Community Study (ACS). Each individual selected out of the ACS was then matched to an individual who completed the CCES survey via matching on socio-economic attributes such as gender, age, race, and education. Finally, CCES respondents were weighted using post-stratification weights in order to equilibrate the CCES marginal distribution and ACS marginal distribution along a number of socio-economic variables (education, race, and age, etc.).

Each CCES survey was comprised of approximately 120 questions where questions common to all participants comprised half of the questionnaire and the other half consisted of questions designed by individual groups and asked of a subset of 1,000 people. The survey had a pre- and post-election design where questionnaires were completed on-line and fielded by the survey research firm Polimetrix, Inc. Pre-election surveys were conducted in October 2006 and the post-election surveys were completed in November 2006. The results presented here are based on a subsample of CCES participants who were asked questions over their level of confidence in the election process. The panel survey contains pre- and post-election opinions for 611 respondents who self-identified as voting in the 2006 mid-term election and self-identified that they voted using a paper, lever, or electronic voting technology.

Since voter confidence about the 2006 election is our dependent variable, the wording of the voter confidence question differed between the pre- and post-election surveys. The dependent variable for

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[6]A complete discussion of the survey methodology can be found at the Cooperative Congressional Election Study at http://web.mit.edu/polisci/portl/cces/index.html. See Gartner (2008) for another example of use of the CCES data.

the pre-election survey is, "How confident are you that your vote in the November 2006 election will be counted as you intended?" Respondents were asked to select one of the following options: very confident, somewhat confident, not too confident, and not at all confident. For the post-election survey, the dependent variable is, "How confident are you that your ballot in the November of 2006 election was counted as you intended?" and again the response options were very confident, somewhat confident, not too confident, and not at all confident. We recoded the responses from the pre- and post-election surveys into the variables *pre-confidence* and *post-confidence*, where a very confident response takes a value of three, a somewhat confident response takes a value of two, a not too confident response takes a value of one, and a not at all confident response takes a value of zero.

Below, we examine the question of voter confidence using both a descriptive and regression methodology. The figures in the next section examine the overall voter confidence level during the pre- and post-election surveys. We anticipate that a winner's effect may exist at the house district, state, and national levels. Specifically, we expect voters who either voted for a winning candidate, or identify with the winning party at the national level, to experience greater gains in confidence following the 2006 election. If the presence of a VVPAT device leads to higher voter confidence among electronic voters, then we expect to observe a difference in the confidence rates between the two groups of electronic voters. Following the descriptive analysis, we discuss the methodology and estimates for a series of multivariate logistic regression models that further investigate the two primary hypotheses.

3.3   Descriptive Analysis

We present in Table 3.1 the weighted summary statistics for voter confidence from the pre-and post-election surveys. In the October 2006 survey, prior to the election, 17.1% of respondents were either not at all confident or not too confident that their 2006 ballot would be counted as intended. Following the 2006 election, in the post-election survey, the percent of respondents who were either not at all confident or not too confident fell to 9.2%, a difference of about 8 points relative to the pre-election survey (t=5.4). The 2006 post-election results are comparable to previous nationally representative polls by Alvarez, Hall, and Llewellyn (2008) and CNN that, respectively, find 11% and 9% of voters were not at all or not too confident that their vote for President following the 2004 election were counted as intended.[7]

By comparing a voter's confidence rate before and after the election, we can determine whether a voter's confidence level was higher, lower, or unchanged following the election. We present in Table 3.2 marginal statistics for changes in voter confidence between the pre-election and post-election surveys. Relative to their pre-election confidence level, approximately one-third of voters were more

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[7]The CNN 2004 exit poll numbers can be viewed at the following website: http://www.cnn.com/ELECTION/2004/pages/results/states/US/P/00/epolls.0.html.

Table 3.1: Voter Confidence Summary Statistics

Confidence	Pre-election	Post-election
Not at all confident	5.3% (41)	3.0% (24)
Not too confident	11.8% (91)	6.2% (49)
Somewhat confident	45.1% (350)	37.7% (296)
Very confident	37.8% (293)	53.1% (417)
Totals	100% (775)	100% (786)

confident following the election, while about 10% of voters are less confident following the election. Finally, more than one-half of voters reported no change in their confidence level following the 2006 election. Summarizing the results presented in Tables 3.1 and 3.2, the confidence level following the 2006 election is higher relative to the pre-election confidence level.[8]

Table 3.2: Voter Confidence by Pre- and Post-Election

Confidence	
Less confident following the election	9.7% (60)
No change in confidence	59.2% (362)
More confident following the election	31.0% (189)
Totals	100% (611)

Consistent with the winner's effect hypothesis, the increase in voter confidence following the 2006 election may reflect increased confidence among voters who cast their ballot for winning candidates. However, another explanation for the higher levels of confidence following the 2006 election is that the factors that influence a voter's assessment of confidence may differ depending upon when the survey is fielded. For instance, prior to the election a voter's socio-economic characteristics, such as party identification or education, may heavily influence voter confidence. Following the election, specific factors regarding the voting process, such as election outcome or the voting technology used, may largely determine voter confidence. We turn now to a descriptive analysis of how the specific context surrounding the voting process may affect voter confidence.

The winner's effect hypothesizes that individuals who vote for winning candidates are more likely to be confident that their vote was counted accurately. Table 3.3 presents post-election confidence levels for individuals who voted in both a house and gubernatorial race. In general, the results presented in Table 3.3 suggest that confidence rates increase as voters report voting for a greater

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[8]The total number of respondents included in Table 3.1 is higher relative to Table 3.2 some respondents who participated in the pre-election survey either declined to participate in the post-election survey or were unable to be contacted.

number of winning candidates. For instance, voters who reported voting for neither the winning house nor gubernatorial candidate are 20 points less likely to report being very confident relative to voters who reported voting for both the winning house and gubernatorial candidates ($t=4.8$). Although we will revisit this in the regression analysis, descriptive results lend preliminary support to the winner's effect hypothesis.

Table 3.3: Voter Confidence by Election Results

Confidence	Both candidates lost	One candidate won and the other lost	Both candidates won
Not at all confident	11.9% (13)	2.9% (6)	0.0% (0)
Not too confident	7.0% (8)	6.9% (14)	5.0% (10)
Somewhat confident	40.6% (45)	35.1% (73)	33.9% (67)
Very confident	40.5% (45)	55.1% (114)	61.1% (120)
Totals	100% (111)	100% (207)	100% (197)

In addition to individual races, we hypothesize that a winner's effect may exist at the state or federal level as a result of partisan identification. Voters not only identify with candidates from their own district but, via their party identification, with candidates from different districts and states. If voters follow races outside of their own district, then voters may be susceptible to inferring local irregularities from national results. An analysis of reported confidence rates by party ID reveals a sharp increase in Democratic voter confidence following the 2006 election. Table 3.4 presents pre- and post-election voter confidence rates for Republicans and Democrats.

Table 3.4: Voter Confidence by Party Identification

Confidence	Pre-election	Post-election
Democrats		
Not at all confident	7.0% (19)	2.2% (6)
Not too confident	16.6% (44)	8.7% (22)
Somewhat confident	54.7% (147)	42.7% (111)
Very confident	21.7% (58)	46.4% (120)
Totals	100% (268)	100% (259)
Republican		
Not at all confident	0.3% (1)	0.7% (2)
Not too confident	4.3% (10)	4.2% (10)
Somewhat confident	35.6% (84)	28.5% (69)
Very confident	59.8% (140)	66.6% (162)
Totals	100% (235)	100% (243)

At the national level, the winner's effect hypothesis predicts that, prior to the 2006 election, Republicans will be more confident relative to Democrats given Republican electoral successes from 2000 to 2004. However, following the 2006 mid-term election, in which the Democrats retook the U.S. House and Senate, Democratic voters should experience an increase in confidence relative to Republicans. As expected, prior to the 2006 election Republicans appear significantly more confident relative to Democratic voters. Although Republicans are still more confident following the 2006 election, the confidence gap between Republicans and Democrats is noticeably smaller. Democratic voter confidence significantly increases following the 2006 election; for instance, the percent of Democrats who are very confident increases by over 20 points (t=6.1). However, post-election Republican voter confidence rates are statistically identical when compared to their pre-election confidence rates (t=1.6).

At the individual voter level, when analyzing changes in confidence between pre-election and post-election confidence rates, Table 3.5 depicts distinct differences between Democrat and Republican voters. Republicans are equally likely to become more confident following the election as they are to become less confident following the election; that is changes in Republican confidence are approximately normally distributed. Relative to Republican voters, following the election Democratic voters are more than twice as likely to report a higher level of confidence and about half as likely to report a drop in confidence.

Table 3.5: Dynamic View of Confidence by Party Identification

Democratic Voter Confidence	Democrats	Republicans
Less confident following the election	7.2% (16)	13.8% (26)
No change in confidence	49.5% (107)	70.2% (134)
More confident following the election	43.3% (94)	16.1% (31)
Totals	100% (217)	100% (191)

Hypothesis 2 states that electronic voters who have access to a VVPAT device will have higher confidence rates relative to electronic voters who do not have access to a VVPAT device. Presented in Table 3.6 are the post-election confidence rates for voters who used one of three voting technologies: electronic voting machines with a VVPAT technology, electronic voting without a VVPAT technology, and paper-based voting.

The descriptive results for confidence, reported by voting technology, indicate that individuals who vote electronically but have access to a VVPAT are significantly more likely to be somewhat or very confident relative to electronic voters who do not have access to a VVPAT (t=3.5). Furthermore, no voter who casts a ballot using an electronic voting machine equipped with a VVPAT described herself as "not at all confident". Additionally, VVPAT voters were 12 points more likely to be

Table 3.6: Voter Confidence by Voting Technology

Confidence	Post-election
Electronic with VVPAT	
Not at all confident	0.0% (0)
Not too confident	3.4% (3)
Somewhat confident	29.9% (30)
Very confident	66.7% (67)
Totals	100% (90)
Electronic without VVPAT	
Not at all confident	5.6% (13)
Not too confident	8.5% (20)
Somewhat confident	39.9% (95)
Very confident	46.0% (109)
Totals	100% (237)
Paper	
Not at all confident	2.5% (10)
Not too confident	6.3% (25)
Somewhat confident	36.5% (145)
Very confident	54.7% (217)
Totals	100% (397)

very confident compared to paper ballot voters and 20 points more confident than electronic voters without a VVPAT. However, we argue that a statistical test of the claim that the VVPAT increases confidence among electronic voters is meaningful only when done in the context of regression analysis that controls for other variables such as age and education of the voter. The basis for this claim is that VVPAT devices may be more common in wealthier voting precincts, which would be positively correlated with education; we account for this type of correlation in the next section.

3.4 Multivariate Analysis

We use a multivariate analysis to analyze the two hypotheses: (1) that a winner's effect exists and (2) the presence of a VVPAT device increases confidence among electronic voters. We estimate two regression models to investigate these two hypotheses, controlling for a set of independent variables, and in order to evaluate two separate effects of our hypothesis. The first regression model, Model 1, uses post-election confidence as the dependent variable to analyze: (1) a winner's effect exists and (2) if post election confidence rates are significantly affected by the presence of a VVPAT device. As the dependent variable in the first model involves an ordinal choice, we estimate an ordinal choice logit model. In Model 1, the dependent variable has four categories, with the value of three

corresponding to a voter who is very confident and a value of zero corresponding with a voter who is not at all confident; thus higher values of the dependent variable translate into higher levels of confidence.

In Model 2, we estimate a dynamic model of voter confidence that measures changes in individual voter confidence between the pre-and post-election surveys. As discussed in the descriptive results section, overall voter confidence increases between the pre- and post-election surveys. The dynamic model, Model 2, is used to evaluate whether the winner's effect or voting technology is partially responsible for this increase in confidence. Furthermore, as we will discuss below, Model 1 is incapable of identifying a winner's effect at the national (party) level. However, under some fairly benign assumptions, Model 2 will allow us to estimate whether the winner's effect exists at the national level. In Model 2, we analyze changes in voter confidence between the pre- and post-election surveys and condense the response space from seven possible changes down to three.[9] The dependent variable in Model 2 takes a value of 1 if the voter expressed a higher degree of confidence in the post-election survey relative to the pre-election survey, a value of -1 if the pre-election confidence level was higher, and 0 if no change between the surveys.

Testing the winner's effect hypothesis is complicated by the possibility that a winner's effect may simultaneously exist over multiple races on the same ballot. What is more, a voter's confidence may be influenced by races in other districts or states. If a winner's effect exists in multiple races or across ballots, this implies fairly sophisticated behavior on the part of voters as they differentiate results from multiple levels of government in their assessment of confidence. In order to evaluate possible levels to the winner's effect, we control for election results at the national, state, and house-district levels. Allowing for the possibility that a Republican voter may favor a Democratic governor or vice versa, we use three different questions to proxy the winner's effects at the house-district, state, and national levels.

In Models 1 & 2, the dummy variables *governor win* and *house win* take values of 1 if the respondent reported voting for the winning gubernatorial or house candidate. Additionally, the dummy variables *governor neutral* and *house neutral* take values of 1 if the respondent did not vote in that particular race.[10] If the values of *governor win* and *governor neutral* both equal zero, then the respondent reported voting for the losing gubernatorial candidate in 2006. Similarly, if the values of *house win* and *house neutral* both equal zero, then the respondent voted for the losing house candidate in 2006. The governor and house variables are intended to capture the winner's effect at the state and house-district levels. If a winner's effect exists at the candidate level, then we

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[9]There exist seven possible changes as respondents may increase or decrease their confidence by any integer in the set [-3,3]. The loss in efficiency from transforming the scale to [-1,1] is minimal as few observations exist at either $\pm$ 2 or $\pm$ 3. Finally, the results do not substantively change when running the regressions on the un-collapsed dependent variable.

[10]All individuals living in a state that did not hold a gubernatorial election in 2006 are coded as being governor neutral.

anticipate that in Model 1 the estimated signs and coefficients for the variables *governor win* and *house win* will be positive and significant.

The baseline categories for the winner's effect variables are those voters who voted for a losing candidate at the house and state levels following the 2006 election. At the national level the Democrats retook both Houses of Congress from the Republicans in the 2006 election and we anticipate that, following the 2006 election, Democrats will most likely view themselves as winners and Republicans will view themselves as losers. Using the 2006 election results and voter party identification, it is natural to want to use party identification to capture the winner's effect at the national level. However, it is conceivable that using partisan identification to proxy a national winner's effect in Model 1 is problematic because of inherent partisan differences in confidence, unrelated to election results. We recognize that in Model 1 the estimated coefficients for party identification may capture differences that arise due to differences in preferences and beliefs (Page and Jones 1972; Franklin 1992). However, assuming differences in partisan preferences and beliefs are fixed in the short-run, the coefficient for Democrat in the dynamic model of voter confidence, Model 2, will estimate the difference in the likelihood of winners (Democrats) becoming more confident at the national level following the election.[11] In other words, if the estimated effects of the party ID coefficients are significant in a dynamic model of voter confidence, then we attribute this finding to the national election results and not some unobserved, ancillary variable.

In order to test the effect of VVPAT devices on electronic voter confidence it was necessary to determine the respondent's voting technology and, for electronic voter's, whether a VVPAT device was present. We obtained information regarding the voting technologies used by respondents through a closed-form survey question that asked respondents the type of machine used to cast their ballot. Respondents were given five voting technology categories from which to choose: electronic, punch card, paper, lever, and other. Because we were unable to classify individuals who either did not know the voting technology they used or responded "other" technology, we eliminated these individuals from the analysis.[12] Furthermore, only 16 respondents claimed they voted using punch card technology and with too few observations to develop a reliable estimate of the effect of punch card voting on confidence, we omitted these respondents from the analysis. Respondents who indicated voting via an electronic technology were asked a follow up question that asked if their electronic machine had a printout to view their vote. We coded the dichotomous variable $VVPAT$ with a value of 1 if respondents reported voting electronically on a machine that had a printout on which to view their vote and 0 otherwise. Included on the right-hand side of Models 1 and 2 are typical socio-economic variables such as age, minority status, gender, and education. In the following

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[11]We anticipate the estimated coefficient for Independents to be positive as, according to a Washington-ABC News poll, Independents supported Democrat House candidates by a 2-1 margin (Balz and Cohen 2006).

[12]As all post-election surveys were completed within a week of the election. We believe it is reasonable that voters recall the specific technology used to cast their ballot. This requirement excluded 3 respondents from the analysis.

sections, we estimate the regressions discussed above and discuss the findings in the context of the 2006 election.

3.5 Confidence After the 2006 Election

The estimated coefficients for Model 1 are found in Table 3.7 and the corresponding first differences for the estimated coefficients are found in Table 3.8. When we examine voter confidence following the 2006 election, socio-economic variables only partially predict voter confidence. While the estimated coefficients for party identification are statistically significant, we find the socio-economic variables education, age, minority status, and gender do not have a significant effect on voter confidence. However, we find that the variables specific to the context of the voting process are significant in predicting voter confidence: that is election results and voting technology significantly affect voter confidence.

Table 3.7: Estimated Coefficients for the Post-Election Model of Confidence

	Coefficient	Stand. Error	Z	Significance
Democrat	-.89	.20	-4.6	.00
Independent	-.99	.19	-5.2	.00
House win	.37	.17	2.2	.03
House neutral	.29	.26	1.1	.27
governor win	.43	.18	2.5	.01
Governor neutral	.19	.20	1.0	.33
Post lever	.67	.33	2.0	.05
Post DRE	-.47	.17	-2.8	.01
VVPAT	1.21	.26	4.6	.00
Female	-.05	.15	-.3	.76
Log education	.22	.14	1.5	.14
Age 18-29	-.27	.33	-.8	.42
Age 30-39	-.15	.27	-.6	.57
Age 40-49	-.40	.25	-1.6	.12
Age 50-64	-.14	.22	-.7	.51
Minority	-.30	.23	-1.3	.19
Cut 1	-3.86	.36		
Cut 2	-2.62	.32		
Cut 3	-.44	.30		
Number of Obs	722			
LR	84.2			
Prob > chi2	.00			
Log likelihood	-670			
Pseudo R2	.06			

Recall that the winner's effect hypothesis states that, following the election, individuals who vote for the winning candidate will be more confident relative to individuals who vote for the losing candidate. The results reported in Tables 3.7 and 3.8 present strong evidence that support the winner's effect hypothesis. The estimated coefficients for *governor win* and *house win* are

Table 3.8: Estimated First Differences for the Post-election Model of Confidence

	Not confident		Not too confident		Somewhat confident		Very Confident	
Median voter[a]	.01		.03		.25		.71	
Democrat	.02	+	.04	+	.14	+	-.20	+
Independent	.02	+	.05	+	.16	+	-.23	+
House win	-.01	+	-.01	+	-.06	+	.08	+
House neutral	-.00		-.01		-.04		.05	
governor win	-.01	+	-.01	+	-.06	+	-.08	+
Governor neutral	-.00		-.01		-.03		.04	
Post lever	-.01	+	-.01	+	-.09	+	.11	+
Post DRE	.01	+	.02	+	.08	+	-.11	+
VVPAT[b]	.00	+	-.01	+	-.11	+	.12	+
Female	.00		.00		.01		-.01	
Log education[c]	-.00		-.00		-.02		.02	
Age 18-29	.00		.01		.05		-.06	
Age 30-39	.00		.01		.02		-.03	
Age 40-49	.01		.01		.07		-.09	
Age 50-64	.00		.01		.02		-.03	
Minority	.01		.01		.05		-.07	

+   Estimate significantly different from zero using a 95% confidence interval.

a   The hypothetical median voter possesses the following characteristics: white, age 65+, republican, completed some college, female, used a paper ballot, and does not live in a district controlled by either party.

b   Estimates include the effect of being an electronic voter.

c   Estimates the effect of increasing a respondents education status from high school degree to completing some college.

both positive and statistically significant. Specifically, individuals who voted for the winning house (gubernatorial) candidate are 8 points more likely to be very confident relative to individuals who voted for the losing house (gubernatorial) candidate.[13] Thus, relative to those voters who cast a ballot for a losing candidate, individuals who voted for the winning gubernatorial or house candidate are significantly more confident.

We turn now to the second hypothesis regarding the effect VVPAT devices have upon the confidence of electronic voters. Consistent with previous research, the estimated coefficient for electronic voting in the post-election model is both negative and significant; electronic voters are less confident relative to voters who use paper ballots. However, when we examine the effect of a VVPAT device on confidence, we find that electronic voters who have the opportunity to review a printed copy of their ballot are significantly more likely to be very confident relative to electronic voters who did not have access to a VVPAT device. Thus, the presence of VVPAT devices significantly increases voter confidence among electronic voters. Furthermore, following the election, electronic voters who cast their ballot on a voting machine with a VVPAT are 12 points more likely than paper-based voters to be very confident.[14] Our results indicate that, from the perspective of voter confidence, the debate over the desirability of electronic versus paper ballots must be placed in the context of whether or not the voting device is equipped with a VVPAT device.

Additionally, Table 3.8 shows that consistent with previous findings, the confidence gap between Republicans and Democrats remains following the 2006 election. While at the national level Democrats were the clear winners in the 2006 election, following the election Republicans confidence levels remain higher relative to Democrats. Recalling that Republicans are the median voter for the first differences at the bottom of Table 3.8, we see that the estimated likelihood of a very confident response among Republican voters is 71% following the 2006 election. Democrats are 20 points less likely to be very confident relative to Republicans. As noted above, due to the possibility of inherent differences between Democrats and Republicans, we are unable to estimate a national winner's effect using party ID with post-election survey data. However, in the next section we present a model that estimates a dynamic model of voter confidence, which allows us to estimate if a relationship exists between party ID and a national winner's effect.

3.6 Changes in Pre- and Post-Election Confidence

The previous results estimate voter confidence at a particular point in time. However, our hypotheses consider how changes in the context of an election, specifically the event and outcomes of an election, affect voter confidence. We investigate the two primary hypotheses more fully in Model 2, where the dependent variable is whether the voter's confidence increases after the election, remains

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[13]Statistically significant at the 95% confidence level
[14]Statistically significant at the 95% confidence level.

unchanged, or declines (using the values 1, 0, and -1, respectively). The estimated coefficients and estimated first differences are found in Tables 3.9 and 3.10.

Table 3.9: Estimated Coefficients for the Dynamic Model of Confidence

	Coefficient	Stand. Error	Z	Significance
Democrat	1.04	.22	4.8	.00
Independent	.68	.22	3.2	.00
House win	-.01	.19	-.1	.96
House neutral	.52	.29	1.8	.08
governor win	.38	.20	1.9	.06
Governor neutral	.40	.22	1.8	.07
Post lever	.26	.33	.8	.42
Post DRE	-.45	.20	-2.3	.02
VVPAT	.67	.26	2.5	.01
Female	.30	.17	1.7	.08
Log education	-.30	.16	-1.9	.06
Age 18-29	.27	.38	.7	.47
Age 30-39	.10	.30	.3	.75
Age 40-49	.18	.29	.7	.52
Age 50-64	.11	.25	.5	.65
Minority	-.03	.26	.1	.91
Cut 1	-1.52	.35		
Cut 2	1.71	.35		
Number of Obs	578			
LR	51.4			
Prob > chi2	00			
Log likelihood	-496			
Pseudo R2	.05			

Recall that we anticipate Democrats will perceive themselves as the victors at the national level. Thus, if a winner's effect exists at the national level, then we expect that, following the election, Democratic confidence rates will be more likely to rise relative to Republicans. Consistent with the winner's effect hypothesis, the estimated coefficient in Model 2 for Democrat is positive and significant. That is, relative to Republican voters, Democrats have a higher probability of increasing their level of confidence following the 2006 election. Specifically, Democratic voters are 19 points more likely than Republican voters to express a higher level of confidence following the 2006 midterm election.[15] The results in Model 2 are consistent with a winner's effect at the national level and provide strong evidence that the winner's effect may be responsible for the reduction in the confidence gap between Republicans and Democrats following the 2006 election.

Turning our attention to the house and governor races, we find weak support that voting for the winning house or gubernatorial candidate will significantly affect a voter's pre-election confidence level. Although the associated p-value of .06 for the estimated coefficient on *governor win* is on the cusp of significance, the estimated coefficient for *house win* is hardly different than zero and takes

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[15]Statistically significant at the 95% confidence level

Table 3.10: Estimated First Differences for the Dynamic Model of Confidence

	Less confident		No change		More confident	
Median voter[a]	.17		.66		.17	
Democrat	-.10	+	-.09		.19	+
Independent	-.08	+	-.04		.12	+
House win	-.00		.00		-.00	
House neutral	-.06		-.03		.09	
governor win	-.05		-.01		.06	
Governor neutral	-.05		-.01		.06	
Post lever	-.03		-.01		.04	
Post DRE	.07	+	-.02		-.05	+
VVPAT[b]	-.03		-.01		.04	
Female	-.05		.01		.04	
Log education[c]	.03		.00		-.03	
Age 18-29	-.03		-.01		.04	
Age 30-39	-.01		-.00		.01	
Age 40-49	-.02		-.00		.02	
Age 50-64	-.02		.00		.02	
Minority	.01		-.01		.00	

+   Estimate significantly different from zero using a 95% confidence interval.

a   The hypothetical median voter possesses the following characteristics: white, age 65+, republican, completed some college, female, used a paper ballot, and does not live in a district controlled by either party.

b   Estimates include the effect of being an electronic voter.

c   Estimates the effect of increasing a respondents education status from high school degree to completing some college

the wrong sign. Therefore, we conclude that the outcomes of house and governor races does not appear to affect voter confidence. Combining this last result with the above post-election results appears to raise an interesting puzzle: a winner's effect exists at the house and gubernatorial levels but the winner's effect does not alter an individual's pre-election confidence rate. This result may be due to a voter's ability to predict, with a fair degree of accuracy, the outcomes of races about which the voter is familiar, such as house and gubernatorial races in their own district and state. However, these same voters may lack the information necessary to predict outcomes at the national level.[16] Although local election results may be factored into pre-election levels of confidence, uncertainty regarding national election results may lead to voters to alter their pre-election confidence levels.

Continuing to investigate contextual explanations for the increase in voter confidence following the 2006 election, we turn our attention to the second hypothesis, which looks at the effect of VVPAT devices on voter confidence. Here, we find that, following the election, individuals using an electronic voting technology without a VVPAT device are 5 points more likely to see a decrease in their confidence relative to paper voters.[17] However, VVPAT voters are a statistically significant 11 points more likely to become more confident following the election relative to regular electronic voters.[18] Finally, the estimates in Table 3.10 suggest that voters who vote using paper ballots and electronic ballots with a VVPAT are equally likely to experience an increase in confidence following the election. We conclude that the effect of voting technology on the probability that a voter changes their assessment of confidence is important, as it may provide an avenue that election administrators can take to improve voter confidence. Contrary to advocates who propose either an entirely paper-based or an electronic voting technology, the evidence presented above highlights the need for voting machines to produce what voters see as independent, verifiable results.

3.7   Conclusions

By leveraging the 2006 electoral environment, we test whether the context of an election, the election outcome and technology used to cast a ballot, affect the confidence voters have that their ballots will be counted accurately. Using 2006 post-election survey data, we test the hypothesis that voters who cast their vote for the winning house and gubernatorial candidates possess higher rates of confidence following the election. Furthermore, we investigate the existence of a winner's effect at the national level by analyzing 2006 panel data comprised of pre- and post-election survey data. Finally, we analyze whether administrative changes that required many states to attach voter verifiable paper audit trail (VVPAT) devices to electronic voting machines resulted in higher levels

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[16]For instance, at the national level empirical evidence suggests voters consistently predict the outcomes of presidential elections, and that correct predictions are correlated with information (Lewis-Beck and Tien 1999).

[17]Statistically significant at the 95% confidence level

[18]Statistically significant at the 95% confidence level

of voter confidence. The large-scale adoption of VVPAT devices allows us to test the confidence rates of two sub-groups of electronic voters at the national level.

The first hypothesis we test is that voters who vote for winning candidates are more confident that their ballot was counted correctly. Specifically, we test whether voting for the winning candidate leads to higher levels of confidence relative to voters who voted for the losing candidate. We test this hypothesis at the individual candidate level using self-reported voting results and house and gubernatorial election results. The empirical results support the conclusion that, following the election, voters who vote for the winning candidate in a house or governor race express significantly higher levels of confidence relative to voters who vote for the losing candidates. Additionally, a dynamic model of voter confidence that measures changes in a voter's confidence, before and after the election, suggests that a winner's effect exists at the national level. Although Republicans are more confident than Democrats before the election, we find evidence that the confidence gap between Republicans and Democrats shrinks following the 2006 election. We attribute this finding to the existence of a winner's effect at the national level where Democrats identify themselves as the winners, and Republicans the losers, of the 2006 election.

The second hypothesis we test is that in the context of electronic voting, the presence or absence of a VVPAT device significantly affects voter confidence. Our results show that when electronic voting machines are not equipped with a VVPAT device that electronic voters are significantly less confident relative to paper voters. However, we find that in a national sample of electronic voters the addition of a VVPAT device significantly increases the confidence rate of electronic voters. Furthermore, estimates of the change in a voter's confidence rate, as measured by the difference in a voter's confidence before and after the election, are statistically equivalent between voters who cast an electronic ballot in the presence of a VVPAT device and voters who cast a paper ballot. We conclude that in discussing the effect of electronic voting upon voter confidence, it is necessary to frame the debate in the context of whether or not a VVPAT device is present.

This empirical evidence lends strong support to the conclusion that, in order to understand voter confidence, it is first necessary to understand the context of an election. The possibility that the factors that predict voter confidence, and to some extent contribute to voter confidence, may vary depending upon the context of the election and timing of the survey is an important question. Only through additional research on voter confidence can academics begin to understand fully the subtle nuances that comprise a voter's perception of confidence in the American electoral process.

The following chapter was written in association with Charles R. Plott. All authors contributed equally to the following chapter.

Chapter 4

Information Revelation in Committees

4.1 Motivation

During the recent economic crisis, Congress commissioned a number of committees to gather information and propose policies to stabilize the financial and auto sectors. These committees frequently relied on the information and policy recommendations provided by corporate executives and industry spokespeople. Numerous media, shareholder rights, and political watchdog groups called into question the prudence of using industry insiders to provide objective policy recommendations. These organizations expressed concern that industry insiders may recommend self-serving legislation rather than policies that are in the best interests of citizens and consumers. These concerns appear justified given the actions of bailout recipients: AIG used bailout funds to pay \$165 million in bonuses to 168 employees and Bank of America spent approximately \$10 million on a Super Bowl party (Zumbrun 2009; Berger 2009). This article analyzes whether the rules and procedures common to most committees transfer information from biased, privately informed experts to committee members.

Through competition among self-interested insiders, market-relevant information known to insiders is revealed to uninformed outsiders; in properly designed financial markets (Plott and Sunder 1982, 1988; Glosten and Milgrom 1984; Forsythe and Lundholm 1990). However, in the context of committee decisions made via majority rule, few studies examine whether committee rules and procedures affect information revelation.[1] Through an experimental design we analyze whether typical committee procedures result in information revelation when the committee relies on information held by nonvoting, biased, privately informed experts. This research is relevant to a large number of political problems, from Congressional committees to the local school boards, where committees rely on outside experts to provide the committee members with relevant policy recommendations. Using

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[1] One exception is Ottaviani and Sørensen (2001) who consider the order of information revelation when committee members possess private, asymmetric information.

laboratory experiments numerous hypotheses are tested to conclude if: (1) procedures similar to Robert's Rules of Order lead to information revelation in a multimember committee and (2) within the framework of Robert's Rules of Order can we identify committee procedures that result in better policy recommendations from biased, self-informed experts? The results have strong implications on the rules and procedures committees should employ when gathering information from experts who have incentives to provide false testimony.

In the context of information revelation applied to problems in political science, information about a realized state variable is often modeled as traveling from an informed, biased expert to a group of uninformed decision makers who are responsible for implementing a policy that is affected by some unobserved random variable (Crawford and Sobel 1982; Green and Stokey 2007). The design is one of cheap talk as the expert's payoff is determined by the action of the decision maker and is unaffected by the expert's decision of whether or not to lie about the realized state. In models of cheap talk where policies exist in a single dimensional, biased experts do not fully reveal their private information (Crawford and Sobel 1982; Gilligan and Krehbiel 1989; Austen-Smith 1993; Krishna and Morgan 2001).[2] In an extension of earlier work, Sobel (1985) analyzes the effect of expert credibility on information revelation and finds experts feign friendliness in order to develop a good reputation. Building on the credibility literature Morris (2001) develops a model with a single expert and decision maker and finds that no information may be conveyed when experts have preferences over their reputation. Analyzing information revelation under a different set of assumptions, Ottaviani and Sørensen (2001) show that when committee members possess private information herding may result in poor public outcomes.

Contrary to results over a single dimension, Battaglini (2002) finds the existence of a fully revealing equilibrium with multiple experts in a multidimensional space. However, this result is called into question when the effective policy space is restricted, as the committee may be unable to adopt a policy that adequately punishes experts for lying (Ambrus and Takahashi 2006). Additionally, when an expert's bias goes to infinity, then any information revelation hurts the expert's expected payoff and results show that in such cases no information will be revealed. (Ambrus and Takahashi 2006; Levy and Razin 2005). Finally, criticism has been leveled at theoretical models as these models tend to ignore potential complications arising from a committee comprised of ideologically extreme individuals (Londregan and Snyder 1994). This critique of theoretical results is strengthened by Krehbiel (1991) who concludes in a discussion of U.S. Congressional committees that "their composition is heterogeneous almost without exception."

Dependent upon the dimensionality, outcome space, number of experts, and magnitude of the expert biases, the research literature produces a variety of predictions about the theoretical existence

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[2]This literature focuses on the decision of either a committee comprised of individuals possessing the same ideal point, or the decision of the median committee member.

of a fully revealing equilibrium. While considering the question of information revelation in committees, we analyze information revelation under a specific set of procedural rules. We use experiments to test information revelation in a multi-dimensional space with multiple experts as: (1) we are interested in assessing whether specific committee procedures result in information revelation, and (2) theory is relatively silent on how results may change in a majority rule setting with committee members possessing heterogeneous preferences.

While related to previous work on information revelation, the experimental results reported here are not a direct test of the above theoretical models. Our experimental design differs from the above theoretical models along several dimensions. In addition to largely ignoring the heterogeneous preferences of committee members, previous theoretical research is often silent on the committee rules and procedures employed to reach a decision. Accounting for these two items, we consider information revelation in a multimember committee, where individual members have heterogeneous preferences, and the committee follows procedures similar to Robert's Rules of Order. Additionally, we account for the Londregan and Snyder (1994) critique as we consider a committee with multiple members who possess extreme preferences relative to both experts and other committee members.

The committee process studied here is that of an otherwise uninformed committee obtaining information through the policy recommendations of privately informed, self-interested experts. This is a model of cheap talk where experts are required to provide policy recommendations, and are neither punished for lying or allowed to vote with the committee. Committee members know something about the preferences of the experts so that expert recommendations and any bias in those recommendations become part of the information process. After observing expert policy recommendations, committee members use majority rule and procedures similar to Roberts' Rules of Order to select a policy from the x-y coordinate plane. As experts have the opportunity and incentive to distort the truth, we use laboratory experiments to analyze whether slight variations in committee procedures significantly affect the transmission of information from experts to committees. The next section presents the distribution of committee and expert preferences, and how uncertainty over state variables affects preferences over policy outcomes. The experimental design and procedures are then discussed, followed by models of committee decisions and behavior. Finally, the committee decisions are analyzed to determine: (1) if information revelation occurs when the committee operates under procedures similar to Robert's Rules of Order and (2) precise rules that lead to greater information revelation in the context of Robert's Rules of Order.

4.2 Overview

The committee problem is to choose a point in a two-dimensional space using a simplified version of Robert's Rules of Order. Much is known about the behavior of such committees when committee

members have well-formed preferences. When committee members are fully informed over their individual preferences and there exists a median voter in all dimensions, then the committee decision is the ideal point of the median voter (Plott 1967; Fiorina and Plott 1978). This article focuses on committee behavior when committee members have uncertainty over their preferences, such as when preferences depend on unobserved events or random state variables.

In order to understand how uncertainty affects committee member preferences over outcomes, consider a case in which committee members possess no uncertainty in their preferences over the outcome space. Group A of Figure 4.1 represents a five-person committee where each solid dot is the ideal point for a different committee member in a two-dimensional space. That is, each committee member is told the outcome that translates into their highest possible payoff (ideal point) and is distributed according to Group A of Figure 4.1. By construction, if committee members know their ideal points, then the distribution of preferences in A of Figure 4.1 results in a unique equilibrium committee decision; equal to the ideal point of the median voter (the third committee member). Furthermore, when committee members are told their ideal points, the relative preferences of committee members are always the same.
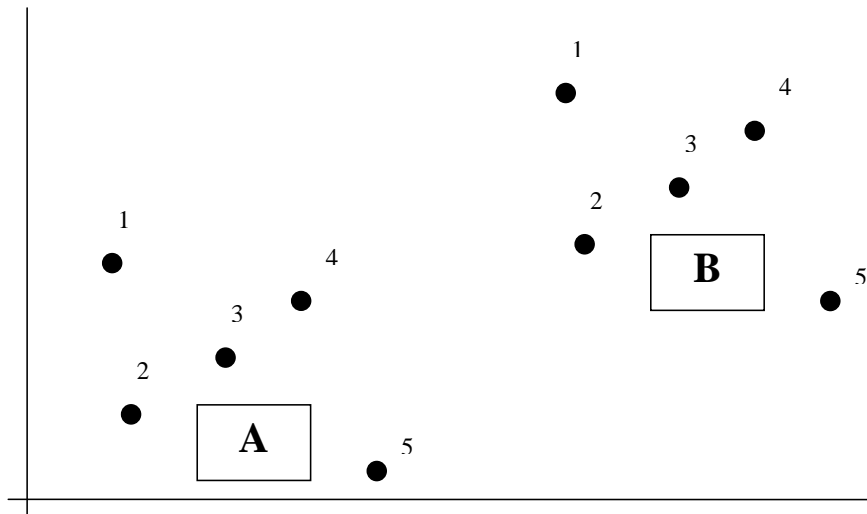

Figure 4.1: Committees & Preferences

Now suppose that committee members have uncertainty over whether their ideal points are those found in group A or group B of Figure 4.1. This scenario resembles a committee decision when the desirability of an action is affected by an unobserved state variable. In this situation, when committee member preferences over outcomes are dependent upon a randomly drawn state of nature, then uncertainty over this random state becomes uncertainty over preferences. Ultimately,

uncertainty over preferences implies that the committee's decision is dependent upon the individual committee members' information and beliefs over the unobserved state variable.

4.3 The Committee Problem

4.3.1 Preferences and Relationship to States

Each period committee members must pass a policy decision via majority rule under procedures similar to Robert's Rules of Order. The committee decision is a point in the x-y coordinate plane and determines the period payoff for all committee members and experts. Committee members and experts have state-dependent, Euclidean preferences. Thus, at time t preferences and payoffs over any point vary depending upon the realization of two random state variables, (S_{xt}, S_{yt}). A realization of s_{xt} shifts all ideal points along the x-axis by the amount s_{xt}, while a realization of s_{yt} shifts all ideal points along the y-axis by the amount s_{yt}. Figure 4.2 plots the ideal points of the committee members and experts after a realization of $(s_{xt}=0, s_{yt}=0)$; where circles represent the ideal points of committee members and the diamonds represent the ideal points of experts.
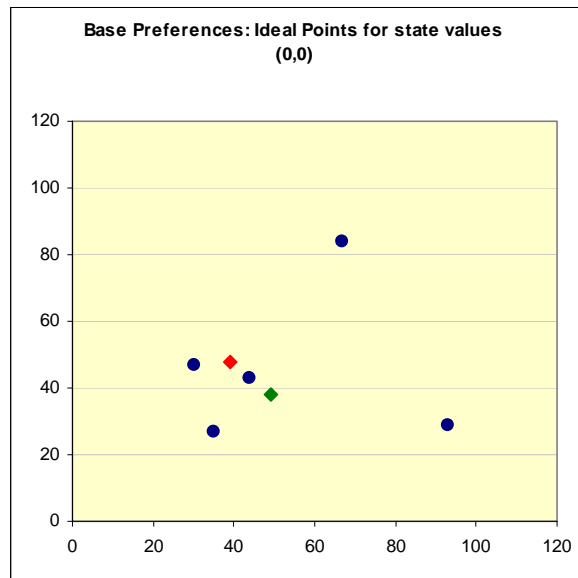

Figure 4.2: Committees' Base Preferences

In the experiments below the state is always known by experts and thus experts always know their own preferences. Experts do not vote in committee decisions, but provide information to the committee through policy recommendations. The preferences of the experts relative to the committee members are always in the same proximity as shown in Figure 4.2. We define dyadic

competition as the configuration of ideal points found in Figure 4.2. That is dyadic competition occurs when experts' ideal points are symmetrically distributed about a voter who is the median in all directions. Given this symmetric distribution and Euclidean preferences, there is no point (x_t,y_t) that both experts prefer to (x_{ct},y_{ct}). Thus, in a nonrepeated game with expert preferences distributed according to Figure 4.2, dyadic competition implies there are no incentives for expert collusion.

Committee and expert ideal points are dependent upon the state and thus vary with different realizations of the random state variables. Figure 4.3 plots the ideal points of committee members and experts following the realization of state (30,30). Given Euclidean preferences over the outcome, observation of (s_{xt},s_{yt}) alters not only individual ideal points, but preferences over the policy space. When committee members observe the realized state values, then a unique equilibrium exists (Plott 1967; Fiorina and Plott 1978); where this equilibrium is equal to the median voter's ideal point. Thus, under perfect private information there exists a point (x_{ct},y_{ct}) which is the unique Nash equilibrium committee outcome and is equal to the ideal point of the median committee member (Fiorina and Plott 1978).
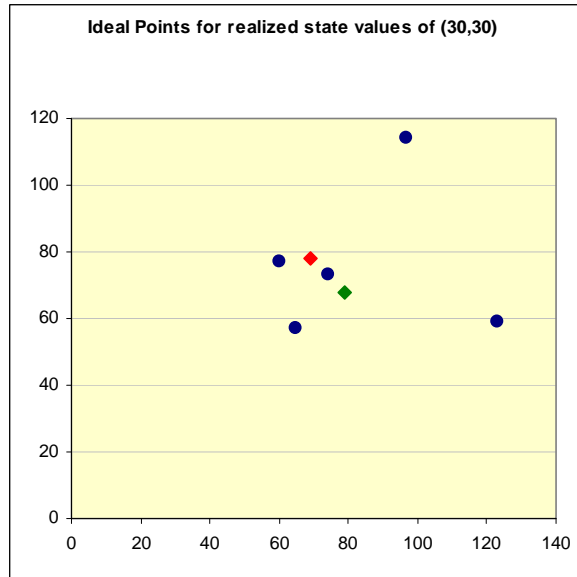

Figure 4.3: Committees' State-Dependent Preferences

4.3.2   Information

Different information environments are analyzed to determine if rules and procedures affect information revelation when biased experts provide policy recommendations to a heterogeneous committee. In these experiments the "testimony" of an expert is a policy recommendation; that is

a single point in the x-y coordinate plane. Experts are perfectly informed regarding the realization of the random state variables, but do not possess voting rights. Committee members possess voting rights, but their information over the realized state is dependent upon the information environment. As preferences depend upon the state, the information about the realized state is crucial to well-formed preferences over the outcome space. Four different information environments are used to analyze information revelation and test the two main hypotheses.

In the first information environment, the realized state values, (s_{xt}, s_{yt}), are publicly revealed to all committee members prior to the start of a period. In this information environment, no uncertainty exists over state values and experts do not provide recommendations. Experiments conducted under the first information environment estimate the upper bound of information revelation.

The second information environment represents a scenario in which committee members publicly observe the distributions, f_x and f_y, which generate the two random variables. Information regarding the realizations of the two random variables is prohibited in this information environment, thus experts are excluded. The second information environment replicates a scenario where members know the distributions of relevant state variables but do not receive additional information regarding state realizations. By only providing committee members with knowledge over the distributions of the state variables, the second information environment provides an estimate to the lower bound of information revelation.[3]

In order to test our main hypotheses about information revelation under Roberts' Rules of Order, two different information environments are analyzed; feedback and no-feedback. In both the feedback and no-feedback environments two perfectly informed, biased experts provide policy recommendations to the committee. In the third or feedback information environment the realized state variables (s_{xt}, s_{yt}) are publicly revealed following each committee decision, (x_t, y_t). However, in the fourth or no-feedback information environment the realized state values (s_{xt}, s_{yt}) for period t are not revealed until after the conclusion of the experiment. Thus, the ability of committee members to assess the accuracy of prior expert recommendations depends on the information environment.

The feedback and no-feedback experiments are used to model committee procedures that either facilitate or restrict the development of an expert's credibility or reputation. Specifically, the feedback environment represents a procedure that requires the committee to repeatedly solicit information from the same set of experts. In the no-feedback environment committee members possesses little or no information over the accuracy of an expert's previous recommendation. Thus, the no-feedback environment is similar to a committee procedure that stipulates new experts be consulted for each new policy decision.

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[3]The median voter's expected ideal point provides only an estimate of the lower bound. It is possible that expert recommendations may confuse committee members to a large enough degree that an environment that solicits expert recommendations may result in less information revelation.

4.4 Experimental Design

4.4.1 The Committee Rule and Procedures

In each period the five-person committee must pass a policy, (x_t, y_t), belonging to the x-y co-ordinate plane. Ideal points are distributed such that under full information a unique equilibrium exists which is the median voter's ideal point (Plott 1967). Each period, the individual payoff for each participant was determined by the committee decision. Except for procedures specific to the information environment, the committee procedures are the same under all experimental conditions. Each period started with an initial status quo of (200,150). Upon recognition by the committee chair, who was the experimenter, a committee member proposed an amendment to the existing status quo. Each proposal must receive verbal support from a second committee member, other than the proposer, in order for the proposal to proceed to the committee floor for a vote.

Once a proposal reached the floor, the committee was free to discuss the proposal. Individual committee members were free to discuss in what direction they preferred the proposal to move, but were prohibited from discussing specific points or payoffs.[4] Following conclusion of debate, the committee simultaneously and publicly voted on whether or not to accept the proposal; abstention was not allowed. If a majority of the committee agreed to adopt an amendment, then that amendment became the new status quo. If a majority of committee members voted against the current amendment, then the status quo remained unchanged. Thus, passing a proposal simply changed the current status quo and did not end the period. Committee members were free to make as many proposals as they wished during a period.

At any time during the proposal process a committee member could make a motion to end debate at which time the entire committee immediately voted whether to accept or reject the current status quo. If a majority of committee members voted to accept the current status quo, then the period immediately ended and payoffs for that period were determined by the current status quo. If a majority of committee members voted against accepting the current status quo, then the proposal process continued from the point of interruption.[5]

In addition to committee members, the experiments conducted under the feedback and no-feedback information environments contained two experts. In each period, experts possessed perfect private information of the state variables (s_{xt}, s_{yt}): where s_{xt} and s_{xt} were independently drawn from the uniform distribution, $[0, 50]$. Prior to the first proposal expert j was required to make a policy recommendation, (x_{jt}, y_{jt}), to the committee. Experts and committee members were told that the point (x_{jt}, y_{jt}) represented j's most preferred policy outcome. The initial recommendation process

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[4]That is committee members where able to say whether they approved or disapproved of the current proposal. Additionally, committee members were free to state in what spatial direction they would prefer to see the current proposal moved.

[5]There were no rules that blocked the committee from rejecting a status quo during the motion to end debate and later passing the same status quo as the final committee decision.

consisted of two actions. First, an expert privately committed to a recommendation by writing (x_{jt}, y_{jt}) on a piece of paper. Second, the expert publicly declared the point (x_{jt}, y_{jt}) aloud to the entire committee.[6]

4.4.2 Experimental Conditions

There were four experimental conditions: each experimental condition corresponds to a different information environment. Each experimental condition consisted of at least one experiment containing multiple periods or policy decisions. The committee decision determined the payoff for both committee members and experts for each period. Committee members possessed different ideal points and preferences over the outcome space. Therefore, the decision point which resulted in the highest payoff to one committee member did not result in the highest payoff to another member. Committee members did not know the ideal points of the other committee members. However, committee members did know the spatial direction (up, down, left, right) of their preferences relative to the preferences of other committee members.

In the experimental conditions containing experts, conditional upon observing (s_{xt}, s_{yt}) committee members could locate each expert's ideal point. Thus, given policy recommendations corresponding to different realizations of the state variables, committee members could infer if at least one expert was lying. However, it is important to note that in this scenario committee members were only able to infer whether an expert was lying and could not tell if both experts were lying. Additionally, committee members were not able to distinguish through the recommendations which expert was lying.[7] Below we outline the four experimental conditions labeled Series 1, Series 2, Series 3, and Series 4 which correspond to one of the four information environments studied.

Series 1: Public Revelation of Realized State Values

Prior to the start of each period t, committee members were publicly told the realized state values (s_{xt}, s_{yt}). The committee proceeded with proposals, deliberation, voting, and ultimate choice from among the X-Y coordinate plane. Experts did not participate in the ideal point information experimental condition. Since the state was known, payoffs were computed and recorded following each period.

Series 2: Public Revelation of Distributions Used to Draw State Values

Prior to the start of each period t, committee members were publicly told the distributions, f_x and f_y, of the two random variables; where $f_x \sim u[0,50]$ and $f_y \sim u[0,50]$.[8] Other than the difference in the revelation of information and that payoffs were not computed until the completion of the final period the Series II condition is identical to that of the Series I condition.

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[6]Experts alternated who gave the first public recommendation.

[7]Additionally, committee members did not possess information regarding the ideal points of the experts relative to other committee members.

[8]The distribution of the random variables f_x and f_y was kept constant across all periods and information environments.

Series 3: Experts with Feedback

Before the first proposal in any period, the realized state values, (s_{xt},s_{yt}), were privately told to both experts; committee members did not observe realized state values. Each expert was required to write a policy recommendation on paper, and then the expert stated this point as the expert's most preferred policy outcome. After expert policy recommendations, the proposal process began. Following the committee's decision to pass a specific policy, the state values were publicly revealed to all committee members. At the end of each period, experts and committee members computed their individual payoffs for that period.

Series 4: Experts without Feedback

The experimental condition for Series 4 is identical to that of Series 3 except that in this condition committee members did not observe the realized state value following the conclusion of each period. Committee members were told the true state values for all periods following the conclusion of the final period; at which time individuals computed their payoffs for each individual period. Thus, unlike Series 3 the Series 4 condition prohibited committee members from evaluating the truthfulness of an expert's previous recommendation.

4.4.3 Experiments

A total of 16 experiments were conducted. The experiment dates, experimental condition, and total number of periods are listed in Table 4.1. While the realized state values vary across periods within an experiment, the values of (s_{xt},s_{yt}) for period t were kept identical across experiments. The list of realized state values, (s_{xt},s_{yt}), is found in Table 4.2. There were a total of 7 periods under each of the Series 1 and 2 conditions while the Series 3 and 4 experiments contained 62 and 72 periods. The number of periods for the Series 1 and 2 conditions is smaller as theory, prior research by Fiorina and Plott (1978), and experimental results suggest additional periods were unnecessary.

The Series 1 and 2 experiments contained 5 subjects with one additional individual being employed as a scribe. The Series 3 and 4 experiments contained 7 subjects with one additional scribe. Our subject pool is comprised primarily of Caltech undergraduates with three Caltech and one UCLA graduate student and one non-affiliated adult. Recruiting was primarily done through email where individuals belonging to the Caltech social science experiment pool received an invitation to participate in an experiment. Additional recruitment took place in undergraduate economics and political science classes taught on Caltech's campus.

4.4.4 Experimental Procedures

At the beginning of each session, the experimenter randomly assigned participants to committee or expert positions. Each participant was provided with the following materials: a printed copy of the

List of Experiments	Information	Number of Periods
Series I		
20060507(a)	Perfect Information	7
Series II		
20060607(b)	No Information	7
Series III		
20060114	Feedback	5
20060301(a)	Feedback	8
20060301(b)	Feedback	10
20060305	Feedback	11
20060308	Feedback	9
20060430	Feedback	9
20060502	Feedback	10
Series IV		
20060125	No Feedback	10
20060128	No Feedback	9
20060129	No Feedback	11
20060304(a)	No Feedback	12
20060304(b)	No Feedback	12
20060512	No Feedback	9
20060513	No Feedback	9

Table 4.1: List of Experiments

Period	s_{xt}	s_{yt}
1	25.1	46.5
2	35.5	18
3	18.6	41.1
4	16.7	6
5	9.8	6.8
6	22.6	25.9
7	1.7	31.1
8	12.6	5.3
9	33.4	21.2
10	26.2	25.3
11	2.6	19.1
12	45.9	7.2

Table 4.2: Realized States for All Experiments

instructions, ruler, calculator, two pencils, several pieces of scratch paper, and a hand written note informing the participant of their state-dependent ideal point. Additionally, participants were given pieces of paper containing a printed x-y coordinate plane. Located on each committee member's x-y coordinate plane was a shaded 50x50 box where the center of the box represented the committee member's ideal point given a realized state of (25,25). Committee members were told that regardless of the state, their highest payoff was always located within the shaded box. Finally, each committee member was given a transparency which contained a point representing the committee member's ideal point and a series of curves representing the committee member's indifference curves. By placing the transparency over the shaded box, participants could calculate their period payoff for any state realization.[9] In the Series 3 and 4 experiments the transparency also contained the ideal points of the two experts relative to the ideal point of the committee member.[10] Following sincere expert recommendations the committee members could use the transparency to locate their and the experts' precise ideal point.

After all participants were seated the experimenter read the instructions aloud to the entire group and answered questions raised during the course of this process. At the conclusion of the instructions the experimenter reiterated that all subjects would be paid in cash following the conclusion of the experiment. Finally, participants were told that the number of periods was predetermined and the group would be notified when the experiment was over after the conclusion of the final period.

After the instructions were read and any questions had been answered, participants were told the first period would be considered a practice round, for which they would be paid, and the relevant state information would be revealed to all participants following the first period. Upon the conclusion of the first round, the experimenter would verify that each participant understood the instructions and could properly calculate their payoff from the first period. At the conclusion of the experiment, subjects totaled their payoffs from each period, as well as the practice round, and were paid in cash. Experiments averaged about two hours and subject payoffs ranged between $18 and $45 dollars with most subjects receiving between $25 and $35 dollars.

4.5   Hypotheses of Behavior & Information revelation

In order to determine if common committee procedures reveal information from biased experts, it is necessary to first determine if the committee decision reflects the information held by the com-

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[9]Subjects calculated their own payoffs using the indifference curves on the transparencies provided. After revelation of the state values, committee members could determine their payoffs by overlaying the transparency on the 200x150 x-y coordinate plane. Using the indifference curves printed on the transparency, committee members calculated their payoffs through a legend that gave a specific number of Konars for each indifference curve. For decisions landing between two indifference curves subjects were instructed to approximate the difference between the two curves. Each subject was provided with a conversion factor which translated Konars into dollars; where conversion factors varied among committee members.

[10]Thus, given committee members knew the state, then committee members could calculate the ideal points of the two experts.

mittee. The first hypothesis considers the information environment where the committee members have full information over their individual preferences. The second hypothesis addresses the information environment where committee members only know the distributions used to draw the state variables. In both hypotheses, it is assumed that the committee decision reflects rational committee behavior; that is members try to maximize their individual expected payoffs.

Hypothesis 1: Given full information about their individual ideal points, committee will implement the full information equilibrium (median voter's ideal point).[11]

Hypothesis 2: Given only knowledge over the distributions used to draw the state variables, the committee will implement the median voter's expected ideal point.[12]

The motivation for this paper is to determine whether: (1) procedures similar to Robert's Rules of Order lead to information revelation, and (2) within the framework of Robert's Rules of Order do specific procedures lead to more informed policy decision. These two questions are stated in the following hypotheses.

Hypothesis 3: When operating under rules similar to Roberts' Rules of Order, the committee decision will reveal information from nonvoting, privately informed, biased experts.

Hypothesis 4: Committee decisions are closer to the fully informed equilibrium under the feedback information environment; relative to the no-feedback information environment.

In both the feedback and no-feedback environments, experts are the greatest source of information. If committee decisions are found to reflect the amount of information held by the committee, then it is necessary to consider the behavior of experts. Additionally, it is necessary to consider how the different committee rules may affect expert behavior.

Hypothesis 5: Through their policy recommendation, experts will reveal their true ideal point.

Hypothesis 6: Expert recommendations will be uninformative.

Hypothesis 7: The distance between expert recommendations is less under the feedback information environment; relative to the no-feedback information environment.

Hypothesis 8: If the distance between recommendations does not match committee member expectations, then the committee will implement a decision that punishes one or both experts.[13]

The next section tests the above hypotheses. Each of the following results is a test of the hypothesis with the corresponding number; thus Result X is a test of Hypothesis X. Following a presentation of the results, the implications of these findings are discussed.

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[11]This hypothesis is supported by both theoretical and experimental results (Plott 1967; Fiorina and Plott 1978).

[12]This is equivalent to stating that absent additional information about the state variables, committee members will behave as expected utility maximizers.

[13]Recall that committee members possess a priori information regarding the state-independent distance between the ideal points of the experts. If expert recommendations are inconsistent with a priori information, then due to either purposeful action or uncertainty over preferences the committee decision punishes one or both experts.

4.6 Results

Result 1: When all committee members know their individual ideal points, the committee decision approximates the fully informed equilibrium (median voter's ideal point).

Support: Prior to the start of the proposal process in the Series 1 experiment, the two state variables were publicly revealed to the committee members. Series 1 committee decisions, (x_t, y_t), are plotted in Figure 4.4 and normalized to the fully informed equilibrium, (x_{ct}, y_{ct}). The committee decisions under perfect information are nearly identical to the fully informed equilibrium. The average distance between committee decision and fully informed equilibrium was 1.1 units with a standard deviation of .5 units. [14] These results are consistent with findings by Fiorina and Plott (1978) and we conclude that under perfect information the committee decisions are near the fully informed equilibrium.
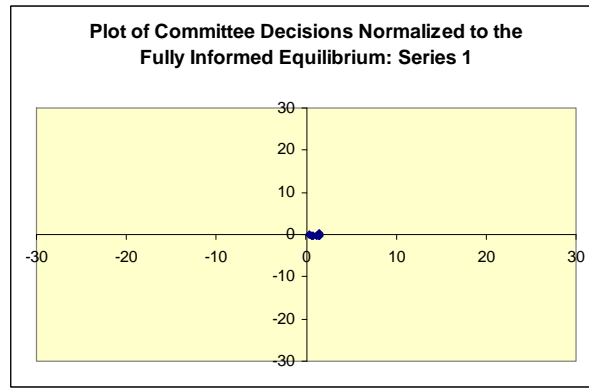

Plot of Committee Decisions Normalized to the Fully Informed Equilibrium: Series 1

Figure 4.4: Series 1 Committee Decisions: Full Information

Result 2: If committee members only know the distribution used to draw the state variables, then the committee decisions are consistent with the median voter's expected ideal point.

Support: Figure 4.5 plots the seven committee decisions made under the Series 2 experimental condition where committee decisions, (x_t, y_t), are normalized to the median voter's expected ideal point. Only two points are visible in Figure 4.5 as the committee implemented only two distinct decision points over the seven periods.[15] When committee members possess knowledge only over the distributions of the random variables, the average Euclidean distance between the committee decision and the median voter's expected ideal point was 1.3 units with a standard deviation of .5 units. Thus, under an information environment where committee members only possess knowledge

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[14] We speculate that a portion of this difference is due to the state variables being distributed continuously distributed along the interval [0,50]. Committee members appeared to ignore the information after the decimal point and always made proposals in whole numbers.

[15] The differences along the x and y axes between the predicted equilibrium and the committee decision was (0,1) for five observations and (2,0) for two observations.

over the distributions that generate the state variables, the committee decision is consistent with behavior that maximizes expected utility.
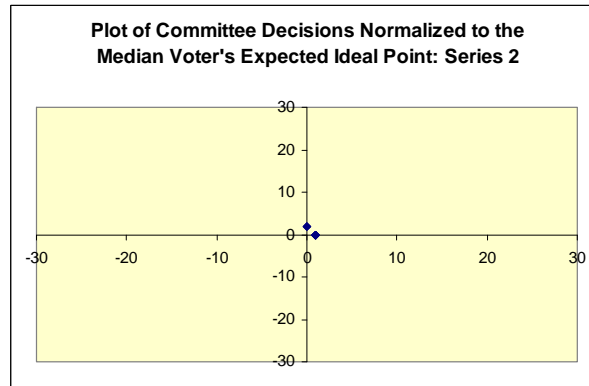

Figure 4.5: Series 2 Committee Decisions: Expected Ideal Point

Result 3: Under dyadic competition and procedures similar to Robert's Rules of Order, the committee process reveals information from biased, nonvoting experts.

Support: In order to determine if the committee process leads to purposeful and meaningful information revelation we analyze three questions. First, do committee decisions differ when committees receive expert policy recommendations relative to committees that possess knowledge only over the distribution of the possible state? Second, does the fully informed equilibrium provide a better prediction of the committee decision relative to the median voter's expected ideal point? Finally, when committees receive expert recommendations, is the average committee decision closer to the fully informed equilibrium or the median voter's expected ideal point?

Turning attention to the first of these questions, the committee decisions under the Series 3 and 4 experimental conditions are normalized to the median voter's expected ideal point and plotted in Figures 4.6 and 4.7. Clear patterns emerge in these figures as the vertical lines tend to represent periods with the same state realizations. The existence of state-dependent patterns suggests that the deviations between the fully informed equilibrium and the committee decisions under the Series 3 and 4 information conditions are not entirely random.

A comparison of how well the two outcome models predict the committee results under the Series 3 and 4 conditions are located in Table 4.3. If committee members have beliefs that the expert recommendations are uninformative, then by Result (2) the Series 3 and 4 committee decisions will approximate the median voter's expected ideal point. A t-test rejects the hypothesis that the average distance between the committee decision and the full information equilibrium is equal to the average distance between the Series 2 decisions and the median voter's expected ideal point (Series 3 t=14,
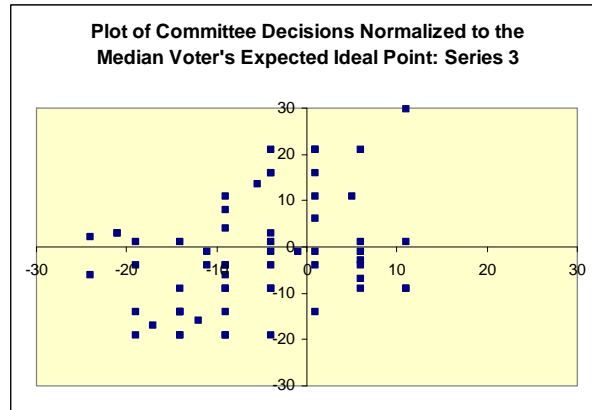
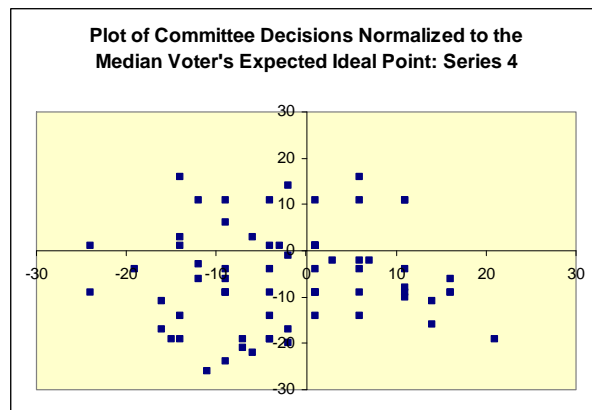Figure 4.6: Series 3 Committee Decisions: Expected Ideal Point

Figure 4.7: Series 4 Committee Decisions: Expected Ideal Point

Series 4 t=14). Thus, on average the committee decision is significantly different than the median voter's expected ideal point.

	Fully Informed Equilibrium		Median Voter's Expected Ideal Point	
Series 1	17.9	(2.8)[a]	1.3	(3.5)[a]
Series 2	1.1	(.2)[a]	16.4	(.2)[a]
Series 3	6.9	(.6)[a]	14.6	(.9)[a]
Series 4	9.5	(.7)[a]	13.4	(.8)[a]

a - This is the standard error which is computed as $\dfrac{s}{\sqrt{n}}$.

Table 4.3: Summary of Committee Decisions by Series

Turning our attention to the full information equilibrium, we investigate whether expert recommendations fully reveal the state variables (s_{xt}, s_{yt}). Figures 4.8 and 4.9 plot the committee decision normalized to the median voter's ideal point. Contrary to results in the distribution limited information case, no strong patterns emerge as the distribution of committee decisions appears to be randomly distributed about the median voter's ideal point. However, expert recommendations are not fully revealing, as the average distance between the full information equilibrium and the committee decision is greater under the Series 3 and Series 4 conditions relative to the Series 1 condition (t=8,t=11).
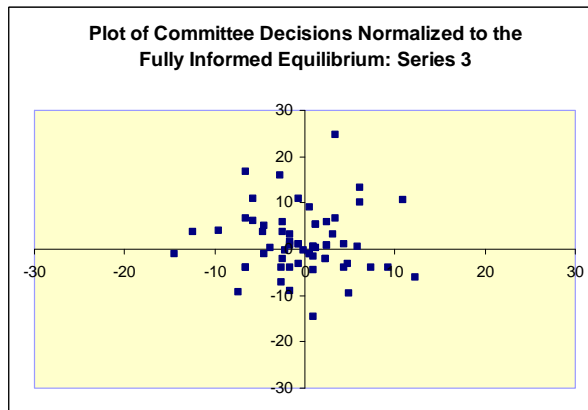

Figure 4.8: Series 3 Committee Decisions: Fully Informed Equilibrium

**Plot of Committee Decisions Normalized to the
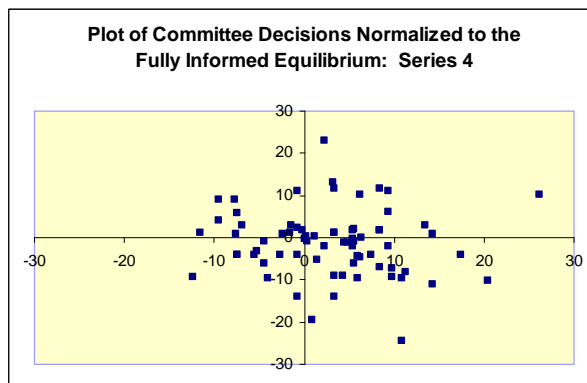Fully Informed Equilibrium: Series 4**

Figure 4.9: Series 4 Committee Decisions: Fully Informed Equilibrium

While neither the full information equilibrium nor median voter's expected ideal point predict the committee decision in Series 3 or 4, it is possible that the full information equilibrium is a better predictor of the committee decision. Across the Series 3 and 4 conditions the full information equilibrium provides a closer approximation of the committee decision in 82% and 64% of observations; relative to the median voter's expected ideal point. Binomial tests reject at the 95% significance level the hypothesis that in 50% of observations the committee decision is closer to the median voter's expected ideal point relative to the fully informed equilibrium. The 95% confidence interval associated with this binomial test is [.71, .91] under the Series 3 condition and [.52, .75] under the Series 4 condition. Thus, in both the Series 3 and 4 conditions the full information equilibrium is a more accurate predictor of the committee decision relative to the median voter's expected ideal point.

Finally, Table 4.3 shows the average distance between the committee decision and the full information equilibrium and the median voter's expected ideal point. Analyzing the experimental results, the average distance between the committee decision under the Series 3 and 4 environments is significantly closer to the fully informed equilibrium relative to the median voter's expected ideal point (t=-7.0 for Series 3, t =-3.6 for Series 4). Thus, on average, the fully informed equilibrium is a better predictor of the committee decision.

In conclusion, experimental results support the claim that information revelation occurs in the Series 3 and 4 conditions. This conclusion is based on experimental results that find: (1) the committee decision implements a point significantly different than that predicted by the median voter's expected ideal point, (2) the committee process results in a decision that is consistently closer to the fully informed equilibrium relative to the median voter's expected ideal point and (3) the fully informed equilibrium is on average a better predictor of the committee decision.

Result 4: Committee decisions are closer to the fully informed equilibrium under the feedback information environment.

Support: In the feedback experiments the 95% confidence interval for the average distance between the fully informed equilibrium and the committee decision is [5.7, 8.1]. The corresponding 95% confidence interval for the no-feedback experiments is [8.2, 10.9]. Thus, the estimated average distance between the committee decision and the median voter's ideal point is significantly less under the feedback environment.

Result 5: Experts do not sincerely reveal their ideal points.

Support: Figures 4.10 and 4.11 show expert recommendations normalized to their state-dependent ideal points for the Series 3 and 4 experimental conditions.[16] Expert A's recommendations are denoted by a diamond while B's recommendations are denoted by a triangle. The graphical evidence shows that expert A's recommendations tend to lie in the second quadrant while B's lie in the fourth quadrant. Given A's (B's) ideal point relative to the fully informed equilibrium lies in the second (fourth) quadrant, A's (B's) recommendations appear to be an attempt to influence the committee decision. Across both the Series 3 and 4 conditions the average Euclidean distance between an expert's recommendation and the expert's ideal point is 9.4 units with a standard error of .6. Thus, the average Euclidean distance between an expert's recommendation and their true ideal points is statistically significant at the 99% confidence level. In the Series 3 condition, only 11 of 124 (8.8%) expert recommendations are within 1 unit of the expert's ideal point. In the Series 4 experiments, just 1 of 144 expert recommendations was within 1 unit of the expert's ideal point. Thus, regardless of the feedback condition experts do not consistently reveal their true ideal points.
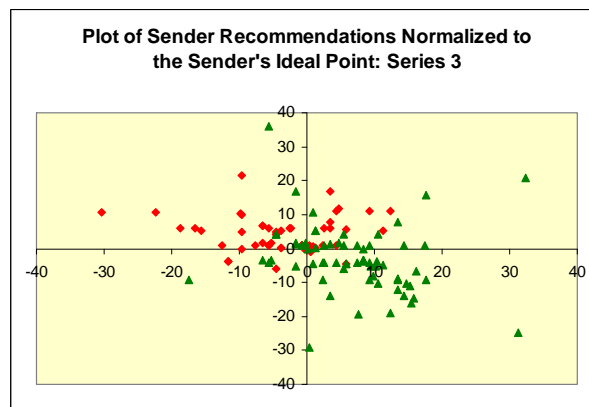

Figure 4.10: Expert Policy Recommendations: Series 3

Result 6: Expert recommendations are informative.

Support: While the recommendations in 4.10 and 4.11 indicate experts do not truthfully reveal their ideal points, about 65% of recommendations in both the Series 3 and 4 experiments are located within 10 units of the expert's ideal point. Thus, while not truthfully revealing their

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[16]Three outliers were eliminated from the Series 4 graph in an effort to make the graph reader friendly.

Plot of Sender Recommendations Normalized to the Sender's Ideal Point: Series 4
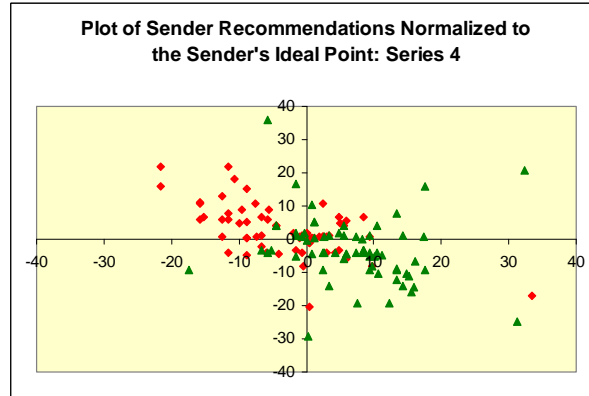
Figure 4.11: Expert Policy Recommendations: Series 4

ideal points, experts tend to provide recommendations relatively near their ideal points regardless of the feedback environment. If experts submitted uninformative recommendations, consistent with recommendations at opposite corners of the state space, then the distance between these recommendations would be 70.7 units. An analysis of the data reveals not one period in which both experts provide recommendations consistent with the corners of the state space. Finally, while not completely uninformative, experts may choose to submit recommendations that are uninformative along a single dimension. Combining observations across the Series 3 and 4 conditions, in 98% of observations recommendations were informative along both dimensions. Thus, expert recommendations are informative; as expert recommendations are informative in more than 95% of observations.

Result 7: The distance between expert recommendations is less under the feedback information environment.

Support: Designating the feedback condition, Series 3, as the treatment and the no-feedback condition, Series 4, as the control, we estimate the average treatment effect on the distance between expert recommendations. When performing an exact match on the realized state values for periods 1-10, the average treatment effect is -4.5 units with a standard error of -2.1 (t=-2.1). Thus, the distance between recommendations is less under the feedback information environment relative to the no-feedback environment.

Result 8: The expected payoffs to both experts are lower when the Euclidean distance between recommendations is greater than 21 units.

Support: Let M be the Euclidean distance between expert recommendations. Given dyadic preferences there is a unique decision, the median voter's ideal point, which results in the same payoff to both experts. For any other decision, one expert receives a higher payoff. Analyzing expert period payoffs, under the Series 3 condition the average payoffs for both the highest- and lowest-paid experts are significantly lower in periods where M>21 (t=2.0 and t=2.9). Similarly, in the

Series 4 condition the average payoffs for both the highest- and lowest-paid experts was significantly lower in periods where M $\geq$ 21 (t=2.0 and t=2.1). Thus, we conclude that experts have incentives to provide recommendations where the distance between the recommendations is not too great. Further study is required to determine if this incentive follows from organized committee behavior which punishes experts for untruthful recommendations or the committee randomly selecting a point within constraints provided by the two recommendations.

4.7   Summary of Conclusions

Experimental results show that when operating under Robert's Rules of Order the committee decision reflects the information possessed by voting committee members. When committee members are fully informed about their preferences the deliberation process results in a committee decision that converges to the fully informed equilibrium (Result 1). When the committee only possesses knowledge over the distributions of random state variables, the committee decision converges to the unique equilibrium that exists when committee members act as expected utility maximizers (Result 2).

If a committee relies on information from biased experts with dyadic preferences, then procedures that resemble Robert's Rules of Order transfer information from experts to an otherwise uninformed committee (Result 3). If specific rules and procedures allow committee members to assess the sincerity of an expert's past recommendation, then information revelation under Robert's Rules of Order is significantly higher (Result 4). When the committee assesses the sincerity of an expert's past recommendation, the committee decision reflects more information as expert recommendations under the feedback environment contain more information (Result 7). We infer from these results that procedures which develop expert reputations lead to greater information revelation.

Expert recommendations do not reveal the experts' true preferences (Result 5), but nevertheless committee members are able to extract information from the experts' recommendations. While experts are willing to manipulate the committee and try to do so, we hypothesize that dyadic competition reduces the reward to such actions resulting in the transmission of information to committee members (Result 8).

The process of expert testimony and policy recommendations in a committee setting stimulates many questions. How does information get to the committee members and what is the role of the procedures and institutions in promoting the phenomenon? While experts do not fully reveal their private information, experts do transmit information as recommendations are not uninformative (Result 6). We hypothesize that unrealistic exaggerations of expert preferences will be recognized by the committee members and indeed, when the recommendations become too divergent the experts themselves suffer (Result 8).

The process of information revelation would seem to be related to the structure of expert preferences. Indeed the process was designed with the anticipation that information revelation would be fostered, with hints taken from existing committee designs. First, the use of two experts with preferences known to be different from those of the committee members facilitates "triangulation" by committee members on the true nature of what the experts know. The fact that experts are in a zero-sum, or dyadic competition relationship with respect to the fully informed equilibrium is similar to that used in court proceedings where the interests of litigants present diametrically opposed information to the court. Furthermore, use of only two experts with dyadic preferences relative to the fully informed equilibrium restricts the formation of coalitions and coordinated efforts to manipulate the committee. Experts were prevented from posturing based on the recommendation of the other's recommendation as experts committed to their recommendation without knowing the recommendation of the other expert. The experts did not vote and were thus limited in using the process itself as a tool for manipulation.

Can we design better processes? Our results seem to only touch on the deep and challenging task of designing deliberation processes that better merge conflict over outcome with the process of information gathering and revelation. We demonstrate that information revelation in committees is possible under procedures similar to Robert's Rules of Order in the presence of conflict and willingness to manipulate. We suggest that the ability of committees to operate in such environments is closely related to the procedures they employ, and find that the development of expert reputations may be crucial to information revelation. As we continue to explore natural and theoretical committee processes, we hope to gain insights about how to design even better procedures.

Chapter 5

Donation by Association

5.1 Candidate Fundraising Decision

Scarce resources limit a candidate's ability to deliver their message to the public. In the event a candidate obtains the public's ear, the candidate should consider the setting that will best suit their immediate and long-term objectives. Consider the situation where a candidate has the option to give a speech at either a press conference or a local charity event. The question posed in this article is where should the candidate give their speech in order to raise the most money from individual contributors? To answer this question two hypotheses are proposed and tested. The first hypothesis proposes that a candidate can use associations with charity organizations to increase campaign contributions. A principle assumption of this hypothesis is that a candidate's association with a charity organization conveys information to individuals, and that this information is relevant to campaign contribution decisions. The second hypothesis posits that the effect of candidate association on campaign contributions is not uniform across all charities. That is varying a candidate's charity associations may result in the candidate targeting different sub-groups of the population. These hypotheses are considered in the context of individuals possessing low levels of candidate information and candidates choosing to associate with nonpartisan humanitarian and medical charities.[1]

While this article is silent as to why individuals contribute to candidates, the research literature provides a variety of motivations for individual campaign contributions. One theory suggests that political contributions are a form of investment where contributions are given in return for favorable policy (Denzau and Munger 1986; Baron 1989; Grossman and Helpman 1994). A second theory suggests that political contributions are a form of consumption good (Ansolabehere, de Figueiredo, and Snyder 2003). A third result finds that individuals tend to donate to friends and family (Thielemann 1993). Despite the variance in possible motivations, the literature generally agrees that resources

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[1]In this paper, humanitarian charities are defined as organizations that assist destitute or underprivileged individuals such as the Red Cross or Feed the Children. Medical charities are defined as medical research charities such as the Susan G. Komen Breast Cancer Foundation and the American Cancer Society.

largely explain individual campaign contributions (Rosenstone and Hansen 1993; Brady, Verba, and Schlozman 1995).

To date the principle finding of the resource approach to campaign contributions is that people who have money tend to contribute to political candidates (Verba, Schlozman, Brady, and Nie 1993; Brady, Verba, and Schlozman 1995; Shields and Goidel 2000). Recognizing that having money is essential to contributing, the resource approach is at best unsatisfying as no attempt is made to explain "how cash in a person's pocket is transformed into political contributions" (Llewellyn 2008). Additionally, if possession of certain types of information increases the likelihood of contributing, then a positive correlation between income and information will overestimate the importance of wealth in explaining campaign contributions. While not modeled in the resource approach, it is reasonable to assume that information plays an important role in transforming cash into candidate contributions. Prior to contributing, an individual must know the candidate's name, where to contribute, and perhaps basic policy positions of the candidate. By incorporating information into the decision process, this paper seeks to answer the question of how cash is transformed into contributions and significantly alter the manner in which the literature views political contributions. In this article, individuals obtain information about a candidate by observing a candidate's relationship with nonpartisan, nonprofit charity organizations.

How a candidate's association with a charity organization translates into individuals receiving political information is perhaps best understood in the context of a social network. An individual's social network is a structure of relations through which social capital and information relevant to the political process are obtained (Coleman 1987, 1988; Fukuyama 1995; Huckfeldt, Beck, Dalton, and Levine 1995; Putnam 1995; La Due Lake and Huckfeldt 1998). Because social capital and information are acquired through social networks, rates of political participation are often thought to be partially explained by an individual's social network (Huckfeldt and Sprague 1995; Putnam 2000; Beck, Dalton, Greene, and Huckfeldt 2002). To date the study of social networks tends to focus on the impact of person-to-person interactions on public opinion, political decisions, and participation (Thielemann 1993; Huckfeldt, Beck, Dalton, and Levine 1995; Huckfeldt, Levine, Morgan, and Sprague 1998; La Due Lake and Huckfeldt 1998; Beck, Dalton, Greene, and Huckfeldt 2002; Sinclair 2007).

Despite a focus on person-to-person interactions, it is clear that individuals receive political information by observing candidate relationships with political and social organizations. For instance, voters use party identification to infer candidate ideology and governing behavior (Campbell et al. 1960; Converse 1975; Bartels 2000; Ray 2003). Through information campaigns and spokespeople, social organizations routinely try to influence public opinion. A social organization's position on a policy or support of a candidate have been found to significantly affect participation and the development of voter preferences (Verba, Schlozman, Brady, and Nie 1993; Lupia 1994; Lupia and

McCubbins 1998; Forehand, Gastil, and Smith 2004). This article borrows from the social network literature the hypothesis that the juxtaposition of candidates and organizations, specifically charity organizations, can affect an individual's decision to contribute to a candidate by altering the individual's information and beliefs over the candidate. While this article does not directly test the type and amount of information candidate association may convey, it is assumed that a candidate's association with nonpartisan charity organizations conveys information over valence attributes such as kindness, generosity, and civic participation.

In a new approach to understanding individual campaign contributions in American elections, the primary hypothesis proposes that candidates can utilize charity organizations to increase political contributions. This hypothesis is based on the assumption that candidate association with charity organizations conveys information about the candidate and this information is relevant to campaign contribution decisions. Survey experiments are used to test this hypothesis when participants possess low levels of candidate information and receive messages about a candidate's association with nonpartisan, nonprofit charities. Following empirical analysis of the primary hypothesis, regression analysis is used to test the second hypothesis that the effect of association on campaign contributions is not uniform across all charities. The following section describes the experimental design, treatments, and method of treatment assignment. Section 3 is a discussion of the survey methodology used to collect the data. Section 4 is a descriptive analysis of the data. Sections 5 and 6 present empirical tests of the primary hypothesis that candidate association with social organizations affects candidate contributions. Regression models are estimated and analyzed in Section 7 to test the second hypothesis that the effect of association varies by organization. Finally, Section 8 discusses the implications of these results on candidate, voter, and social organization behavior.

5.2   Experiment and Treatments

A survey experiment was used to test the hypotheses regarding candidate association with charity organizations. Survey respondents were randomly assigned to either the control group or one of two treatment groups: humanitarian or medical. Of the 1,000 respondents assigned to the experiment, half were placed in the control group which simulates the situation where the candidate has no stated or known associations. The remaining observations were evenly divided between the humanitarian and medical treatments. Following assignment to a control or treatment group respondents were given the opportunity to opt out of the experiment. This choice was given in an effort to reduce bias that may arise from careless participation. Given individuals had the opportunity to decline participating in the experiment, participation rates are under 100%, the implications of low participation are discussed in greater detail in Section 5.4.

The information provided to experiment participants varied by group assignment. All control and treatment groups received a message containing information about a candidate running for office with details of the candidate's speech and policy positions. Information about the candidate's political affiliation and platform was uniform across all groups. Members of the humanitarian and control treatments received an additional message regarding the location of the candidate's speech. The control group did not receive this additional message and only knew the details of a candidate's speech and political identification. The wording of the message to the control group was:

> "Now I would like you to consider a congressional race involving independent candidate Robert Hunt. Congressional candidate Robert Hunt recently gave a speech highlighting his promises to get tough on political corruption, improve the educational system, and reduce crime."

Observations belonging to the humanitarian and medical treatments received an additional message that the candidate gave the speech to either a humanitarian or medical charity organization. The wording of the message in the humanitarian and medical treatment was:

> "Now I would like you to consider a congressional race involving independent candidate Robert Hunt. Congressional candidate Robert Hunt recently attended a charity event that raised money for humanitarian relief efforts (for cancer research). At the charity event candidate Robert Hunt gave a speech highlighting his promises to get tough on political corruption, improve the educational system, and reduce crime. "

Following the message participants were asked, "If you were asked by Robert Hunt's campaign for a financial contribution what is the percent chance (or what are the chances out of 100) that you would make a financial contribution to Robert Hunt's campaign?" Participants entered their response with an integer between 0 and 100 in a text box; this response is the dependent variable in the following analysis.[2] The next two sections discuss the method of data collection and descriptive results.

5.3   Data

The survey data comes from the 2008 Cooperative Congressional Election Study (CCES); a panel survey comprised of a pre- and post-election questionnaire that covers the November 2008 U.S. election. The objective of the 2008 CCES is to study and understand American views over Congress and Congressional representatives. The data presented in this article is taken from the pre-election survey which was fielded over the Internet during October 2008.

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[2]This article focuses on the likelihood of contributing for two primary reasons: (1) the relatively low ceilings on individual campaign contributions significantly reduces the variability in individual campaign contributions and (2) increasing likelihoods of contributing may correspond to larger donations as it may be reasonable to expect that *ceteras paribus* individuals who are willing to give larger contributions will most likely report a higher likelihood of contributing.

The 2008 pre-election CCES survey contains both a common content portion and individual research team content. The common content is asked of all 32,800 respondents and covers questions on socio-economic characteristics, political opinion, and political behavior. In addition to the common content portion, each pre-election survey contained a second set of questions submitted by one research team. The 2008 CCES is comprised of 30 American and European research teams with members at more than 34 research institutions. Each research team developed a set of questions which was asked of approximately 1,000 participants. The data presented in this article is from questions placed on the Caltech module, which is a 1,000 person nationally representative sample.

The sample frame or target population was constructed via sampling of the American Community Survey (ACS) and contains data on most socio-economic and political variables: age, race, gender, education, income, employment, party identification, etc. The 2008 CCES target population selected from the American Community Survey is a true probability sample and representative of the American population. Following completion of the CCES survey, respondents were matched to individuals in the target population based on a distance metric that paired observations with similar socio-economic and political characteristics. The goal of the matching algorithm was to pair an individual in the target population to the most similar survey respondent. The matched cases were then weighted to the sampling frame using propensity scores. A nationally representative sample of US adults was created via sample matching on registered and unregistered voters and using appropriate sample weights. Comparison of national and state election results with the weighted 2008 CCES data provides evidence that the sampling and weighting methodology produce valid national- and state-level results.[3]

5.4   Descriptive Results

Table 5.1 presents the breakdown of participation rates and observations by treatment. Recall that survey respondents were given the opportunity to opt out of the experiment, and thus participation rates are less than 100%. Analyzing the participation rates found in Table Table 5.1, it is evident that the participation rates are fairly consistent between the treatments and control group. Among the control group the participation rate was 51% and a total of 243 individuals declined to participate in the experiment. Out of a possible 250 participants the humanitarian treatment has 137 participants for a participation rate of 54%. Finally, out of a possible 250 participants the medical treatment has 123 participants for a participation rate of 49%. The greatest difference in participation is between the humanitarian and medical treatments which indicates differences may exist between the groups in the underlying distribution of socio-economic characteristics.

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[3]For more information on the sampling and weighting methodology of the 2008 CCES see "Guide to the 2008 Cooperative Congressional Election Study" (Ansolabehere 2008) at http://web.mit.edu/polisci/portl/cces/material/CCES_Guide_2008_Rough_Draft_v2.pdf.

Table 5.1: Participation & Observations

	Control	Humanitarian	Medical
Participation rate	51%	54%	49%
Total Observations	257	137	123

The primary variable of interest is a participant's likelihood of contributing to the candidate Robert Hunt (likelihood of contributing). When asking respondents in a survey their likelihood of contributing to a political candidate, one concern is that survey results may overestimate the likelihood of this event. For instance, it is possible that respondents will report being far more likely to contribute relative to their actual behavior. While a valid concern, a look at the data shows that this is not the case. In total 35% of experiment participants reported donating money to one or more political campaigns in 2008. In comparison, when averaging across all groups, the average likelihood of contributing to the candidate Robert Hunt is 18%.

Another validity check on responses is to examine if there exists a relationship between political interest and contributions to the candidate. The data would appear fundamentally flawed if a participant with a low level of political interest reports a high likelihood of contributing to the candidate. Thus, it is expected that low levels of political interest will coincide with a low likelihood of contributing. Analyzing the data, the average probability of a political contribution from a respondent who self-identifies as "not very interested in politics" is just 2.2%. In other words, individuals who report low levels of interest in politics report a very low likelihood of contributing to the candidate.

Table 5.2 and Figures 5.1–5.3 present sample statistics and histograms for the likelihood of contributing by group assignment. A review of the data shows that across all groups the center of mass for the likelihood of contributing is relatively low. The interpretation of the data presented in these figures is that on average participants are not very likely to make a political contribution to the treatment candidates. Relative to both the humanitarian and medical treatments, the likelihood of contributing for individuals assigned to the control group is skewed slightly more toward the left; implying members of the control have a lower likelihood of contributing. Comparing both the 95% confidence intervals and the histograms for the likelihood of contributing in the humanitarian and medical treatments it is apparent that these two distributions are approximately equal. Finally, the mean likelihood of contributing for both the humanitarian and medical treatments is equivalent (t=0.36).

The primary explanation for individual political contributions is that people who have money make political contributions (Brady, Verba, and Schlozman 1995). Figure 5.4 presents a plot of income and political contributions where lighter shades correspond to a greater concentration of observations. Analyzing Figure 5.4 it is apparent that the greatest density of observations is for a

Table 5.2: Likelihood of Contributing by Assignment

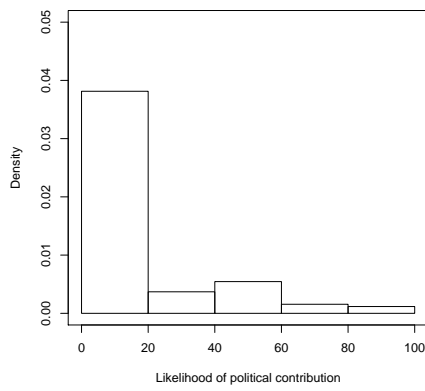|	Control Group	Humanitarian Treatment	Medical Treatment
Sample average	14.1	21.6	22.9
Standard error	23.8	29.3	31.5
95% Confidence Interval	11.2 - 17.0	16.6 - 26.5	17.3 - 28.5

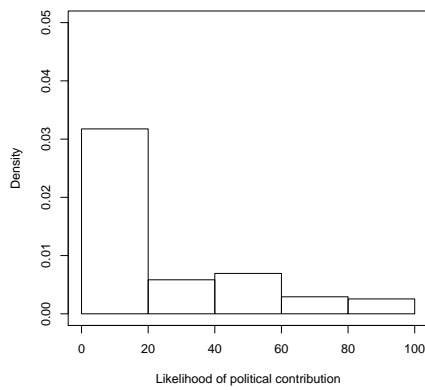Figure 5.1: Likelihood of Contributing Control Group

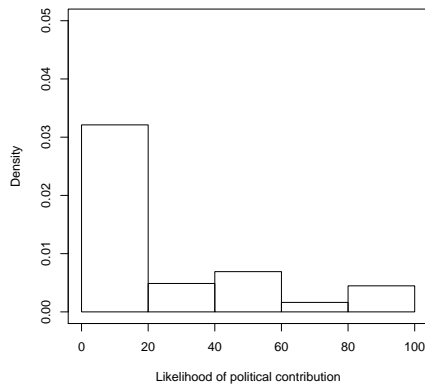Figure 5.2: Likelihood of Contributing Humanitarian Treatment

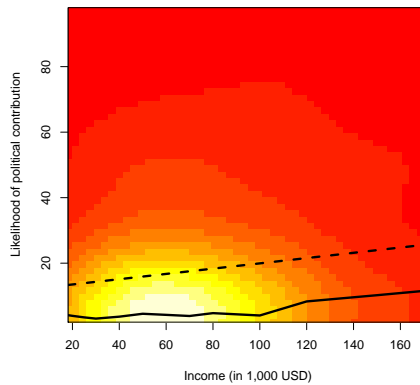Figure 5.3: Likelihood of Contributing Medical Treatment

Figure 5.4: Likelihood of Contribution by Income

low likelihood of contributing and an income level between $40,00-80,000. The solid line through Figure 5.4 plots the regression of the likelihood of contributing on income and the dotted line plots the locally weighted regression line. Similar to previous studies of political contributions, the slope of the regression line indicates a positive relationship between income and contributions. However, analyzing the slope in the locally weighted least-squares regression of income on contributing, it is clear that for most individuals the slope of the regression line is near zero. Only for families earning over $100,000 does the locally weighted regression possess a consistent and positive slope. Thus, it appears that high income individuals, who comprise a small fraction of the population, are driving the strong linear relationship between income and contributions. This result suggests that in a multivariate analysis the appropriate model specification may incorporate a nonlinear income effect.
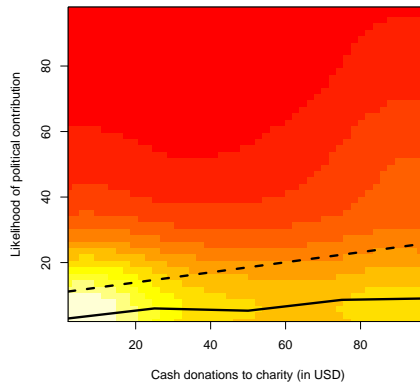
Figure 5.5: Likelihood of Contribution by Charitable Donations

One might expect that in a model of candidate association with charity organizations a positive relationship will exist between charitable donations and the likelihood of contributing. One justification for this expectation is that charitable contributions and income are positively correlated (ρ=.29). As shown above, for high levels of income there is a positive relationship between income and political contributions. Second, individuals with greater ties to the charity organization may infer greater amounts of positive information from candidate association. Figure 5.5 is a plot of charitable donations and political contributions where lighter shades correspond to a greater concentration of observations. The data in Figure 5.5 is fairly well distributed along the x-axis as more than two-thirds of participants report making charitable donations in 2008. The solid line in Figure 5.5 plots the regression line for the likelihood of a political contribution on charitable donations and the dotted line plots the locally weighted regression for these two variables. While somewhat flat in places, the slope of the locally weighted least-squares regression line is generally increasing and indicates that charitable donations have a positive effect on contributions.

Finally, it is reasonable to expect that the humanitarian and medical treatments will have the biggest effect on individuals who donate large sums of money to charity. That is a candidate's identification with a charity organization is likely to have the greatest positive effect on the members and individuals who identify with charity organizations. Figure 5.6 contains plots of the mean and standard errors for the likelihood of a political contribution by the amount of charitable donations and group assignment.

Analyzing the control group first, total charitable donations of $50 or less appear to have little effect on the mean likelihood of contributing, while donations exceeding $75 appear to have a positive and significant effect on the likelihood of a contribution. Similarly, for individuals assigned the humanitarian treatment charitable donations of $50 or less appear to have little effect on the mean
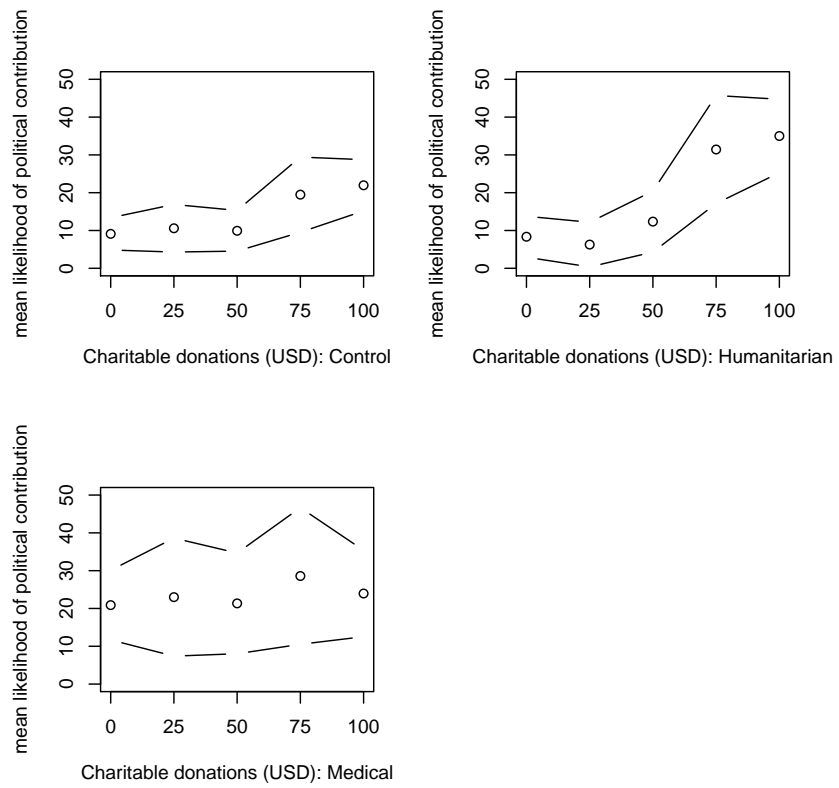
Figure 5.6: Likelihood of Contributing by Charitable Donations and Group

likelihood of contributing. Comparing observations within the humanitarian treatment, individuals donating \$75 or more are on average more than three times as likely to make a political contribution. Relative to the control group, the likelihood of contributing for individuals who make large charitable donations is roughly 10 points higher in the humanitarian group.

The bottom-left panel of Figure 5.6 plots the average likelihood of a political contribution by total charitable donations for the medical treatment. The difference between the medical treatment relative to both the control and humanitarian treatments is at once evident. The medical treatment appears to increase the likelihood of contributing for individuals who make little or no charitable donations. Relative to both the control and humanitarian groups the average likelihood of contributing for individuals who donate \$50 or less to charity is approximately 10 points higher in the medical treatment. This variance in treatment effects, as depicted in Figure 5.6, is discussed in greater detail in Section 7. However, simple descriptive results suggest that candidates may need to consider their target population when choosing between speaking engagements.

Descriptive results and figures indicate that in general the data match intuitive expectations. Individuals do not report overwhelming probabilities of contributing and there are positive relationships between political contributions and covariates such as political interest, income, and charitable donations. Finally, Figure 5.6 suggests that group assignment may alter the relationship between charitable donations and political contributions. To better understand how candidate association with charity organizations affect campaign contributions, the next section estimates naive estimates of the average treatment effect.

5.5 Naive Estimate of the Treatment Effect

The power and popularity of a randomized experiment is due to the straightforward computation of the average treatment effect (ATE). The ease of calculating the ATE in a randomized experiment is that the researcher does not need to consider socio-economic or other explanatory covariates. When group assignment is random and participation approaches 100%, then the net result of possible confounding covariates is offset by the randomization process. Let Y_i be i's likelihood of contributing, Z_i designate group assignment, and $k=\{$humanitarian, medical$\}$, then the naive ATE is:

Naive $\text{ATE}_k = \frac{1}{N_k} \sum_i Y_i(Z_i = k) - \frac{1}{N_{control}} \sum_i Y_i(Z_i = \text{control})$.

The above equation states that in a randomized experiment with full participation the ATE for treatment k is simply the difference between the sample means. Table 5.3 presents the estimates for the naive ATE for the humanitarian and medical treatments. Based on the results in Table 5.3, the estimated naive treatment effects for the humanitarian and medical treatments are a positive and

Table 5.3: Naive Average Treatment Effect

	Humanitarian Treatment	Medical Treatment
Naive ATE	7.5	8.8
Standard error	(2.9)	(3.2)
t statistic	2.6	2.8
95% Confidence Interval	1.7 - 13.2	2.5 - 15.1

significant 7.5 and 8.8 points. Thus, if only presented data from these sample averages, a politician would conclude that association with either a humanitarian or medical charity organization will significantly increase the likelihood of contributing.

Given participants had the opportunity to self-select out of the experiment and response rates well under 100%, random group assignment may not result in groups possessing similar underlying distributions of socio-economic characteristics. Specifically, if the treatment significantly alters the likelihood of respondent participation based upon income, political interest, or charitable donations, then the resulting estimate of the naive ATE may be biased. Analyzing the data, significant differences between the control and treatments are found to exist in the means of the distributions for charitable donations and political ideology. This suggests that the failure to treat is correlated with an individual's likelihood of contributing, and a better measure of the treatment effect is the average treatment effect for the treated (ATT). The ATT is derived:

$$\text{ATT}_k = \frac{1}{N_k} \sum_i Y_i(Z_i = k) - \frac{1}{N_k} \sum_i Y_i(Z_i = \text{control} \mid Z_i = k).$$

In the equation above, the first term is the observed likelihood of contributing for members of the humanitarian and medical treatments. However, the second term is the counter factual statement, "How would a member of the humanitarian or medical treatment behave if she were placed in the control?". This second term is unobserved and is estimated by matching an observation from the treatment with an observation(s) from the control. The next section describes the method used to match treatment and control observations in order to estimate the counter factual statement contained in the ATT. Following a discussion of the matching results, the treatment effects are re-estimated using the matched data.

5.6 Estimating Treatment Effects via Matching

To prevent careless participation, participants had the option to opt out of the experiment which resulted in differences between the control and treatment groups in the distribution of charitable donations and other socio-economic variables. Given theoretical and descriptive results suggesting charitable donations and socio-economic variables are correlated with candidate contributions,

matching algorithms are used to correct for the potential bias found in the estimate of the naive ATE. In this section matching algorithms are used to pair each observation from the humanitarian and medical treatments to two observations from the control group based on socio-economic, charitable donation, and political characteristics. Using these matched pairs, it is possible to estimate the counter factual statement $E(Y_i(Z_i = 0 \mid Z_i = k))$ where $k=\{\text{humanitarian, medical}\}$, and subsequently estimate the ATT.[4]

Using the $MatchIt$ program in the statistical package R, a genetic matching algorithm was used to match individuals based on their propensity of participating in either the control or treatments.[5] Two sets of propensity scores were estimated. One set of propensity scores was estimated for the control and humanitarian group observations. A second set of estimates was derived for the control and medical group observations. To derive the propensity score, a logistic regression was estimated where the dependent variable was zero if the observation participated in the control group or one if the observation participated in the humanitarian (medical) group. The independent variables in this regression were gender, family income, political interest, age, charitable donations, 2008 political donations, and political ideology. The propensity score is the logistic model estimate of the probability that an observation was in the treatment group. Each observation in the humanitarian and medical treatments was matched to the two observations from the control group with the most similar propensity score. Balance was achieved on the above covariates; balance is achieved if the means and variances of the underlying characteristics are not significantly different.

Figures 5.7 and 5.8 display the estimated propensity scores for the treated and control groups. A dark observation indicates that the control observation was matched to an observation in the corresponding treatment group. A light or clear observation in the control group indicates that this observation was not matched to a corresponding observation in the treated group. Unless specifically stated, unmatched control observations are not included in subsequent calculations.

Analyzing the distributions of the propensity scores found in Figures 5.7 and 5.8 it is evident that the control group has greater mass on lower propensity scores. The interpretation of this finding is that individuals with lower incomes, lower political interest, and lower charitable donations are more likely to participate in the control treatment relative to either the humanitarian or medical treatments. Assuming a positive relationship between these variables and political contributions, the estimate of the naive ATE is likely to overestimate the true ATE. By matching observations with similar propensity scores and eliminating unmatched observations, the likelihood of participation for the control and treated groups are held constant for characteristics such as income and charitable donations.

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[4]For greater discussion of causal inference and estimating counter factuals see Morgan and Winship (2007). For discussion and application of matching algorithms in estimating treatment effects see Imai (2005).

[5]The genetic matching algorithm uses an evolutionary search algorithm to determine the weight assigned to each covariate in an effort to achieve balance on all specified covariates (Diamond and Sekhon 2005). For more information on matching algorithms in R see Ho, Imai, King, and Stuart (2007, 2007b).
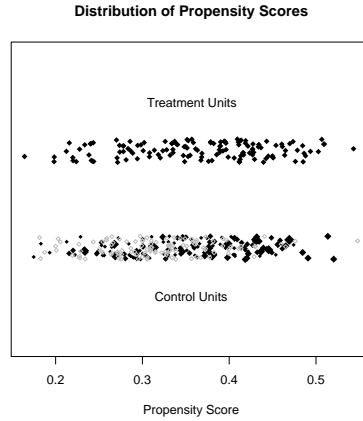
Distribution of Propensity Scores

Figure 5.7: Humanitarian Treatment

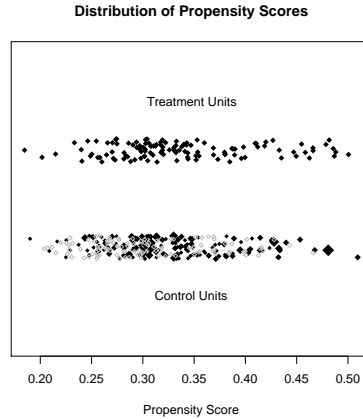**Distribution of Propensity Scores**

Figure 5.8: Medical Treatment

Table 5.4 presents the estimated ATT and ATE for the matched samples. When using matching to correct for group differences in charitable donations, income, and political ideology, estimates of the ATT and ATE indicate that candidates can affect political behavior through association with charity organizations. However, the success of these attempts is conditional upon the charity organization. By providing information that the candidate is associated with a medical charity, candidates may significantly increase the likelihood of a political contribution by 6.5 points (t=2.4). On the other hand, association with a humanitarian organization does not have a significant effect on the probability of a political contribution.

The above results focus on the effect among all observations within a group and do not account for possible differences in the treatment effect by charitable donations. As seen above in Figure 5.6, differences in the treatment effect appear to exist based on an individual's charitable donations. The

Table 5.4: Estimated Treatment Effects Under Matching

	Humanitarian		Medical	
	Control	Treated	Control	Treated
Total	257	137	257	123
Matched	173	137	162	123
Unmatched	84	0	95	0
Estimated ATT	3.2		6.5	
standard error	(2.1)		(2.0)	
t statistic	1.5		3.3	
95% Confidence Interval	(-)0.8 - 7.0		2.7 - 10.6	
Estimated ATE	3.0		5.7	
standard error	(2.2)		(2.4)	
t statistic	1.4		2.4	
95% Confidence Interval	(-)1.2 - 7.0		1.0 - 10.4	

next section uses regression analysis to analyze the hypothesis that the affect of association may vary between charity organizations.

5.7 Regression Analysis

Recall that one interpretation of Figure 5.6 is that candidates who associate with humanitarian groups are more likely to receive contributions from individuals who donate large sums of money to humanitarian charities. On the other hand, Figure 5.6 also suggests that candidate association with medical charities may affect the intercept term. Regression analysis is used in this section to test these descriptive results through the use of a more rigorous analysis that controls for socio-economic covariates and the differences in the distributions of the underlying covariates. This section presents two regressions models, the first of which demonstrates that the data behaves properly and within expectations developed by the resource approach to campaign contributions. The second regression, Model 2, analyzes the second hypothesis that the subset of individuals who are more likely to contribute may differ as a candidate chooses to associate with different charity organizations.

The second hypothesis is analyzed through a regression model that estimates differences in the treatment effects by combining observations from the humanitarian and medical treatments into a single regression; where the dependent variable is an individual's likelihood of contributing. An earlier analysis showed that in order to properly analyze and interpret the data, it was necessary to control for differences between groups in the distributions of income and charitable donations. When comparing the humanitarian and medical treatments, the mean charitable donation was significantly higher and the mean political ideology was significantly lower for the humanitarian treatment (t=2.65, t=2.07). Using the genetic algorithm in the $MATCHIT$ program, a matching algorithm

was run to develop individual weights that will reduce differences in the distributions of covariates between the humanitarian and medical treatments. Individuals belonging to the humanitarian and medical treatments were matched along the following characteristics: education, age, income, family size, political ideology, party identification, 2008 donation behavior, and charitable contributions. The resulting matching algorithm successfully matched all individuals in both treatments and produced an individual weight for each observation; where each medical treatment observation was matched to two humanitarian treatment observations. When analyzing the weighted data, using the individual weights computed by the matching algorithm, the significant differences in the parameters of the underlying covariates were eliminated. In the subsequent regression analysis, the individual observations are weighted according to the weights generated by the matching algorithm.[6]

Turning attention to the regressions, Model 1, is a standard model of individual political contributions. The independent variables included in Model 1 are common to past studies of campaign contributions; such as income, age, education, political identification, and political interest.[7] Based on the results of similar models explaining campaign contributions, it is expected that both income and political interest will exert a positive and significant effect in Model 1.

The estimates for the coefficients included in Model 1 are presented in Table 5.5. The results of the first model suggest that a basic regression of the likelihood of contributing on socio-economic variables produces similar results to that found in the resource literature. Specifically, the estimated coefficient for income and age are significant and positive. The significance of the estimated coefficient for income in Model 1 suggests that the data appear reasonable and comparable to previous analyses. However, the low value of the adjusted R^2 in Model 1 suggests that a purely socio-economic explanation does not adequately model campaign contributions when candidates associate with charity organizations.

The second column in Table 5.5 presents the estimates for the coefficients in Model 2. In addition to the variables included in the first model, Model 2 estimates coefficients for the independent variables *medical*, *charitable donations - humanitarian*, and *charitable donations - medical*. The variable *medical* captures any shift in the intercept that occurs from an individual receiving the medical treatment relative to the humanitarian treatment. Given estimates of the average treatment effect that suggest the effect of the medical treatment on the likelihood of contributing is greater for the medical treatment, it is expected that the coefficient for *medical* will be positive. Finally, it was suggested earlier that individuals who donate large sums of money to charity may be more likely to contribute to candidates who associate with charity organizations. The two variables *charitable donations - humanitarian* and *charitable donations - medical* measure how much money

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[6]This ensures that the underlying covariate distributions possess similar means and variances.

[7]Given descriptive results that suggest a nonlinear relationship between income and contributions, the regression models are estimated with a squared income coefficient on the right-hand side. Alternative specifications which incorporate a linear income term do not produce significantly different results, but are a poorer fit to the data.

Table 5.5: Models of Political Contributions

	Model 1	Model 2
age	**0.36**	**0.29**
	(.12)	(.13)
education	-2.57	**-2.96**
	(1.32)	(1.26)
income squared[d]	**0.57**	.45
	(.25)	(.26)
political interest	3.39	3.67
	(3.09)	(2.99)
political ideology	0.01	0.02
	(.10)	(.10)
charitable donations - humanitarian	-	**.20**
	-	(.06)
charitable donations - medical	-	.01
	-	(.07)
medical	-	**14.2**
	-	(4.88)
intercept	16.0	12.0
	(10.30)	(9.67)
observations	260	260
log likelihood		
adjusted R^2	.08	.17

a. Coefficients in bold are significant at the 95% confidence level, $p \leq .05$

b. Variables included in the regression and excluded from the table:

 gender, married, kids, party strength, and party identification.

c. Excluded variables did not have a significant effect in any model.

d. In millions

an individual in either treatment donated to charity; the variable takes a value of zero if the individual did not belong to that treatment. If individuals who donate large sums of money are more likely to contribute to a candidate who associates with charity organizations, then one or both of the coefficients for charitable donations will be positive and significant.

Recall that the second hypothesis posits that the effect of candidate association, that is who is more likely to contribute, is not uniform across all charity organizations. The results of Model 2 support the second hypothesis as regression results show that humanitarian and medical association have distinct and separate effects on who contributes. First, the interpretation for the positive and significant coefficient on *charitable donations - humanitarian* is that individuals who donate large sums of money to charity are more likely to contribute to a candidate who associates with a humanitarian charity. Second, the insignificant coefficient on *charitable donations - medical* suggests that the amount of an individual's charitable donations has no effect on the likelihood of a campaign contribution when the candidate associates with medical charities. Finally, the positive and significant coefficient on the variable *medical* suggests that all individuals, regardless of income, age, charitable donations, or political ideology, are significantly more likely to contribute to a candidate who associates with a medical charity.

The regression results in Model 2 imply that the effect of candidate association with social organizations varies between organizations and has a highly nuanced effect on political contributions. First, the positive and significant estimate for the coefficient *medical* implies that the likelihood of a contribution for a candidate associated with a medical charity organization is largely independent of income and charitable donations. However, for candidate's associating with humanitarian groups the probability of a contribution is significantly and positively tied to the charitable donations of the individual. These results suggest that candidates should be aware of their support base, and should choose associations depending upon whether they are targeting broad-based populous or well financed philanthropists.

5.8 Discussion

An implication of empirical studies of campaign contributions is that, short of increasing an individual's income, there is little candidates can do to increase individual political contributions. In this article, the hypothesis is proposed that candidates can significantly increase individual campaign contributions by becoming associated with charity organizations. This hypothesis is built on the assumption that candidate association with a charity conveys information relevant to the contribution process. A second hypothesis posits that the effect of association is not necessarily uniform across all charity organizations. Tests of these hypotheses are performed in the context of nonpartisan, nonprofit charities where candidates may associate with either a humanitarian or

medical charity. The above hypotheses are tested through survey experiments in combination with matching algorithms and regression analysis.

The primary conclusion is that candidate association with charity organizations can increase campaign contributions. Results show that candidates who associate with medical charities significantly increases the likelihood of campaign contributions. However, candidates must be careful in choosing their associations as a candidate's identification with a humanitarian charity is not found to have a significant effect on the likelihood of contributing. Additionally, candidate association with different charity organizations results in different subpopulations being more likely to contribute. The effect of candidate association with medical charities is uniform across all socio-economic characteristics, in particular an individual's level of charitable donations. On the other hand, individuals who donate large sums of money to charity are more likely to contribute to the candidate who associates with a humanitarian charity relative to a medical charity.

The individual campaign contributions literature focuses upon the role of money, and fails to consider how or why voter levels of information about a candidate may affect individual campaign contributions. This article hypothesizes that candidate associations with social organizations convey information about the candidate to individuals, and that this information is relevant to an individuals decision to contribute. Experimental results support this hypothesis as candidate association with medical charities is found to significantly increase campaign contributions. These results are important as they suggest that contrary to the implications of the resource approach, candidate strategies exist that may increase political contributions and the best strategy may be contingent upon the candidate's target population. Candidates seeking a broad base of support are better suited to associate with medical charities. However, candidates seeking campaign funds from wealthy philanthropists may find it beneficial to seek speaking engagements with humanitarian charities.

Perhaps raising more questions than it answers, the finding that social institutions and organizations affect political contributions is another step in better understanding the interaction of social institutions and political behavior. Additional research is needed to understand why candidate identification with some charities results in popular and uniform support, while others appear to channel a specific and wealthy subpopulation. Another open question raised in this article is what form and how much information does candidate association with social organizations provide? While empirical results imply voters receive additional information from candidate association, greater study is needed to understand the type and nature of this information. In the experiments above, care was taken to consider nonpartisan, nonprofit charities. It may be interesting to study the simultaneous effect of partisan social organizations on contributions and turnout.

If political contributions are tied to political access, then the results of the resource approach to campaign contributions present dire predictions for representative government. Given that income

inequalities exist, this article presents an alternative and perhaps optimistic view of campaign contributions. Through a solely selfish desire to increase political contributions, candidates may break, or at least weaken, the hypothesized link between income and political contributions by associating with social organizations.

Chapter 6

Cost and Rules: Candidate Behavior in Presidential Primaries

6.1   Introduction

Empirical studies of candidate policy positions find that candidate platforms do not converge at the U.S. presidential or Congressional levels (Page 1978; Enelow and Hinich 1984; Erikson and Wright 1989; Ansolabehere, Snyder, and Stewart 1998; King 1999). While scholarly research has identified numerous explanations for candidate divergence in two-candidate races, researchers persistently find that, regardless of the electoral institution, multicandidate races are a centrifugal force on candidate platforms (Coleman 1971; Aranson and Ordeshook 1972; Palfrey 1984; Adams 1999, 2000; Schofield 2004; Schofield and Sened 2005; Adams and Merrill 2006; Owen and Grofman 2006).[1] Because candidate positions are responsive to the sequential nature of an election (Aldrich 1980a), primary rules that quickly narrow the field of candidates may be successful in reducing or eliminating the centrifugal force of a multicandidate race. In the context of United States presidential elections, research generally overlooks the effect of rules on candidate exit decisions. This article attempts to partially fill this gap by modeling a two-stage sequential primary followed by a general election where candidates have the option to exit after the first primary.

Since the 1980s, there has been little progress made in explaining the process by which U.S. presidential candidates are *winnowed*: the dynamics through which potential nominees are eliminated. Typically winnowing is considered the result of a feedback loop between election outcomes and fundraising or media coverage. Unable to raise either cash or the media's attention, losing candidates are forced to exit the nomination process (Aldrich 1980a, 1980b). Formal models of candidate winnowing depict candidates locked in a war of attrition, but ignore the implications of

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[1]See Black (1948) or Downs (1957) for the definition and intuition of the median voter theorem. Recent research by Ansolabehere and Snyder (2000), Groseclose (2001), and Aragones and Palfrey (2002) suggests that candidate divergence in two-candidate races is the result of differences in candidate quality. See Fiorina (1999) for a discussion of the theories that lead to a breakdown in the median voter theorem.

winnowing on candidate platforms (Strumpf 2002). Research on the dynamics of winnowing tends to focus upon the elimination of candidates within subgroups of the Democratic and Republican parties; such as the emergence of one candidate from among all extreme Democratic candidates (Brams 1978; Shafer 1988; Kessel 1992). However, given multiple partisan subgroups the emergence of one candidate from each subgroup does not eliminate the centrifugal force of a multicandidate election.

Empirical research finds that candidates voluntarily exit the nomination contest when a candidate's electoral prospects fall below a minimal threshold (Norrander 2000). Building on this basic relationship between electoral prospects and candidate exit decisions, this article assumes that candidates with poor electoral prospects will be unwilling to pay a large cost to keep their nomination hopes alive. Under this assumption, a model is developed where primary rules and institutions require candidates to pay a cost to enter later primaries. The central question of this paper is, can a cost to enter later primaries winnow the field of candidates in a predictable manner? After the exit of within-party competition, the eventual party nominee is free to adopt a platform that maximizes the probability of winning the general election *during* the remaining primaries. Adoption of moderate platforms during the primaries is important, as research suggests that a candidate's general election platform is affected by their primary positions and actions (Burden 2001, 2004; Ezra 2004).

The model of costly sequential elections developed below is similar to the process used to select the president of the United States. There are two parties where each party contains two office-motivated candidates who compete in a two-stage party primary for their party's nomination.[2] After observing the results of the first primary all candidates must pay a fixed cost to compete in the second primary or exit the race. It is important to note that this cost is not variable or in any way tied to candidate effort. The cost candidates pay is a candidate's unavoidable financial liability: employing a campaign staff, raising campaign funds, moving the campaign staff to the next location, filing federal election commission reports, and paying ballot access fees. Following the nomination, the two party nominees face off in the general election. In general, there exist many equilibria where because of the cost to continue candidates choose to exit following the first primary. This article focuses upon the conditions in which there exists a cost and a unique equilibrium strategy profile such that following the first primary losing candidates exit and winning candidates stay. Results show that in a front-loaded primary calendar, there generally exists a cost and unique equilibrium strategies such that after the first primary losing candidates exit and winning candidates stay in the election. However, when most of the primaries take place late in the primary calendar, an equilibrium where losing candidates exit and winning candidates stay is unique only when voters derive little utility from candidate policy positions.

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[2]Office-motivated politicians has been a common theoretical assumption, anecdotal observation, and empirical finding dating back to Downs (1957) and Mayhew (1974).

6.2 Sequential Elections and Candidate Competition

Research on voter behavior during presidential primaries tends to focus on divisive primaries and momentum. The crux of the divisive primary argument is that during the general election turnout suffers from a fiercely contested nomination battle (Lengle 1980; Kenney and Rice 1987). Controlling for candidate quality and election context, Atkeson (1998; 2000) finds that the sign on the effect of divisive primaries is correct but tends to be overstated. Research on how momentum affects candidate behavior is rooted in empirical and experimental evidence that finds voters prefer to support the winning candidate (Niemi and Bartels 1984; Bartels 1985; Abramowitz 1989; Bartels 1988; Herron 1998). Finally, theoretical work finds that bandwagons will form in equilibrium when voters possess preferences over voting for the winning candidate (Callendar 2007).

The behavior of candidates, and subsequently voters, is affected by the sequential nature of the primary process. Specifically, the amount and types of information candidates transmit to voters is in part determined by the sequential nature of the presidential campaign. Downs (1957) hypothesizes that the incentives for candidates to espouse clear positions during the campaign are clearly suspect. However, primary debates have been found to be a source of voter information and have a significant effect on voter perceptions of candidates (Yawn et al. 1998; Best and Hubbard 1999). Aldrich (1980a) finds that candidates respond to these incentives during presidential primaries by altering their message to adjust for the preferences of the electorate in the next primary. Finally, theoretical results indicate that when candidates are uncertain over voter preferences, then a sequential election may reveal voter preferences and candidates will adopt ambiguous positions early in an election (Meirowitz 2005).[3] The literature on the effect of momentum in presidential primaries focuses on the twin effects of candidate expectations and resources. First, candidates who perform better than expected gain momentum and candidates who underperform lose momentum (Aldrich 1980a, 1980b). Second, momentum and resources go hand in hand as momentum is key to obtaining campaign contributions and media coverage, while candidates without momentum lose access to these resources and are forced to drop out (Aldrich 1980a, 1980b; Gurian 1986).

Electoral rules and institutions affect candidate behavior (Norrander 2000), and ultimately platform convergence (Cox 1990). Study of the rules of presidential nominations has analyzed the effect of delegate allocation rules, such as winner-take-all and proportional rules on candidate behavior (Geer 1986; Wattenberg 1991; Mayer 1996). Research suggests that the winner-take-all rule is not only more responsive to voter preferences (Ansolabehere and King 1990), but provides an advantage when the other party allocates delegates based upon voteshare or congressional district (Mayer

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[3]On the other hand, some political scientists believe that when voters are risk adverse, campaigns will transmit information, as voters are likely to punish vague policy statements on election day (Shepsle 1972; Alvarez 1997). Testing these competing hypotheses, empirical research finds that at the start of a political campaign season voters are relatively uninformed about specific candidate positions and attributes, but through candidate campaigns voters gather relevant candidate information (Gelman and King 1993; Alvarez 1997).

1996). Analysis of the rules and centrifugal forces of primary elections tends to focus on either the sequential dynamic or voting behavior in open versus closed primaries (Coleman 1971; Aranson and Ordeshook 1972; Gerber and Morton 1998; Grofman and Brunell 1997; Heckelman 2000; Kanthak and Morton 2001; Owen and Grofman 2006). The sequential elections literature finds that when a candidate's platform is fixed prior to the final election, then primaries lead to divergent platforms as a candidate becomes more extreme in an effort to secure the party nomination (Coleman 1971; Aranson and Ordeshook 1972; Owen and Grofman 2006). In the context of Congressional primaries, Gerber and Morton (1998) find that closed primary rules result in more extreme candidates relative to semi-open primary rules.

Through changes in information, momentum, or rules, candidates may have incentives to adjust their strategy during the campaign. However, research suggests that the ability of candidates to adjust voter perceptions of their ideological platform is limited by cost (Page 1978; Ezra 2001) and a candidate's previous political record (Bernhardt and Ingberman 1985; Franklin 1991; Enelow and Munger 1993; Alvarez 1997). Specifically, a candidate's previous record and positions restrict movement along the ideological space as changes in policy create uncertainty (Alvarez 1997); damaging a candidate's chances of election among a risk-adverse voting population. Finally, in the context of presidential nominations, research finds that primaries lead to the nomination of extreme candidates who, because of reputation or fiscal constraints, are unable to moderate their policy positions during the general election (Burden 2001, 2004). If multicandidate races exert a centrifugal force on candidate platforms and candidates are restricted by the positions taken in the primary, then nomination rules which lengthen partisan competition may lead to more extreme general election candidates.

This article attempts to expand the literature on presidential primaries by considering how cost and primary rules affect winnowing and platforms in presidential nomination contests. The next section presents a model where candidate behavior is dependent upon the primary calendar and the cost of entering the second primary. In this context, equilibrium platforms and exit decisions are analyzed to determine the effect of cost and rules on winnowing. While many equilibria exist in candidate exist decisions, the analysis focuses upon the conditions where there exists a unique equilibrium in which candidates play strategies consistent with a *Losing Candidate Winnowing* (LCW) equilibrium: that is, after the first primary losing candidates always exit and winning candidates always stay in the election. In general, results indicate that in a front-loaded primary calendar there exists a cost C and unique equilibrium strategies consistent with the LCW equilibrium. However, in a back-loaded primary the LCW equilibrium is unique only when candidates place little salience on candidate platforms.

6.3   The Model

The model below analyzes candidate behavior in a costly sequential primary: that is, following the first primary all candidates must pay a cost, C, to remain in the race.[4] As candidate actions are publicly observed, the equilibrium concept is subgame perfect Nash equilibrium (SPNE). While there exist many equilibria to the game, the focus is placed upon finding the conditions in which the LCW equilibrium is a unique SPNE. The timing of events for a costly sequential primary are depicted in Figure 6.1.
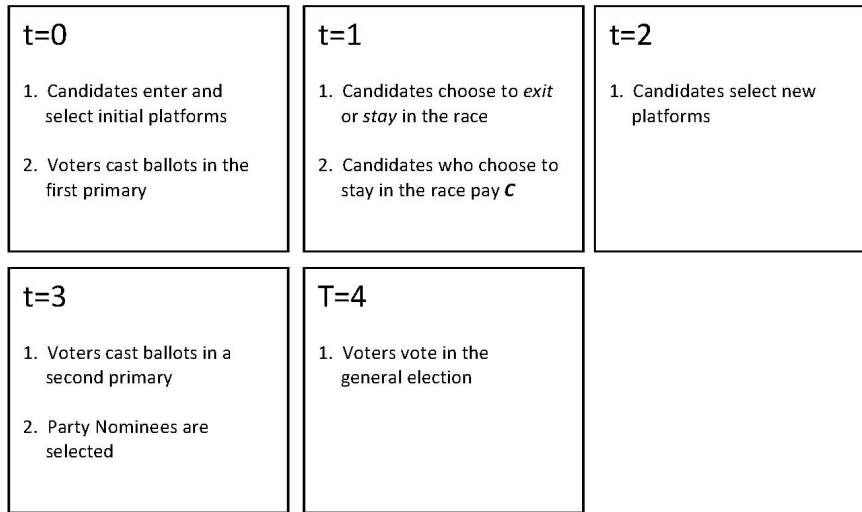

Figure 6.1: Timing of Events

Sincere voters cast ballots in two primaries at t=0 and t=3 as well as the general election at T. The subscripts t and T are used to distinguish between primaries and the general election. Voters belong to one of three equal-sized groups: Left party, Right party, or independent; $G = \{L, I, R\}$. The set G has individual elements g where x_g and x_j represent group ideal points and candidate platforms along a single dimensional policy space. The ideal points for the Left and Right party are distributed symmetrically about the ideal point of independent voters; for convenience we assume $x_I = 0$.

During the primaries voter preferences over the candidates are Euclidean in candidate platforms. Preferences are also affected by the presence of a stochastic utility shock η_j^t which is generated from a type I extreme value distribution and is independent across both time and candidates. Voter utility over candidate j at time t is:

$$u_g(x_j^t, \alpha) = -\alpha(x_g - x_j^t)^2 + \eta_j^t \tag{6.1}$$

[4]This is a fixed cost that candidates incur simply by being a candidate. The cost is unrelated to candidate effort.

where

$$v_g(x_j^t, \alpha) = -\alpha(x_g - x_j^t)^2.$$

The term α assigns the weight voters attach to a candidate's ideological position; $\alpha > 0$ is assumed to be common knowledge and constant throughout the election. Given (6.1) it is possible to write the probability that a group votes for candidate j from the set of candidates j and k at time t as:[5]

$$p_g(x^t, \alpha) = \frac{exp(v_g(x_j^t, \alpha))}{exp(v_g(x_j^t, \alpha)) + exp(v_g(x_k^t, \alpha)).} \tag{6.2}$$

Voters are sincere and select the party nominee through a closed, sequential primary at t=0 and t=3. Following the first round of primaries but before the second round, candidates may alter their policy platforms. Any change in a candidate's platform between t=0 and t=3 is observed by voters who adjust their beliefs accordingly. It is important to note that voter beliefs over candidate platforms are fixed before the conclusion of the nomination process. Following the second primary and the selection of the party nominees voters elect a candidate at T. Conditional upon j obtaining the party nomination, a group g casts all their ballots, b_g, for j at T as follows:

$$b_g = \begin{cases} j & \text{if} \quad j \in g\text{'s party} \\ j & \text{if} \quad u_{g_I}(x_j^T, \alpha) > u_{g_I}(x_k^T, \alpha). \end{cases}$$

Thus, voter behavior during the general election is dependent upon group identification; where group members behave homogeneously. Partisan voters always vote for their party nominee in the general election, and independent voters decide the general election.[6] This model of voter behavior in the general election is similar to the voters described in *The American Voter* (Campbell et al. 1960) and compatible with empirical evidence which suggests a resurgence of partisan voting behavior in U.S. presidential elections (Bartels 2000).

6.4 Candidates

In both the Left and Right parties, two office-motivated candidates compete for their party's nomination in a costly two-stage primary followed by a general election. The primaries are closed; i.e., only party identifiers may vote in the primary. Candidates are motivated by the desire to hold office. All candidates attach the same value to winning office, where the value is normalized to 1. Candidates compete for office by selecting platforms prior to the first and second primaries.

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[5]Assuming η_j^t is drawn i.i.d. and all members within a group observe the same η_j^t this result follows from properties of the distribution of the η term. See Train (1986).

[6]Extensions of this model that relax the partisan behavior assumption do not significantly affect the results. However, relaxing the behavioral assumption requires additional assumptions on the distribution of η_j.

Candidates are elected to office if the candidate obtains their party nomination by winning both primaries at $t=0,3$ and the general election at T. Let W_j^t be a binary outcome variable where:

$$W_j^t = \begin{cases} 0 & \text{if } j \text{ loses the election at time } t \\ 1 & \text{if } j \text{ wins the election at time } t. \end{cases}$$

Candidates may also obtain their party nomination by winning a single primary and being nominated by the party elite. The likelihood that the party elite nominates a candidate is dependent upon the timing of the primary calendar. A front-loaded primary calendar conveys an advantage to the winner of the earlier contest, whereas a back-loaded primary calendar conveys an advantage to the winner of the second primary. Let $\theta \in (0\,1]$ be the probability that the candidate who wins the second primary is nominated by the party elite. Given the above definitions, $\theta < \frac{1}{2}$ implies a front-loaded primary, while $\theta > \frac{1}{2}$ implies a back-loaded primary; $\theta = \frac{1}{2}$ implies a neutral primary calendar. The value of θ is common knowledge to all candidates.

At $t=0$, two-candidates from each party enter the contest and select initial platforms in $\Re$. Following candidate entry and platform selection, partisan voters cast their ballots and the election results are publicly observed. The subscripts 1 and 0 distinguish the winning and losing candidates from the first round of primaries; j_1 and j_0. When candidates j and k are accompanied by a subscript, this will distinguish winning and losing candidates from the two different parties.

Let h^t be a history of all election outcomes, candidate actions and the weight voters assign to the issue space up to t. The binary variable N_j takes a value of 0 if j loses the nomination and 1 if j wins the nomination. The probability that j wins the nomination after the first primary is:

$$p(N_j = 1 \mid \theta, h^1) = \begin{cases} \theta \cdot p(W_{j_0}^3 = 1) & \text{if } j = j_0 \\ 1 - \theta + \theta \cdot p(W_{j_1}^3 = 1) & \text{if } j = j_1. \end{cases}$$

Following the first primary candidates are faced with the action space $A^1 = \{stay, exit\}$; where candidates who choose *stay* pay the cost C. Conditional upon staying in the election candidate j selects a new platform, $x_j^2 \in \Re$. Candidates select x_j^2 so as to maximize the joint probability of winning their party's nomination and the general election. Thus, at $t=2$ a candidate maximizes:

$$E(U_j \mid \theta, h^2) = p(W_j^T = 1 \mid \theta, h^2) \cdot p(N_j = 1 \mid \theta, h^2). \tag{6.3}$$

As this is a sequential game with observed actions, we solve for SPNE strategies. While solutions are solved via backwards induction, equilibrium platforms during candidate entry are presented first as each candidate possesses a dominate strategy at $t=0$. Following the description of equilibrium platforms at $t=0$, the next section develops the conditions under which pure strategy Nash equilib-

rium platforms exist at $t=2$. Following a discussion of several important properties of the equilibrium platforms at $t=2$, attention is turned to equilibrium exit strategies.

6.5 Candidate Entry and Equilibrium Platforms

At $t=0$ two-candidates from each party enter the race and select initial platforms in order to maximize their probability of winning the first primary. As the next proposition shows all candidates have a dominant strategy in platform selection at $t=0$.

Proposition 1 Dominant strategies exit in candidate platform selection at $t=0$ where candidate j from the Left party and k from the Right party select $x_j^0 = x_L$ and $x_k^0 = x_R$.

Proof: Let candidates j and l belong to the same partisan group g. The probability that j wins the first primary is given by $p(W_j^1 = 1) = \frac{\exp(-\alpha(x_g - x_j^0)^2)}{\exp(-\alpha(x_g - x_j^0)^2) + \exp(-\alpha(x_g - x_l^0)^2)}$. Taking $\frac{\partial p(W_j^1 = 1)}{\partial x_j^0}$ and setting it equal to zero, it is the case that $p(W_j^1 = 1) \cdot (1 - p(W_j^1 = 1)) \cdot 2\alpha(x_g - x_{j^0}) = 0$ if and only if $x_g = x_j^0$.

Thus, regardless of α or θ all candidates select initial platforms consistent with the party median voter and each candidate has an equal probability of winning the first primary contest. Given the existence of a dominant strategy for all candidates at $t=0$, no candidate has an incentive to deviate from the strategies in Proposition 1. The next sections present the existence of and location of equilibrium platforms at $t=2$. Using these equilibrium platform positions, the expected payoffs to a candidate's stay or exit decision are analyzed to examine the existence of a unique equilibrium where losing candidates exit the election and winning candidates stay.

6.6 Equilibrium Campaign Platforms

After publicly observing the results of the first primary and decisions to stay or exit, a candidate's last decision is to select a platform that maximizes the joint probability of winning the nomination and general election: equation (6.3). Let $x^2 = (x_{j_1}^2, x_{j_0}^2, x_{k_1}^2, x_{k_0}^2)$ be a vector of candidate platforms at $t=2$ where $\hat{x}^2$ represents a vector of pure strategy Nash equilibrium platforms. At $t=2$ candidates select platforms in order to maximize their probability of being elected at T. Taking the partial derivative of (6.3) with respect to x_j^2:

$$
\begin{aligned}
\frac{\partial E(U_j \mid \theta, h^2)}{\partial x_j^2} &= \frac{\partial p(W_j^T = 1 \mid \theta, h^2)}{\partial v_I(x^2, \alpha)} \cdot \frac{\partial v_I(x^2, \alpha)}{\partial x_j^2} \cdot p(N_j = 1 \mid \theta, h^2) \\
&\quad + p(W_j^T = 1 \mid \theta, h^2) \cdot \frac{\partial p(N_j = 1 \mid \theta, h^2)}{\partial v_g(x^2, \alpha)} \cdot \frac{\partial v_g(x^2, \alpha)}{\partial x_j^2}.
\end{aligned}
$$

The implicit solution for a candidate's optimal platform is conditional upon the outcome of the first primary. If a candidate wins the first primary, $W_j^0=1$, the implicit solution for a candidate's optimal platform is:

$$\acute{x}_{j_1}^2 = \frac{x_g}{K_1 + K_2} \cdot p(W_{j_1}^3 = 1 \mid h^2) \cdot (1 - p(W_{j_1}^3 = 1 \mid h^2)) \tag{6.4}$$

where

$$K_1 = (1 - p(W_{j_1}^T = 1 \mid \theta, h^2)) \cdot (\tfrac{1}{\theta} - 1 + p(W_{j_1}^3 = 1 \mid h^2))$$
$$K_2 = p(W_{j_1}^3 = 1 \mid h^2) \cdot (1 - p(W_{j_1}^3 = 1 \mid h^2)).$$

If j_1 runs unopposed in the second primary, then j_1 wins the nomination with certainty; $p(N_{j_1} = 1) = 1$. It follows directly from (6.4) that if j_1 runs uncontested in the second primary, then $\acute{x}_{j_1}^2 = 0$ regardless of other candidate platforms. Thus, when unopposed during the second primary a candidate's *dominant strategy* is to adopt a platform identical to the overall median voter.

For a candidate who loses the first primary, $W_j^0=0$, the implicit solution for the candidate's optimal platform is:

$$\acute{x}_{j_0}^2 = \frac{x_g}{K_3 + K_4} \cdot p(W_{j_0}^3 = 1 \mid h^2) \cdot (1 - p(W_{j_0}^3 = 1 \mid h^2)) \tag{6.5}$$

where

$$K_3 = (1 - p(W_{j_0}^T = 1 \mid \theta, h^2)) \cdot p(W_{j_0}^3 = 1 \mid h^2))$$
$$K_4 = p(W_{j_0}^3 = 1 \mid h^2) \cdot (1 - p(W_{j_0}^3 = 1 \mid h^2)).$$

One important difference between the equilibrium platforms for the winners and losers of the primary, equations (6.4) and (6.5), is that if at $t=3$ only one primary is contested, then j_0's optimal strategy is independent of whether the primary is front- or back-loaded. The loser of the first primary must be nominated by the party elite and thus θ does not directly affect the losing candidate's choice of platform. On the other hand, when j_1's primary is contested at $t=3$, then j_1's optimal strategy is always dependent upon θ.

It is trivial to show that when $\alpha=0$, for all $x \in \Re^4$ the vector of candidate platforms x is a set of Nash equilibrium platforms. For cases where $\alpha > 0$ the vector of candidate platforms, $\widehat{x}^2$, describes a set of pure-strategy Nash equilibrium platforms if and only if for $\tilde{x}_j^2 \neq \widehat{x}_j^2$:

$$\forall j \qquad E(U_j(\tilde{x}_j^2, \widehat{x}_{-j}^2, \alpha) \mid \theta, h^2) \leq E(U_j(\widehat{x}_j^2, \widehat{x}_{-j}^2, \alpha) \mid \theta, h^2).$$

Let $f_j(x) = \acute{x}_j^2$ where $f_j : \Re^4 \to \Re$ and $e_j(x) = \acute{x}_j^2$ where $e_j : \Re^2 \to \Re$. Define $T = [x_L, x_R]$ where T^4 (T^2)is a non-empty, closed subset of $\Re^4$ ($\Re^2$).[7] The vector-valued mapping $\mathbf{f} = (f_{j_1}(x), f_{j_0}(x), f_{k_1}(x), f_{k_0}(x))$ is a mapping from T^4 into T^4 and represents the history where no candidate exists following the first primary. Similarly, $\mathbf{e} = (e_{j_1}(x), e_{j_0}(x))$ maps T^2 into T^2 where $x = (x_{j_1}, x_{j_0})$ and represents the history where one candidate from *either* the Left *or* the Right party exists following the first primary.[8] Extending the results of Merrill and Adams (2001) to the case of a multicandidate sequential election:[9]

Lemma 6.6.1 If there exists M_1 and M_2 such that for all $x \in C^4$ and $y \in C^2$,

$$\max_{M_1} \sum_{k \neq j} | \frac{\partial \mathbf{f}_j(x)}{\partial x_k} | \leq M_1 < 1 \quad and \quad \max_{M_2} \sum_{k \neq j} | \frac{\partial \mathbf{e}_j(y)}{\partial x_k} | \leq M_2 < 1 \tag{6.6}$$

then for all histories h there exists a unique Nash equilibrium strategy $\widehat{x}_j$ for each candidate in the election at t=2.

Proof: This lemma is an extension of the results contained in Merrill and Adams (2001). When the above conditions are met the vector valued functions $\mathbf{f}$ and $\mathbf{e}$ are contraction mappings on C^4 and C^2. Uniqueness of these platforms comes from the contraction mapping lemma on $\Re^n$, which states that when $\mathbf{f}$ or $\mathbf{e}$ is a contraction mapping on a closed subset of $\Re^n$ a unique fixed point exists such that $\mathbf{f}(x) = x$ or $\mathbf{e}(x) = x$; see Drager and Foote (1986). By the contraction mapping lemma on $\Re^n$, if $\mathbf{f}$ and $\mathbf{e}$ are contraction mappings on T^4 and T^2 there exist unique pure-strategy Nash equilibrium candidate platforms when primaries are competitive at t=2. It was shown above that when j_1 is unopposed in the second primary j_1 possesses a dominant strategy at t=2 to adopt the platform $x_{j_1} = 0$. Thus, unique pure Nash equilibrium platforms exist $\forall h^2 \in H^2$ when $\mathbf{f}$ and $\mathbf{e}$ are contraction mappings.

It is straightforward that given voter utility functions specified in equation (6.1), the conditions outlined in Lemma 6.6.1 will not always be met. The weight voters place on a candidate's platform is determined by α and as $\alpha \to \infty$ the weight voters place on the stochastic component goes to zero. Thus, when voters put substantially more weight on the ideological dimension, the model

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[7]Restricting candidate platforms to the interval $T = [x_L, x_R]$ is a technical assumptions that does not place any additional restrictions on candidate behavior. For any platform $\tilde{x} \notin T$ it is shown in the next section that there exists an $x \in T$ that dominates $\tilde{x}$.

[8]As the candidate in the uncompetitive primary has a dominant strategy, it is necessary to consider only the actions of the candidates in the contested primary.

[9]The approach used here to show the conditions under which equilibrium platforms exist at t=2 is similar to that found in Merrill and Adams (2001). However, there are several distinct differences in the functional form used here and that found in Merrill and Adams who consider parties or candidates as maximizing their expected vote share over a single election. Here candidates maximize their probability of winning the general election over sequential elections and the probability of attaining office is affected by θ. Because candidates make a decision to stay or exit at t=1, solving for SPNE strategies at t=2 is appropriate only if equilibrium platforms exist regardless of candidate decisions at t=1. Finally, the random parameter in this model is interpreted as a time-specific random shock rather than a valence parameter.

essentially reduces to a multicandidate race over a single dimension; which has no pure-strategy Nash equilibrium solution (Ordeshook 1986). Using the $fsolve$ computer package in $MATLAB$ and assuming voter ideal points of {-1,0,1}, simulation results indicate that candidate platforms converge as long as voters do not weight the ideological dimension 186 times greater than the stochastic dimension. For each $h^2 \in H^2$ analyzing the parameters $0 < \theta \leq 1$ under different seed values, candidate platforms converge for $0 < \alpha < 186.4$.[10] For larger values of α equilibrium platforms do not exist for all values of θ in a three-candidate race. Thus, while there are limitations to how ideological voters can be, the upperbound implies that voters can weigh the ideological dimension 186 times greater than the stochastic dimension and equilibrium platforms will exist.

6.7 Properties of Equilibrium Platforms

This section analyzes properties of equilibrium platforms when at least one primary at $t=3$ is contested. The following properties are derived from the optimal platforms found in (6.4) and (6.5). The first lemma in this section states that at $t=2$ and for any two candidates belonging to the same party, if one candidate is closer to the general election median voter, then the closer candidate's probability of winning the primary at $t=2$ is lower relative to the other partisan candidate. Furthermore, when the second primary is competitive, the equilibrium platform at $t=2$ for the winner of the first primary, j_1, is weakly closer to the general election median voter relative to j_0. A third property of any set of equilibrium platforms at $t=2$ is the expected utility of j_1 is weakly greater than that of j_0; where the expected utilities of j_1 and j_0 are equal only if the primary rules are such that $\theta=1$. The last proposition states that candidates adopt a platform consistent with the overall median voter if and only if the second primary is uncontested.

Lemma 6.7.1 For any history h^2 and any j, k in the same party if $\mid x_j^2 \mid < \mid x_k^2 \mid$, then
$p(W_j^3 = 1) < p(W_k^3 = 1)$.

This lemma follows directly from the properties of equilibrium platforms. In the primary any Left party candidate platform outside the interval $[x_L,0]$ is dominated by a platform inside the interval. Additionally, during the general election the platform $x_j^2=0=x_I$ dominates all other platforms. Thus, in equilibrium Left party candidates will only adopt platforms in the interval $[x_L,0]$ and Right party candidates will only adopt platforms in the interval $[x_R,0]$.

Proposition 2 For any history h^2 in which the second primary is contested, in any set of equilibrium platforms $\mid x_{j_1}^2 \mid < \mid x_{j_0}^2 \mid$.

Proof: By contradiction suppose $\mid x_{j_1}^2 \mid > \mid x_{j_0}^2 \mid$. It is the case that for a given set of equilibrium platforms; $x_g \cdot p(W_{j_0}^3 = 1) \cdot (1 - p(W_{j_0}^3 = 1)) = x_g \cdot P(W_{j_1}^2 = 1) \cdot (1 - P(W_{j_1}^3 = 1)) = A$ Similarly,

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[10]The θ parameter was increased by increments of .01 while the α parameter was increased by increments of .1

$P(W_{j_0}^3 = 1) \cdot (1 - P(W_{j_0}^3 = 1)) = P(W_{j_1}^3 = 1) \cdot (1 - P(W_{j_1}^3 = 1)) = D$ Simplifying equations (6.4) and (6.5), $\mid x_{j_1}^2 \mid > \mid x_{j_0^2} \mid$ implies that ;

$\mid \frac{A}{B+D} \mid > \mid \frac{A}{C+D} \mid$ where $B = (\theta - 1 + P(W_{j_1}^t = 1)) \cdot (1 - P(W_{j_1}^T = 1)) < P(W_{j_0}^t = 1) \cdot (1 - P(W_{j_0}^T = 1)) = C$ Recall $\theta \in (0\ 1]$ which implies $P(W_{j_0}^t = 1) < \frac{1}{\theta_n} - 1 + P(W_{j_1}^t = 1)$. Finally, since $\mid x_{j_1} \mid > \mid x_{j_0} \mid$ this implies $P(W_{j_1}^T = 1) < P(W_{j_0}^T = 1)$ which implies that $B < C$ is a contradiction and thus $\mid x_{j_1} \mid > \mid x_{j_0} \mid$ is a contradiction.

It follows directly from equilibrium candidate strategies and the proof of Proposition 2 that $P(N_{j_1} = 1 \mid \theta, h^1) \geq P(N_{j_0} = 1 \mid \theta, h^1)$. Thus, given the existence of Nash equilibrium platforms the probability that the winner of the first primary wins the party nomination is greater than or equal to the probability that the loser of the first primary wins the nomination. More generally, the following proposition characterizes the expected utility for equilibrium platforms at $t=2$.

Proposition 3 If $\widehat{x}^2$ represents a set of equilibrium platforms at $t=2$, then $E(U_{j_1}(\widehat{x}^2)) \geq E(U_{j_0}(\widehat{x}^2))$.

While the proof to this proposition is a direct result of the proof to Proposition 2, the intuition for this result is clear. If $E(U_{j_1}(\widehat{x}^2)) < E(U_{j_0}(\widehat{x}^2))$, then j_1 would always be better off by adopting a platform equal to the platform of j_0. However, j_0 does not have the luxury of always being able to match the platform of j_1 as it is necessary that j_0 win the second primary.

Proposition 4 For $\alpha > 0$ and $j \in g$ where $x_g \neq 0$, the platform $x_{j_1}^2 = x_I$ is a pure-strategy Nash equilibrium platform if and only if j_1 is uncontested in the second primary.

Proof:

The sufficient condition follows directly from the fact that $p(W_j^2 = 1)=1$ and the conditions for equilibrium platforms developed in equation (6.4). By equation (6.2) when the second primary is contested and both candidates pick a platform from the closed interval C, then $p(W_{j_1}^3 = 1) > 0$. Lemma (6.7.1) implies that $p(W_{j_1}^3 = 1) < 1$ and thus by equation and equation (6.4) $p(W_{j_1}^t = 1) \cdot (1 - p(W_{j_1}^t = 1)) \neq 0$ Thus, when pure strategy Nash equilibrium platforms exist and the second primary is contested the numerator is never equal to zero, and $x_{j_1} \neq x_I$.

Taken together Lemma 6.7.1 and Proposition 2 present a disconcerting picture of sequential primaries. When primary rules are such that $\theta \neq 1$ the loser of the first primary, who is the more extreme candidate, is more likely to win the second primary. Thus, when the second primary is contested, there is a greater than 50% chance that party elites will decide the party nominee. Finally, by Proposition 4 a failure to winnow candidates following the first primary results in candidates adopting a more extreme platform for the primary at $t=3$ and the general election at T.

Assuming convergence to the median voter is desirable, the proof to Proposition 2 states that the moderate partisan candidate is more likely to win the nomination. Furthermore, Proposition 3

states that following candidate exit decisions at $t=1$, the expected utilities for the winners of the first primary are always (weakly) greater than those of the losing candidates. By exploiting the difference in the expected utilities of j_1 and j_0, there may exist a common cost C across candidates and histories that winnows losing candidates following the first primary. Assuming $\alpha > 0$, Proposition 4 states that candidates will adopt equilibrium platforms consistent with the median voter theorem if and only if the second primary is uncontested. The next section analyzes equilibrium strategies of the $t=1$ subgame where candidates must choose whether to exit or stay in the race.

6.8   Candidate Winnowing

This section investigates equilibrium candidate strategies in which winnowing occurs following the first primary. Winnowing occurs as candidates exit the race to avoid paying the cost C of running in later primaries. This fixed cost is similar to the cost candidates incur to: retain their campaign staff, put their name on the ballot in upcoming elections, move their campaign staff to the next state and file necessary documentation with the Federal Election Commission.[11] At $t=1$, equilibrium strategies are dependent upon the expected payoffs to the candidates at $t=2$ and the cost C. The first condition for SPNE strategies at $t=1$ to exist is that equilibrium platforms must exist during the campaign phase at $t=2$. Given this is a finite game with observed actions, if there exist equilibrium strategies at $t=2$, then by Nash (1950) there exists at least one equilibrium to the sequential game. If equilibrium platforms do not exist at $t=2$, then candidate exit decisions do not have a clear mapping to expected payoffs and additional assumptions on candidate behavior are necessary to analyze candidate behavior.

Varying the cost C results in different equilibrium exit strategies, where some of these equilibria are more interesting than others. For instance given a sufficiently large (low) cost no candidates will enter (leave) the second primary. In general it is trivial to show that there exists a range of costs where equilibrium strategies result in candidate winnowing. Given the value of office is normalized to one and $\frac{1}{2} < C \leq 1$, in equilibrium only one candidate remains in the election. Additional equilibria exist where the second primaries are uncontested, but either the winner or loser of the first primary stays in the election. The focus in this section is in establishing the conditions under which the LCW equilibrium is the unique SPNE.

After observing the election results at $t=1$, the action space for all candidates is $A_j^1 = \{\text{stay,exit}\}$; where all candidates choosing to remain in the race must pay the same cost C. A candidate's pure strategy s_j is a series of maps $s_j^t : h^t \to a_j^t$; let $\sigma_j^t : h^t \to a_j^t$ denote a mixture over the strategy space. Candidate decisions to stay or exit are simultaneous and public. Following public observation of candidate decisions to stay or exit, all remaining candidates adopt new policy platforms x_j^2. The

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[11]In the model developed here it is necessary that candidates do not receive benefits either today or in the future from these payments.

term uncompetitive primary is used to denote a history where a candidate exits the race following a loss in the first round. As candidates make exit decisions only once, the time superscript will be dropped when it is clear the strategy is over exit decisions. The objective of this section is to find the conditions under which the LCW equilibrium exists. Let s and $\tilde{s}$ represent the following strategies: $\mathbf{s} = (stay_{j_1}, stay_{j_0}, stay_{k_1}, exit_{k_0})$ and $\tilde{\mathbf{s}} = (stay_{j_1}, stay_{j_0}, stay_{k_1}, stay_{k_0})$.

Proposition 5 When $E(U_{j_1}(\mathbf{s}) \mid \theta, h^1) > E(U_{j_0}(\tilde{\mathbf{s}}) \mid \theta, h^1)$ there exists a cost $C = E(U_{j_1}(\mathbf{s}) \mid \theta, h^1)$ such that the LCW equilibrium is the unique SPNE.

Proof: The proof will proceed in two parts. First, it will be shown that

$$\min_{H^2} E(U_{j_1} \mid \theta, \mid h^2) = E(U_{j_1}(stay_{j_1}^1, stay_{j_0}^1, stay_{k_1}^1, exit_{k_0}^1) \mid \theta, h^2). \tag{6.7}$$

Part 1: As candidates have dominant strategies when running unopposed, it does not matter which candidate k_1 or k_0 stays in the election. Let s^1 be the strategy profile $s^1 = (stay_{j_1}^1, stay_{j_0}^1, stay_{k_1}^1, exit_{k_0}^1)$ and $\tilde{s}^1 = (stay_{j_1}^1, stay_{j_0}^1, stay_{k_1}^1, stay_{k_0}^1)$, it needs to be shown that $E(U_{j_1}(s^1)) \geq E(U_{j_1}(\tilde{s}^1))$. By equation (6.4) given the strategy profile s^1 candidate k_1 has a dominant strategy in platform selection where $x_{k_1} = 0$. Given voter utility functions described in (6.1):

$$\forall x_j \in \Re \qquad p(W_j^T(x_j, 0) = 1 \mid x_k = 0) \;<\; p(W_j^t(x_j, x_k) = 1 \mid x_k \neq 0). \tag{6.8}$$

Suppose $E(U_{j_1}(\tilde{s}^1)) > E(U_{j_1}(s^1))$: $\;\mathrm{p}(\tilde{W}_{j_1}^T) \cdot (1 - \theta + \theta \cdot p(\tilde{W}_{j_1}^3)) > p(W_{j_1}^T) \cdot (1 - \theta + \theta \cdot p(W_{j_1}^3))$. Rearranging terms:

$$\mathrm{p}(\tilde{W}_{j_1}^3) > \tfrac{1}{\theta} \cdot \left(\frac{p(W_{j_1}^T)}{p(\tilde{W}_{j_1}^T)} \cdot (1 - \theta + \theta \cdot p(W_{j_1}^3)) - 1 \right) + 1 = \tfrac{1}{\theta} \cdot \left(\frac{p(W_{j_1}^T)}{p(\tilde{W}_{j_1}^T)} \cdot p(N_{j_1} = 1) - 1 \right) + 1$$

Given (6.8) it is the case that $\frac{p(W_{j_1}^T)}{p(\tilde{W}_{j_1}^T)} \geq 1$. Additionally, as a direct result of the proof to Proposition 2 it was shown that $p(N_{j_1} = 1) \geq \tfrac{1}{2}$. Thus, it is the case that $p(\tilde{W}_{j_1}^3) > \tfrac{1}{2}$ which is a contradiction of Lemma 6.7.1 and Proposition 2 and therefore it is the case that $E(U_{j_1}(s^1)) \geq E(U_{j_1}(\tilde{s}^1))$.

Given observed actions map to unique Nash equilibrium payoffs, the proof when j_0 and/or k_0 play mixed strategies is similar to the above proof and is left to the reader to show that

$E(U_{j_1}(stay_{j_1}^1, stay_{j_0}^1, stay_{k_1}^1, exit_{k_0}^1) \mid \theta, h^2) > E(U_{j_1}(stay_{j_1}^1, \sigma_{j_0}^1, stay_{k_1}^1, \sigma k_0^1) \mid \theta, h^2)$.

Part 2:

Let $E(U_{j_1}(stay_{j_1}, stay_{j_0}, stay_{k_1}, exit_{k_0}) \mid \theta, h^1) = C$, it is trivial that when C is greater than j_0's maximum expected utility across all history profiles, then regardless of the actions of k_0 the expected utility to j_0 of staying in the race is negative and j_0 will exit. Recall that in any set of SPNE strategies, each history at $t=1$ maps to a unique Nash equilibrium platform at $t=2$ and thus a unique expected payoff. Suppose the maximum expected payoff to j_0 oc-

curs under the strategy profile $(stay_{j_1}, stay_{j_0}, stay_{k_1}, exit_{k_0})$. By Proposition 3 it is the case that $E(U_{j_1}(stay_{j_1}, stay_{j_0}, stay_{k_1}, exit_{k_0}) > E(U_{j_0}(stay_{j_1}, stay_{j_0}, stay_{k_1}, exit_{k_0})$ and thus by the first part of the proof there exists a cost C such that the LCW equilibrium is the unique SPNE. Suppose the maximum expected payoff to j_0 occurs under the strategy profile $(stay_{j_1}, stay_{j_0}, stay_{k_1}, stay_{k_0})$. If $C \leq E(U_{j_0}(stay_{j_1}^1, stay_{j_0}^1, stay_{k_1}^1, stay_{k_0}^1) \mid \theta, h^1)$, then in equilibrium both j_0 and k_0 will pay C and run in the second primary. If $C = E(U_{j_1}(stay_{j_1}^1, stay_{j_0}^1, stay_{k_1}^1, stay_{k_0}^1) \mid \theta, h^1) > E(U_{j_0}(stay_{j_1}^1, stay_{j_0}^1, stay_{k_1}^1, stay_{k_0}^1) \mid \theta, h^1)$, then given j_1 and k_1 are playing the equilibrium strategies $stay$ neither j_0 or k_0 have any incentive to remain in the race.

The intuition for the existence and uniqueness of the LCW equilibrium is that across all histories of candidate exit decisions, the minimum expected utility for j_1 must be greater than the maximum expected utility for j_0. By Proposition 3, for any strategy profile the expected utility to j_1 is always greater than that of j_0. Thus, it is necessary to only consider expected payoffs for j_1 and j_0 under different histories and determine if the expected utility for j_1 is greater than the expected utility for j_0. The proof of the above proposition shows that the minimum expected utility for j_1 always occurs under the strategy profile $(stay_{j_1}, stay_{j_0}, stay_{k_1}, exit_{k_0})$. Therefore, a LCW equilibrium exists if the expected utility to j_0 under the strategy profile $(stay_{j_1}, stay_{j_0}, stay_{k_1}, stay_{k_0})$ is greater than the minimum expected utility for j_1.

While less intuitive a rearrangement of Proposition 5 changes the first part of the statement to $\frac{1}{\theta} > \frac{p(W_{j_0}^T(\mathbf{e})) \cdot p(W_{j_0}^t(\mathbf{e}))}{p(W_{j_1}^T(\mathbf{f}))} + p(W_{j_0}^t(\mathbf{f}))$. For $\theta = 1$ partisan candidates will adopt identical platforms, and therefore a LCW equilibrium will never exist. On the other hand, for $\theta = 0$ there always exists a LCW equilibrium as the expected utility to j_0 for staying in the race is zero. The existence and uniqueness of the LCW equilibrium is dependent upon the primary calendar, θ, and voter ideological salience, α. Figure 6.2 below plots the ranges of α and θ over which there exists a cost C such that the LCW is a unique equilibrium.

For all parameter values (θ, α) to the left of the plotted line in Figure 6.2, there exists a cost C such that there is a unique SPNE where candidates play strategies according to the LCW equilibrium. The implications of Figure 6.2 are clear. In a front-loaded primary calendar, even when voters place significant weight upon the ideological dimension, there exists a cost C such that the LCW equilibrium is a unique SPNE. For a back-loaded primary calendar, $\theta \neq 1$, when voters weight candidate platforms moderately greater than the stochastic shock there does exist a cost C such that the LCW equilibrium is the unique equilibrium. The next section uses simulated equilibrium platforms to analyze the effect of candidate winnowing on equilibrium platforms at $t=2$ under different primary rules and calendars.
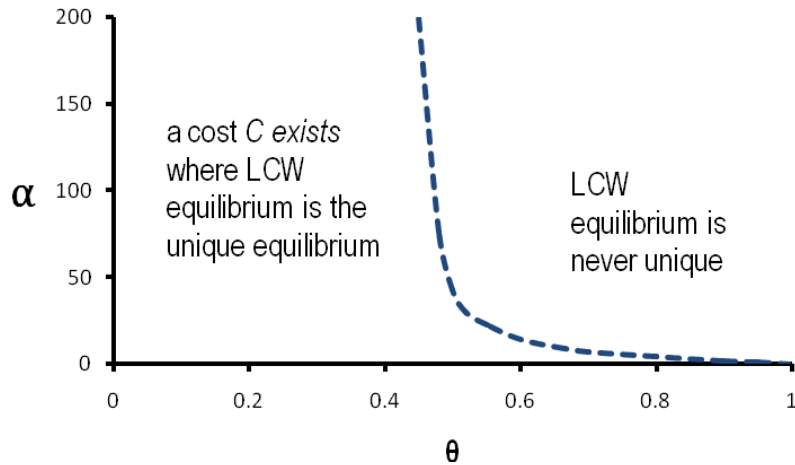
Figure 6.2: Existence of cost C and a unique LCW equilibrium

6.9 Winnowing and Behavior

After eliminating boundary values, Proposition 4 states that through winnowing the utility of the overall median voter is maximized. The above section focused upon the existence and uniqueness of an equilibrium where, after the first election, losing candidates always exit and winning candidates always stay. In this section simulated equilibrium platforms are analyzed to determine how primary rules and the existence of a unique LCW equilibrium affect candidate placement. Considering a neutral primary rule ($\theta = \frac{1}{2}$), equilibrium platforms for three different types of primaries are depicted in Figures 6.3, 6.4, and 6.5. Equilibrium platforms are plotted along the x-axis for various levels of α with group ideal points of $\{-1, 0, 1\}$. Figure 6.3 depicts equilibrium platforms when candidates compete in a single primary followed by a general election.[12] Figure 6.4 presents equilibrium platforms when candidates compete in a costless sequential primary followed by a general election. Finally, Figure 6.5 presents equilibrium candidate platforms under a hybrid primary structure. The hybrid primary structure implements a costly sequential primary when the LCW equilibrium is the unique SPNE and a costless sequential primary for all other values of α.[13]

The simulated equilibrium platforms presented in Figures 6.3, 6.4, and 6.5 depict three main differences between equilibrium platforms under the different primary rules. First, when candidates compete in a single primary followed by a general election, partisan candidates adopt identical platforms consistent with a point halfway between the party and independent voter ideal points. Under the assumption that a candidate's primary platform locks in a candidate's general election

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[12]Candidates adopt a single platform prior to the first primary.

[13]Discussion of equilibrium refinement when the LCW equilibrium is not unique is avoided here as it is the subject of another chapter in my dissertation which deals with candidate quality and signaling.
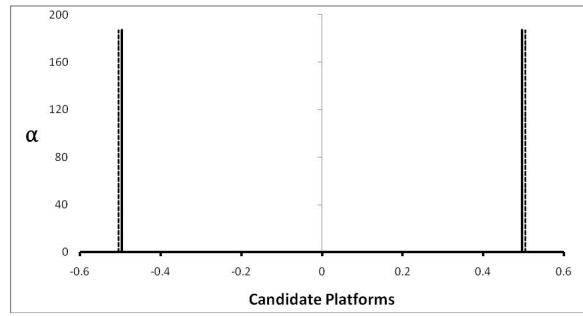
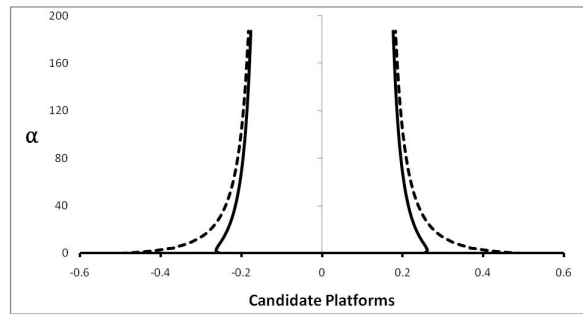Figure 6.3: Equilibrium Platforms: One Primary $\theta = \frac{1}{2}$

Figure 6.4: Equilibrium Platforms: Sequential Primary $\theta = \frac{1}{2}$
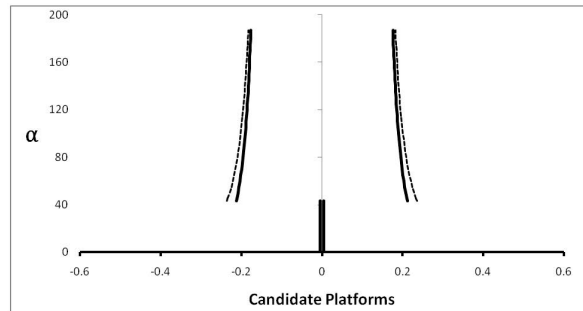

Figure 6.5: Equilibrium Platforms: Hybrid Sequential Primary $\theta = \frac{1}{2}$

platform, the distance between independent voters and equilibrium candidate platforms is greater under a single primary relative to sequential primaries.

The key difference between candidate platforms under the sequential and hybrid primary rules is that the most divergent platforms under sequential primaries are replaced by platforms consistent with the median voter theorem in the hybrid primary structure. This relationship arises because for low values of α there exists a cost C such that the LCW equilibrium is the unique SPNE. However, as the value of α rises, the conditions in Proposition 5 are no longer met: there no longer exists a cost C such that losing candidates always exit and winning candidates always stay. The interpretation of this last point is that the LCW equilibrium will not be unique when voters put significant weight on the ideological space.[14]

As shown above, the timing of the primary calendar impacts candidate winnowing, and therefore equilibrium candidate platforms. Figures 6.6–6.9 plot equilibrium candidate platforms in the context of back-loaded and front-loaded primary calendars. As discussed earlier for large values of θ and modest values of α there does not exist a C such that the LCW equilibrium is unique. Analyzing the platforms in Figure 6.7 this last point is observed as there is only a small interval of α such that equilibrium candidate platforms coincide with the overall median voter. In the context of the back-loaded primary calendar, when the LCW equilibrium is unique voters place little weight on the ideological dimension. On the other hand, Figure 6.9 plots simulated equilibrium platforms under the hybrid sequential primary for a front-loaded primary. For $\theta = \frac{1}{3}$, there exists a C such that the LCW equilibrium is unique over the entire range of α analyzed; resulting in equilibrium candidate platforms at $t=2$ that coincide with the median voter theorem.
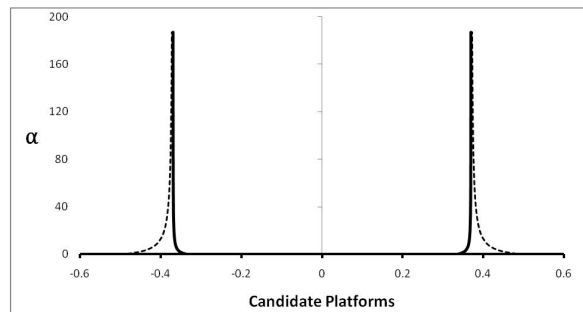

Figure 6.6: Equilibrium Platforms: Sequential Primary $\theta = \frac{2}{3}$

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[14]This last point may help to explain the lack of candidate exit in the 2008 Democratic nomination contest.
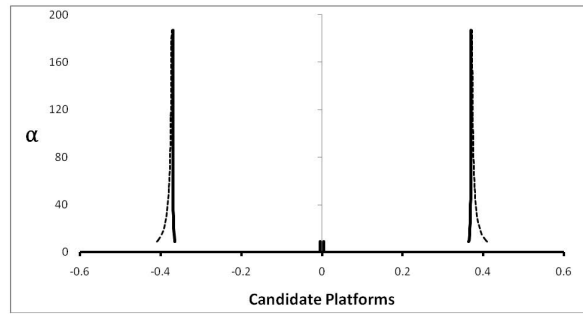
Figure 6.7: Equilibrium Platforms: Hybrid Sequential Primary $\theta = \frac{2}{3}$
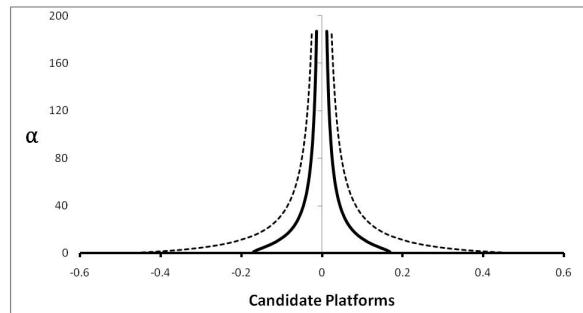

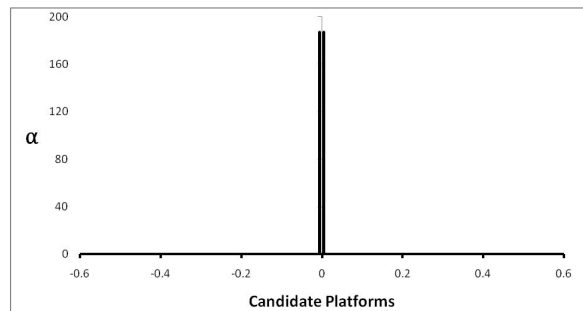Figure 6.8: Equilibrium Platforms: Sequential Primary $\theta = \frac{1}{3}$

Figure 6.9: Equilibrium Platforms: Hybrid Sequential Primary $\theta = \frac{1}{3}$

6.10   Discussion

Despite numerous findings that suggest multicandidate elections lead to divergent equilibrium platforms, the literature has largely overlooked the development of rules and institutions that promote the winnowing or elimination of candidates during the presidential nomination contests. Under the hypothesis that candidates with poor electoral prospects will be less willing to incur the cost of running, a model is developed where after the first primary all candidates must pay a common, fixed cost or be eliminated from the nomination process. When candidates are restricted by their primary platforms and winnowing occurs early in the nomination contest, results show the party nominee adopts a more moderate platform during the second primary. Adoption of moderate platforms during the primary may be important given findings that candidate movement during the general election is restricted by the candidate's primary campaign (Burden 2001, 2004).

This article considers whether a fixed cost will result in voluntary candidate exit or winnowing following the first primary. Findings indicate the existence of multiple costs and equilibrium strategies that result in winnowing after the first primary. The article focuses on the existence of a cost C such that the unique SPNE is the Losing Candidate Winnowing (LCW) equilibrium: that is, after the first primary losing candidates are winnowed and winning candidates always stay. The existence and uniqueness of the LCW equilibrium is found to be dependent upon the expected payoffs of: (A) the winner of the first primary when only her second primary is contested and (B) the loser of the first primary when both primaries are contested. Results show that when (A) > (B), there exists a cost C=(A) such that the LCW equilibrium is the unique SPNE. It is shown that the uniqueness of the LCW equilibrium is largely dependent upon whether the primary calendar is front- or back-loaded; where the LCW equilibrium is unlikely to be unique in a back-loaded primaries. While not considered here, given the above results it is likely that in open primaries a cost C and unique LCW equilibrium will exist over greater values of voter issue salience and back-loaded primaries relative to closed primaries. Finally, analytic and simulation methods find that equilibrium platforms are more moderate when winnowing occurs after the first round.

The above results are particularly relevant in today's political atmosphere where voting rights groups and elites are calling for primary reform. In 2008, Iowa moved their caucus up by about two weeks relative to 2004, but many states such as Arkansas, Colorado, Florida, Illinois, Kansas, Louisiana, and Wyoming moved their 2008 primary or caucus up by at least one month. This race to the front of the primary calendar has resulted in a front-loaded primary process where the majority of delegates are assigned to candidates soon after the first caucus is held. The increasingly front-loaded nature of the nomination process has prompted calls for reform from voting rights activists and political elites such as Senator Dianne Feinstein (D-CA) and Republican Party Rules Committee Chairman David Norcross. One of the main complaints leveled against the current nomination

process is the unsubstantiated claim that a front-loaded nomination process reduces information transmission by accelerating the candidate winnowing process. Results suggest that when ignoring information effects, the impact of a back-loaded primary calendar is likely to lengthen the time over which candidates are winnowed; when candidates do not exit following a primary victory. The increased length of the winnowing process may result in more extreme general election candidates and a higher likelihood of party elites selecting the nominee. Thus, greater study is needed of the costs and benefits of proposed alternatives to the current primary process, such as the Delaware, American, and Regional primary plans, which call for a back-loaded primary calendar.

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