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MAJORITY REQUIREMENTS AND MINORITY REPRESENTATION

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I. INTRODUCTION

Multi-candidate elections run under “majority requirements” may lead to two rounds of voting. In the first round (the “primary” round), voters cast votes for a single candidate. If one candidate receives a majority of votes, that candidate wins the election. If not, a subsequent “run-off” election is held between the two leading candidates from the primary election. The candidate who wins the run-off is elected. This two-round system stands in contrast to elections run under a “plurality” system. Under the plurality system, the candidate with the most votes in a single election round wins, regardless of whether that candidate receives an absolute majority of votes.¹

The effect of majority requirements on the ability of minority voters to elect representatives of their choice in elections is controversial. On the one hand, comparative electoral scholars have long grouped majority requirements with proportional representation² as having the effect of increasing the number of voting groups that can achieve representation (such groups are known as “viable elec-

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1. GEORGE WASHINGTON MCCRAY, *A TREATISE ON THE AMERICAN LAW OF ELECTIONS* §§ 206–07 (Callaghan & Co. 4th ed. 1897) (1875).

2. Proportional representation is a system in which seats in representative bodies are awarded to parties in proportion to the votes they receive in the election, sometimes subject to some minimum vote requirement. *See, e.g.*, MAURICE DUVERGER, *POLITICAL PARTIES: THEIR ORGANIZATION AND ACTIVITY IN THE MODERN STATE* 373 (Barbara North & Robert North trans., Methuen & Co. 1967).

toral coalitions”).³ It is argued that this benefits minority ethnic groups in particular since a candidate need only be second in vote totals to make a run-off election (assuming that no candidate receives the required majority in the first round). In his seminal work on the effects of electoral institutions on voter coordination,⁴ Cox notes that majority requirements should lead to three viable electoral coalitions,⁵ while plurality voting, under certain circumstances, may lead to only two such coalitions.⁶ Golder and Clark maintain that, as ethnic heterogeneity in presidential systems increases, the number of candidates for president also increases if majority requirements are used, but not under plurality rule.⁷ Similarly, some minority rights activists in American politics contend that run-off elections can help minority candidates win elections in which they would not be successful under a plurality rule. For example, Andrew Young, the second black mayor of Atlanta,⁸ argued against changing the majority requirement rule in Georgia.⁹

Yet, there are reasons to doubt the extent to which majority requirements facilitate the ability of more than two major electoral coalitions, particularly those dominated by ethnic minorities, to win elections. It is generally believed that the motive for adopting majority requirements in the eleven southern states in which they are currently used (Alabama, Arizona, Arkansas, Florida, Georgia, Louisiana, Mississippi, North Carolina, Oklahoma, South Carolina, and Texas) was to reduce the ability of African-American candidates to win elections as African-Americans gained the right to vote.¹⁰ Many

3. See William Roberts Clark & Matthew Golder, *Rehabilitating Duverger's Theory: Testing the Mechanical and Strategic Modifying Effects of Electoral Laws*, 39 COMP. POL. STUD. 679, 681 (2006) (“[S]ingle ballot [voting] encourages the two-party system; on the contrary both the [plurality voting] system with second ballot and proportional representation favour multipartism.” (quoting MAURICE DUVERGER, *POLITICAL PARTIES: THEIR ORGANIZATION AND ACTIVITY IN THE MODERN STATE* 239 (Barbara North & Robert North trans., John Wiley & Sons 1963))).

4. GARY W. COX, *MAKING VOTES COUNT: STRATEGIC COORDINATION IN THE WORLD'S ELECTORAL SYSTEMS* (1997).

5. See *id.* at 138.

6. See *id.* at 155 (describing model of entry in simple plurality elections).

7. Clark & Golder, *supra* note 3, at 703–04.

8. ANDREW DEROCHE, *ANDREW YOUNG: CIVIL RIGHTS AMBASSADOR* 122 (2003).

9. See Ronald Smothers, *U.S. Files Suit Against Georgia, Charging Bias in Election Laws*, N.Y. TIMES, Aug. 10, 1990, at A1 (noting that Andrew Young opposed the suit, saying that “runoffs helped parties select the candidate with the broadest appeal”).

10. See J. Morgan Kousser, *Historical Origins of the Runoff Primary* (Apr. 13, 1996), <http://www.h-net.org/~pol/ssha/netnews/t96/kousser.htm>. Kousser summarizes this view of the adoption of majority requirements in the South and the evidence in support:

political activists such as Lani Guinier believe that majority vote requirements discriminate against minorities and create an additional barrier to achieving office.¹¹ These minority rights activists typically point out instances in which minority candidates won primaries

Neither historians nor political scientists have specifically investigated the intent of the original framers of runoff requirements. There is likely to be little direct evidence about their purpose, since they were often adopted at non-public party executive committee meetings, and even in cases when they were written into law, the surviving evidence from state legislative records will probably not be conclusive. None of the southern state assemblies recorded debates or printed committee reports, newspaper stories on any but the most controversial amendments are usually uninformative, and few legislators left collections of their papers. There was lots of press discussion about the general principles of primaries and conventions, but little on such specific topics as the runoff. . . . The indirect evidence from the pattern of adoptions of the runoffs suggests that racial motives for choosing the device were hardly absent. South Carolina, which had the largest proportion of blacks of any state in 1900, was the first to put the statewide primary and the runoff into regular use. The Democratic convention which proposed the scheme in that state, in an action paralleled in Georgia in 1906, also called for state constitutional action to disfranchise blacks. Mississippi, which had the second largest percentage of blacks, became the first state to mandate the runoff primary by law, and Alabama acted by party rule in the same year. Florida, still over 40% black at the turn of the century, held its first runoff in 1904, and Louisiana, third in black proportion, acted by law in 1906. Texas toyed with the idea, Tennessee's runoff was born late and died in infancy, and North Carolina acted only in 1915. Among the eleven ex-Confederate states, only Arkansas in the Deep South and the border state of Virginia, its machine and anti-machine factions solidified early, never instituted the double primary during the first two decades of this century. No northern state, not even such uncompetitive ones as Maine, Vermont, and Kansas, ever experimented with runoff primaries. In sum, the evidence suggests that the primary in the South in general, and the runoff in particular, was not part of a general "progressive" movement to democratize elections, but rather, that it was one episode in a reactionary crusade to eliminate any chance of black influence in politics by perpetuating one-party rule.

Id.

11. LANI GUINIER, *THE TYRANNY OF THE MAJORITY* 8–12 (1994). For example, in his presidential campaign of 1984, Jesse Jackson strongly criticized majority requirements and called for their elimination. Charles S. Bullock, III & A. Brock Smith, *Black Success in Local Runoff Elections*, 52 J. POL. 1205, 1206 (1990) (noting that Jackson characterized run-off elections as the "present-day equivalent of the white primary or the poll tax"). Guinier, who represented the plaintiffs in an unsuccessful court case challenging majority requirements in Phillips County, Arkansas, has recounted her view of the case:

Because this rule combines with local racism, almost half the voters for over a century never enjoyed any opportunity to choose who represents them. As a numerical, stigmatized, and racially isolated minority, blacks regarded the majority vote requirement as simply a tool to "steal the election"—a tool that had the effect of demobilizing black political participation, enhancing polariza-

with a plurality of the vote in a three-way contest, but later lost to a white candidate in the succeeding run-off.¹² Gerber, Kanthak, and Morton show that, controlling for other factors that affect political competition, Congressional districts with majority requirements have fewer candidates than in other districts.¹³ This suggests that majority requirements reduce the number of viable electoral coalitions.

The formal theoretical research, which endogenizes the number of electoral coalitions, is also mixed on the effects of majority requirements on the number of viable candidates. Assuming that parties are motivated by policy and, thus, restricted in the positions they may adopt, and that voters choose sincerely (i.e., for their most preferred candidate or party), Osborne and Slivinski have shown that majority requirements lead to greater numbers of candidates receiving positive vote shares.¹⁴ In contrast, modeling strategic voting (in which voters are willing to vote for their second preference under the right conditions), Callander has demonstrated that only two electoral coalitions are viable in equilibrium.¹⁵ In Callander's model there are two initial parties and the majority requirement deters entry by a third.¹⁶ Callander suggests that his model is most applicable to situations where there already exists a dominant two-

tion rather than fostering debate, and in general excluding black interests from the political process.

GUINIER, *supra*, at 11.

12. An often-cited instance is the defeat of Mickey Michaux in the run-off for North Carolina's Second Congressional District in 1982 after achieving a plurality in a primary election. Alexander P. Lamis, *The Runoff Primary Controversy: Implications for Southern Politics*, 17 PS 782, 783 (1984). In comparison, Carol Mosely-Braun achieved the Democratic nomination for the Senate in 1992 in Illinois with a plurality of the vote in a three-person contest. Mosely-Braun's vote share was 38%, Alan J. Dixon's 35%, and Albert F. Hofeld's 27%. Paul M. Green, *Braun's Dazzling Win as Downstate Fails Dixon; Bush and Clinton Pile Up Delegates*, ILL. ISSUES, June 1992, at 10-13. In the general election, Mosely-Braun received 53% of the vote, Richard S. Williamson received 43%, and 4% of the vote went to minor candidates. James Bennett et al., *The 1992 Elections: State by State; Midwest*, N.Y. TIMES, Nov. 5, 1992, at B12; *see also* Andrea Stone, *The Senate: Braun Makes Senate History*, USA TODAY, Nov. 4, 1992, at 12A.

13. Elisabeth R. Gerber, Kristin Kanthak & Rebecca B. Morton, *Selection Bias in a Model of Candidate Entry Decisions* 16-17, 36 (July 1999) (unpublished manuscript, on file with the New York University Annual Survey of American Law).

14. Martin J. Osborne & Al Slivinski, *A Model of Political Competition with Citizen-Candidates*, 111 Q.J. ECON. 65, 83 (1996).

15. Steven Callander, *Duverger's Hypothesis, the Run-Off Rule, and Electoral Competition*, 13 POL. ANALYSIS 209, 219-20, 226 (2005).

16. *Id.* at 210.

party system such as in the southern United States and Australia.¹⁷ In these cases, introducing majority requirements deters entry by third parties and candidates. However, Callander also suggests that, in countries where there is an existing multiparty structure (i.e., more than two viable electoral coalitions), institution of a majority requirement does not reduce the number of candidates, as evinced by the French Fifth Republic (the current French political system).¹⁸ Callander's contention might also explain Golder and Clark's analyses of the effects of majority requirements on presidential systems.¹⁹ In the countries Golder and Clark studied, for instance, those with legislatures that impose majority requirements and are elected by means of proportional representation were also characterized by the presence of multiple parties in the legislature, any of which could field candidates for the presidency.

If Callander is right, then in a situation in which there are three existing electoral coalitions, voter behavior in majority required elections should differ significantly from behavior in plurality rule elections. Under a plurality rule, voters should coordinate into two larger groups, resulting in only two viable candidates. In this Article, we use experimental methods to examine the effects of majority requirements on voter coordination. We divide voters into three major coalitions and compare the results of run-off systems with plurality rule elections. Two of the coalitions have similar preferences and together constitute the majority of the electorate. The third coalition has distinctly different preferences and, though in the minority, would win a plurality election if the two major groups could not coordinate on a single candidate.

Under majority requirements, we find that voters are less likely to coordinate into only two major coalitions prior to the election. However, majority voters use the results of the primary election and majority requirement as a coordination mechanism. The run-off allows the two groups of voters to combine their votes for a single candidate in the run-off. If there are multiple existing electoral coalitions, they have an incentive to run individual candidates in the primary election under majority requirements rather than coordinate on a common candidate as they might under a plurality rule.

Our results therefore do not suggest that majority requirements are necessarily "friendly" to minority voters. Because the majority requirement works so well as a coordination mechanism for

17. *Id.* at 209, 222–23.

18. *Id.* at 222.

19. Clark & Golder, *supra* note 3, at 704–05.

the two majority groups of voters (in our experiments, better than their ability to coordinate under a plurality rule), the minority group of voters (who could win in a plurality rule election) loses ultimately in almost every election. Further, these voters cease to participate over time. Thus, our results support the argument of Guinier²⁰ and other critics that majority requirements hurt minority voters.

Experimental research is particularly well-suited for our analysis since it allows us to control for many factors that cannot be controlled in a naturally occurring environment. For example, it is quite difficult to measure true voter preferences over candidates. In the laboratory, we can induce these preferences by paying voters based on the candidate elected. We can also test multiple election systems under identical voter preference and candidate positions.

We do not, however, claim experimental analysis is a substitute for non-experimental empirical research. Instead, we believe our work serves as a useful complement to non-experimental empirical research. Our experiments do not attempt to measure directly the effects of racial and ethnic attitudes or composition on voter behavior. Instead, they provide evidence about the likelihood of minority-preferred candidates winning in straight plurality rule elections versus those with majority requirements. The experiments also show how these institutions affect the choices of majority and minority voters. Abstracting from many possible confounding influences, they provide for clean predictions and comparisons across institutions.

In the next section we discuss our experimental design. In Section III, we explain the voting equilibria we expect to find, and our theory-derived hypotheses. Section IV discusses the results of our experiments and compares these results with our predictions and with the results of previous non-experimental empirical research. Section V addresses voter abstention, as well as the coordination effect of campaign advertising. Section VI concludes.

II. EXPERIMENTAL DESIGN

The basic experimental design used to test the effects of majority requirements was similar to those previously used.²¹ The experi-

20. See GUINIER, *supra* note 11, at 9.

21. See Robert Forsythe et al., *An Experiment on Coordination in Multi-Candidate Elections: The Importance of Polls and Election Histories*, 10 SOC. CHOICE & WELFARE 223, 226–28 (1993) [hereinafter Forsythe et al., *Experiment on Coordination*]; Robert

ment consisted of two sessions. The sessions are labeled CPSS and CPSSR for Computerized, Plurality, Single-shot, Symmetric-payoff elections without and with Run-offs. We conducted the sessions at the University of Iowa, drawing subjects from a participant pool of several hundred subjects recruited from the student population attending M.B.A. and undergraduate classes in the Colleges of Business Administration and Liberal Arts.²²

Each experimental session included twenty-eight subjects or “voters.” As subjects arrived for the experiment they were seated at computer terminals in a large classroom and given copies of the instructions for the session. The appendix contains the instructions for session CPSSR. Each subject’s screen was concealed from the others by dividers. The instructions were read aloud and all questions answered in public so that all instructional information was commonly known. No other communication between subjects was allowed. Each subject was designated by a voter identification number.

There were twenty-four “periods” in the experiment. In each period of the experiment, voters were divided into two voting groups, A and B, each with fourteen of the twenty-eight subjects.²³ Then, each voting group was further partitioned into three “types” of voters. Voter types differed by their payoffs, conditional on the winner as given by Table 1 (though voter types are identified by

Forsythe et al., *An Experimental Study of Voting Rules and Polls in Three-Candidate Elections*, 25 INT’L J. GAME THEORY 355, 358–64 (1996) [hereinafter Forsythe et al., *Experimental Study*]; Thomas A. Rietz, *Comportamiento estratégico en elecciones con múltiples alternativas: una revisión de alguna evidencia experimental* [Strategic Behavior in Multi-Alternative Elections: A Review of Some Experimental Evidence], 54 CUADERNOS ECONOMICOS DE I.C.E. 129, 140–41 (1993) (Spain); Robert Forsythe, Thomas Rietz & Robert Weber, *Theory, Outcomes and Individual Voter Behavior in Two Candidate Elections with Voting Costs 2–3* (Nov. 2001) (unpublished manuscript, on file with the New York University Annual Survey of American Law).

22. The CPSS experiments are also reported in Forsythe et al., *Experiment on Coordination*, *supra* note 21, at 226–28; Thomas Rietz, Roger Myerson & Robert Weber, *Campaign Finance Levels as Coordinating Signals in Three-Way, Experimental Elections*, 10 ECON. & POL. 185, 190–93 (1998).

23. The number of voters may seem small relative to naturally occurring elections. However, a small number of voters is typical in laboratory research because it results in a manageable group size, it allows for multiple replications, and subjects can be paid meaningful amounts of cash to induce preferences across election outcomes. It is representative of a larger election if voters cast votes in blocs (each voter in our experiment would represent a single bloc). Finally, it is large enough for a meaningful coordination problem. Given an equilibrium distribution of votes (discussed later), no single voter can change the outcome. It can be changed only by a coordinated response.

their most preferred candidate here, they were identified only by number in the actual payoff tables).

Table 1: Payoff Schedule				
Voter Type	Winning Candidate			Number of Each Type
	ORANGE	GREEN	BLUE	
1 (Orange)	\$1.20	\$0.90	\$0.20	4
2 (Green)	\$0.90	\$1.20	\$0.20	4
3 (Blue)	\$0.40	\$0.40	\$1.40	6

In the experimental design there are two “majority” candidates, **Orange** and **Green**, and one “minority” candidate, **Blue**. Eight voters (types Orange and Green) prefer either **Orange** or **Green** to **Blue**, while six voters (type Blue) prefer **Blue** to either **Orange** or **Green**. Since **Blue** would lose in a pair-wise vote with either **Orange** or **Green** alone, **Blue** is a “Condorcet loser.”²⁴ In the experiment, the names and orders of the candidates were randomly switched in each group and in each period. However, for clarity of presentation we will refer to the minority candidate across elections and groups as **Blue**, though in the actual election the minority candidate might have been labeled **Orange**, **Green**, or **Blue**. Similarly, we will refer to the first listed majority candidate as **Orange** to allow identification of ballot-position effects giving an advantage to the first-listed candidates on the ballot.²⁵

Within a group, each individual payoff schedule was identical except that each voter’s type was highlighted on her own computer screen. Hence, each voter knew her own payoffs, the payoffs to the other voter types in the group, and the number of voters of each type. Voters did not know the specific assignment of types to others in the room. In addition, the voters did not know the specific identities of others in their group.

In the plurality treatment, each period consisted of a single election round in which voters cast simultaneous ballots with three listed candidates. Results were revealed to the group only after everyone had voted or responded with an abstention. In the run-off treatment, each period consisted of a primary election in which vot-

24. A “Condorcet loser” is a candidate who would lose in a two-way race against each other candidate. MARQUIS DE CONDORCET, CONDORCET: FOUNDATIONS OF SOCIAL CHOICE AND POLITICAL THEORY 34 (Iain McLean & Fiona Hewitt trans. & eds., Edward Elgar Publishing 1994) (1785).

25. See Joanne M. Miller & Jon A. Krosnick, *The Impact of Candidate Name Order on Election Outcomes*, 62 PUB. OPINION Q. 291, 293–95, 315–16 (1998).

ers cast simultaneous ballots with three listed candidates. Results of the first round were revealed to the group only after everyone had voted or responded with an abstention. After the first round, either a winner was declared or subjects were allowed to vote simultaneously in a second round with only the two leading candidates from the first round listed on the ballot. Again, results were revealed to the group only after everyone had voted or responded with an abstention.

After each period, voters were randomly reassigned to new groups and new types. Voters then used new payoff schedules with randomly rearranged and relabeled rows and columns. This allowed us to observe many different groups in each cohort while minimizing any repeated-game effects that might carry over from one group to the next.

In each session we conducted twenty-four elections or election series for each voting group, A and B (an election series is a primary election followed by a run-off in the CPSSR elections). Therefore, we had forty-eight total elections or election series per session. Individual subjects, however, participated in only one voting group, and therefore voted in only twenty-four elections or election series. In total, we obtained 672 voter observations for an election cycle under each treatment (CPSS or CPPSR).

In each election, whether a plurality or run-off, a voter could either abstain or cast one vote for one candidate. In CPSS a single plurality rule election was held in which the candidate with the most votes was declared the winner, whatever the relative size of the vote for that candidate. In CPSSR, a three-candidate election, called a “preliminary” election, was held first. A candidate was declared the winner if that candidate received fifty percent or more of the vote in the preliminary election. If no candidate received fifty percent of the vote, then the two top vote-receivers would face each other in a second election, called a “run-off.” Voters in a group with a run-off were allowed either to vote for one of the two candidates in the run-off or to abstain. The winner of the run-off would then be declared the winner.

In CPSS, if a tie occurred between two candidates for first place, we selected the winner randomly.²⁶ In CPSSR, if a tie occurred between two candidates for first place in a preliminary election, the tie was not broken. Instead, a run-off election between the

26. Specifically, we placed colored balls corresponding to the names of the tied candidates in a bucket and asked a subject to draw a ball from the bucket without looking. The candidate whose name was the same as the color of the selected ball was declared the winner.

tied candidates would be announced on the subjects' computer screens and they would vote (or abstain) in the ensuing run-off election. If a tie occurred between two candidates for second place in the preliminary election and the first place candidate did not have fifty percent of the vote, then we used the tie-breaking procedure to determine which of the two trailing candidates would be in the run-off election with the leading candidate.²⁷ If a tie occurred between the two candidates in a run-off election, we used the tie-breaking procedure to determine which candidate won.

After each election (regardless of type), subjects were informed (on their screen) of the vote totals received by each candidate, whether a winner was declared, and their payoff if a winner was declared.

III. VOTING EQUILIBRIA

A. *Plurality Elections*

The three-candidate plurality rule game has been the subject of many theoretical analyses. Our theoretical analysis is based on the work of Myerson and Weber.²⁸ In the experiment we can think of voter k as choosing a vote vector, (v^k_O, v^k_G, v^k_B) , where v^k_i is the number of votes voter k gives to candidate i . In the plurality rule game the only permissible vectors are $(1,0,0)$, $(0,1,0)$, $(0,0,1)$, or, if voter k abstains, $(0,0,0)$.²⁹ We assume that each voter seeks to maximize her expected utility gain from the outcome of the election. Hence, voters choose vote vectors that maximize their expected utilities. Define u^k_i as the utility that voter k receives when candidate i is elected; for simplicity we assume that u^k_i equals the payment voter k will receive when candidate i is elected.³⁰

27. This procedure is the same as the procedure used to determine the winner of a tie in CPSS. See *supra* note 26.

28. Roger B. Myerson & Robert J. Weber, *A Theory of Voting Equilibria*, 87 AM. POL. SCI. REV. 102 (1993).

29. The notation here allows for more general voting rules. For example, "approval voting" allows voters to cast votes for as many candidates as they like. This adds the vote vectors $(1,1,0)$, $(1,0,1)$, $(0,1,1)$, and $(1,1,1)$ to the set of admissible vote vectors. For an analysis of "approval" voting and a rank-ordering rule (called the Borda Rule), see Robert Forsythe et al., *Experimental Study*, *supra* note 21, at 361, 368–69.

30. More general assumptions about voter utility functions will not change the qualitative results of our analysis. For a detailed general presentation of the theory, see Myerson & Weber, *supra* note 28, at 103–05.

Utility-maximizing voters will sometimes vote *strategically*, finding it optimal to vote for a candidate other than their first choice. Such voters are concerned not only with the payments they will receive if a candidate wins, but also with the likelihood that a candidate will win and that a single vote will determine who will win. Thus, how a voter perceives the relative likelihood of various “close races” should play a role in his voting strategy. Following Myerson and Weber,³¹ we make two assumptions about voter perceptions of these probabilities:

1. Near-ties between two candidates are perceived to be much more likely than between three or more candidates; and
2. The probability that a particular ballot moves one candidate past another is perceived to be proportional to the difference in votes cast on the ballot for the two candidates. The constant of proportionality is the subjective probability of the event that the candidates will be tied for first place in the election, called the *pivot probability*.

The first of these assumptions reflects the simple observation that if there are three random variables, the likelihood that all three will equal each other is an order of magnitude less than the likelihood that two of the three will happen to equal each other. The second is an innocuous assumption given the types of election rules we are studying. It says that, if a voter could cast two votes for a candidate, it would double the probability that the ballot cast by the voter is pivotal and, therefore, affects the election outcome.³² The pivot probabilities recognize that the ballot cast by a voter will only matter if it changes the election outcome.³³

Under these assumptions, Myerson and Weber³⁴ have shown that voter k will choose a vote vector to maximize her expected utility, $E(u^k)$:

$$E(u^k) = v_O^k [p_{OG}^k(u_O^k - u_G^k) + p_{OB}^k(u_O^k - u_B^k)] + \\ v_G^k [p_{OG}^k(u_G^k - u_O^k) + p_{GB}^k(u_G^k - u_B^k)] + \\ v_B^k [p_{OB}^k(u_B^k - u_O^k) + p_{GB}^k(u_B^k - u_G^k)]$$

31. *Id.* at 103.

32. This makes a difference when voters can rank order candidates (as they can under the Borda rule), vote for multiple candidates (as they can under “approval” voting), or cast multiple votes for a single candidate (as they can under “cumulative” voting).

33. A ballot can affect the outcome in two ways. First, it can create a tie. In this case, the candidate voted for goes from losing to a fifty percent chance of winning. Second, it can break a tie. In this case, the candidate voted for goes from a fifty percent chance of winning to winning outright.

34. See Myerson & Weber, *supra* note 28, at 103–04.

Where p_{ij} is voter k 's *perceived* probability that candidates i and j will be in a "near tie" for first place. Again, the probabilities are known as the pivot probabilities.³⁵

We define a *voting equilibrium* as follows:

Definition 1: A voting equilibrium is an election outcome for which there exist perceptions that simultaneously justify the voter behavior leading to that outcome, assign positive (although perhaps very small) pivot probabilities to all candidate pairs, and are rationalized by the outcome (in the sense that candidates receiving high vote totals are perceived to be much more likely to be involved in near-ties for victory than are candidates with low vote totals).

Further, we define two classes of voter behavior according to:

Definition 2: Voter k 's vote vector is *sincere* if $v_i^k = 1$, and candidate i is voter k 's most preferred candidate.

Definition 3: Voter k 's vote vector is *non-sincere* if $v_i^k = 1$, and candidate i is *not* voter k 's most preferred candidate.

Finally, a vote vector may be either *rationalizable* or *dominated*:

Definition 4: Voter k 's vote vector is *rationalizable* if it provides the voter with the highest expected utility, given some perceptions of each candidate's probability of winning.

Definition 5: Voter k 's vote vector is *dominated* if there exists some other permissible vote vector that provides her with higher expected utility for all possible probabilities of each candidate winning (i.e., all rational perceptions).

For example, an "Orange" type voter has a preference ranking as follows: **Orange** \succ **Green** \succ **Blue** (where " \succ " means "preferred to"). If she casts the vote vector (1,0,0), i.e., a vote for **Orange**, her vote is "sincere." Other vote vectors are "non-sincere." Some voter perceptions may rationalize sincere voting and some may rational-

35. By "near tie" we mean a single voter's actions can change the outcome and, as a result, the voter's actions will make her pivotal in determining the election outcome. *See id.* at 103.

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ize non-sincere, but strategic, voting. For an Orange type voter, $(1,0,0)$ is optimal if she believes candidate **Orange** will be in contention and her vote is sufficiently likely to decide the race in favor of **Orange**. Alternatively, the vote vector $(0,1,0)$ may prove optimal if she believes candidate **Green** is more likely to be in contention than candidate **Orange**. Voting for **Blue** and abstaining are always “dominated” vote vectors for Orange voters (and Green voters with preferences **Green** \succ **Orange** \succ **Blue**). These vote vectors always yield less expected utility than voting for **Orange** or **Green**. No perceptions could justify these choices. For Blue voters (here with preferences **Blue** \succ **Orange** \approx **Green**; where “ \approx ” means “indifferent between”) non-sincere votes are always dominated.

Recall that Orange and Green voters constitute a split majority. Blue voters are a minority. There are three possible voting equilibria in the plurality rule game: **Orange** \gg **Blue** \gg **Green**, **Green** \gg **Blue** \gg **Orange** and **Blue** \gg **Orange** \approx **Green**; where $i \gg j$ implies that candidate i is expected to receive strictly more votes than candidate j , and $i \approx j$ implies that candidates i and j are in a close race. In the equilibrium **Orange** \gg **Blue** \gg **Green**, voters perceive a near-tie for first place between **Orange** (a majority preferred candidate) and **Blue** (the minority preferred candidate) to be much more likely than a near-tie for first place between **Orange** and **Green** (the two majority preferred candidates). Thus, all majority voters vote for **Orange** and all minority voters vote for **Blue**; **Orange** and **Blue** become the two leading candidates and expectations are justified. In the equilibrium **Green** \gg **Blue** \gg **Orange**, voters perceive a near-tie between **Green** (a majority preferred candidate) and **Blue** (the minority preferred candidate) to be the most probable and, consequently, all majority voters vote for **Green** and all minority voters vote for **Blue**, again justifying expectations. In the equilibrium **Blue** \gg **Orange** \approx **Green**, voters perceive near-ties for the lead between **Orange** and **Blue**, and between **Green** and **Blue**, to be likely with similar probabilities and much more likely than a near-tie for the lead between **Orange** and **Green**. Therefore, all voters vote sincerely, and Blue wins. This is the equilibrium in which the minority candidate (the Condorcet loser) wins. The voter choices for each equilibrium are summarized in Table 2.

Table 2: Equilibria and Consistent Vote Vectors for Plurality Rule			
Voter Type	Consistent Vote Vectors		
	O>>B>>G	G>>B>>O	B>>O≈G
1 (Orange)	(1,0,0)*	(0,1,0)**	(1,0,0)*
2 (Green)	(1,0,0)**	(0,1,0)*	(0,1,0)*
3 (Blue)	(0,0,1)*	(0,0,1)*	(0,0,1)*

*Sincere
**Strategic

Which equilibria would we expect to occur in the experiment? Clearly, voter perceptions play a major role in determining the outcome of the plurality rule experimental elections. For a majority candidate, say **Orange**, to win, voters must perceive that **Orange** is much more likely than **Green** to be in a close race with **Blue**. That is, voters must perceive that Green voters will vote non-sincerely, but strategically, for **Orange**. Similarly, for **Green** to win, voters must perceive that Orange voters will vote for **Green**. If voters do not believe that one of the two types of majority voters will vote non-sincerely, then the likely outcome will be the equilibrium in which **Blue**, the minority candidate, wins.

The symmetric payoff schedules and other design features provide few cues to coordinate majority voters on a candidate. One available cue is ballot position (the ordering of candidates on the ballot). Majority voters may use it to coordinate on one candidate. If voters do not coordinate on ballot position (and lack other coordinating information), we expect frequent wins by **Blue**, the minority candidate.³⁶ Therefore, to the extent that majority candidates win, we expect ballot order to be a strong predictor; otherwise, we expect the minority candidate (**Blue**) to win.

B. Majority Required Elections

The majority required election game entails a slight, but significant, change in the rules of the election game. In the majority required elections, if the first-place candidate in the preliminary election does not achieve more than fifty percent of the vote, she faces the second-place candidate in a run-off election. We begin our analysis of the majority requirement game by first examining voter strategies in run-off elections, then moving to strategies in the preliminary elections.

36. In the discussion of our empirical results, we consider other possible coordinating mechanisms that exist in actual elections, such as pre-election campaign contributions.

1. Strategies in Run-Off Elections

Two categories of run-off elections may occur: a run-off between the two majority candidates or a run-off between a majority candidate and the minority candidate.

When the two majority candidates face each other in a run-off, optimal voter strategies are straightforward. Orange and Green (majority) voters are expected to vote for their most-preferred candidate. Blue (minority) voters are expected either to randomize or abstain since there is no perceived utility difference between the two run-off candidates. Therefore, Blue voters should be indifferent between voting and abstaining. This leads to equal expected-vote totals for the two majority candidates and frequent close races.

When one majority candidate and the minority candidate face each other in a run-off, optimal voting strategies are also straightforward. Orange and Green voters will vote for the majority candidate and Blue voters will vote for the minority candidate. Since voting is costless, and since minority voters perceive a difference between the majority and minority candidates, voting dominates abstaining. Recall there is always some perceived positive probability, however small, that the two candidates will be in a close race. We expect majority candidates to win these run-offs.

If there is a run-off election, the expected outcome is either a tie between the two majority candidates or a definite win for one. Minority candidates are expected to lose run-offs.

2. Strategies in Preliminary Elections

Dominated vote vectors under plurality rule elections are also dominated in the majority required preliminary elections. Blue (minority) voters will always vote sincerely for **Blue** in any equilibrium.³⁷ Orange and Green (majority) voters will not vote for **Blue** in any voting equilibrium.³⁸ Will majority voters vote sincerely in

37. This is because, by assumption, there is some positive (although perhaps very small) perceived probability that BLUE could win the preliminary election with a majority of the vote. Moreover, there is some perceived positive probability that if BLUE is in a run-off, a single vote could matter. Since there is some probability that a vote for BLUE could affect the election outcome, and because they are indifferent between the two majority candidates, Blue voters always receive a higher expected utility from voting sincerely than from voting non-sincerely.

38. The vote vector (0,0,1) is dominated for these voters. Under any configuration of vote totals, majority voters will always expect a greater utility gain from voting for one of the majority candidates than for BLUE. BLUE winning outright is clearly the worst outcome for these voters, so if a voter's vote will determine whether BLUE is in first place, the majority voters will not vote for BLUE. If the vote configuration is such that voting for BLUE will force one of the majority candidates

equilibrium? They may. If they expect the preliminary election outcome **Blue >> Orange \approx Green**, each majority voter will expect a run-off between a majority candidate and **Blue**. Regardless of which majority candidate is selected, **Blue** will lose the run-off with very high probability. The primary concern of the majority voters is which majority candidate will enter the run-off. Thus, Orange voters will vote for **Orange** and Green voters will vote for **Green**. Voting for the other majority candidate will only decrease the chances of the voter's preferred candidate entering the run-off and, ultimately, winning. This behavior reinforces the equilibrium.

Will majority voters vote non-sincerely in equilibrium? Again, they may. For example, suppose that voters expect preliminary election outcome **Orange >> Blue >> Green**. For this to be the outcome, Green voters must vote for **Orange**. If a Green voter changes her vote to **Green**, the most likely result is to force a run-off between **Orange** and **Blue**. While it is unlikely, **Blue** may win this run-off.³⁹ Voting for **Green** may also increase the chances that **Green** will end up in a run-off with either **Orange** or **Blue**. **Green** will have a good chance of winning such a run-off. If the former effect dominates, the equilibrium is reinforced with Green voters casting non-sincere, strategic votes. If the latter effect dominates, the voters move to the **Blue >> Orange \approx Green** equilibrium in which all voters vote sincerely.

Thus, as in the plurality election game, there are three possible equilibria in the majority required election game:

Orange >> Blue >> Green candidate ranking in the preliminary election with candidate **Orange** receiving more than fifty percent of the votes and winning without a run-off.

Green >> Blue >> Orange candidate ranking in the preliminary election with candidate **Green** receiving more than fifty percent of the votes and winning without a run-off.

into a run-off with **BLUE**, a majority voter will vote for one of the majority candidates rather than face the small probability that the majority candidate will lose the run-off. Furthermore, abstention is also dominated for majority voters; these voters can always expect more utility gain from voting for one of the majority candidates than abstaining (given that voting is costless). And in a voting equilibrium, there is some positive probability that one of the majority candidates could be in a tie for first or second place.

39. Our results suggest that this is very unlikely. However unlikely though, it is possible for **BLUE** to win if there is a run-off and **BLUE** is in it. It is not possible for **BLUE** to win if there is no run-off or, obviously, if **BLUE** is not in it.

Blue >> Orange \approx Green candidate ranking in the preliminary election with a run-off between **Blue** and either **Orange** or **Green**, resulting in the majority candidate winning the run-off.

The equilibria in the majority required election game lead to the same predictions about voter choices in the preliminary election as in the pure plurality election game. However, there is no equilibrium in which the minority candidate is expected to win in the overall election. Instead, the run-offs give a second chance to majority candidates (and *not* minority candidates, as is sometimes argued).

Which equilibria do we expect in the experiments? Again, there is little in the experimental design in CPSSR (beyond the ballot position of the majority candidates) to facilitate coordination. On the other hand, the equilibrium **Blue >> Orange \approx Green** is a much more attractive equilibrium to majority voters under the run-off system than under the plurality system. Whichever candidate is randomly determined to compete in the run-off, the result is expected to be better than having **Blue** win. Therefore, we expect to see this last equilibrium frequently. Further, we expect majority voters to vote sincerely more often in the preliminary elections than in the plurality elections.⁴⁰

C. *Implications of the Theory*

In summary, our theoretical analysis of the two types of election games yields the following predictions about voter behavior in the two settings.

1. Expected Outcome Differences

In the plurality rule election game, an equilibrium exists in which minority candidates are expected to win. Moreover, this is the equilibrium we expect to observe most often in our experiments. In the majority required election game there are no equilibria in which minority candidates are expected to win. When there is a run-off, we expect it to be between the minority candidate and a majority candidate, and we expect the majority candidate to win. When run-offs occur, we expect majority voters to coordinate on their preferred candidate. This dynamic implies that leaders in

40. The tendency for voters to vote non-sincerely less often is seen by many social choice theorists as an additional advantage to majority requirements. See, e.g., SAMUEL MERRILL, III, MAKING MULTICANDIDATE ELECTIONS MORE DEMOCRATIC 104, 106–07 (1988); Samuel Merrill, III, *A Comparison of Efficiency of Multicandidate Electoral Systems*, 28 AM. J. POL. SCI. 23, 44–45 (1984).

preliminary elections who face a subsequent run-off (most likely **Blue**) will be less likely to win than second-place finishers (most likely **Orange** or **Green**).⁴¹

2. Expected Voting Patterns

In the plurality rule election game, we expect to find minority voters voting sincerely and majority voters voting either sincerely or non-sincerely. When majority voters do not vote sincerely, we expect them to use ballot position as a coordinating mechanism and switch most often to the first-listed majority candidate. In the preliminary elections of the majority required election game, we expect to find minority voters also voting sincerely and majority voters voting sincerely more often than in the plurality rule game. In run-off elections we expect to find all voters voting sincerely.

3. Other Implications

For minority candidates, run-offs should not give second chances. In the equilibrium in which the minority candidate finishes second in the preliminary election, a run-off election is not expected and, if it occurs, the minority candidate is expected to lose. When the minority candidate achieves a run-off, it should come after a first-place finish in the preliminary election. The minority candidate is also expected to lose this type of run-off. Thus, real second chances come only to majority candidates who use the run-off process to build a coalition of support. This analysis fits with the Guinier critique;⁴² that is, we expect majority requirements to reduce significantly the probability that minority candidates win the election game. Finally, while costless voting implies that all voters should choose to vote, we expect that minority voters will abstain more often in the majority required game, particularly in run-off elections. This arises because the probability of casting a vote that will result in the minority candidate winning the election is much smaller in the majority required game. Therefore, if there is some small positive cost to voting (e.g., effort in thinking about what to do), we expect higher abstention among minority voters. This fits with the empirical results on turnout levels in run-offs reported by Bullock and Johnson⁴³ and by Wright.⁴⁴

41. This is contrary to the empirical evidence reported by Bullock and Johnson in which leaders in preliminary elections win approximately seventy percent of the time. CHARLES S. BULLOCK, III & LOCH K. JOHNSON, RUNOFF ELECTIONS IN THE UNITED STATES 35 (1992).

42. GUINIER, *supra* note 11, at 9.

43. BULLOCK & JOHNSON, *supra* note 41, at 135–58.

IV.
EXPERIMENTAL RESULTS

A. Election Outcomes

Overall, majority candidates are much more likely to win the experimental elections, and minority candidates much more likely to lose, in the majority required election game than in the plurality game. Table 3 reports the election results for the plurality and majority required elections.

Table 3: Summary of Election Outcomes						
Plurality Elections						
Periods	Wins			Ties		
	B	O	G	B & O	B & G	O & G
1-24	38	0	2	6	2	0
1-6	8	0	1	1	2	0
19-24	8	0	0	4	0	0
Majority Required Elections						
Periods	Wins			Ties		
	B	O	G	B & O	B & G	O & G
1-24	9	19	15	3	1	1
1-6	7	2	0	3	0	0
19-24	0	5	6	0	0	1
Plurality Elections with Campaign Advertising ⁴⁵						
Periods	Wins			Ties		
	B	O	G	B & O	B & G	O & G
1-24	12	17	11	3	5	0
1-6	4	2	4	2	0	0
19-24	1	5	3	0	3	0
Majority Required Elections with Campaign Advertising						
Periods	Wins			Ties		
	B	O	G	B & O	B & G	O & G
1-24	17	10	21	0	0	0
1-6	6	2	4	0	0	0
19-24	3	5	4	0	0	0

44. Steven G. Wright, *Voter Turnout in Runoff Elections*, 51 J. Pol. 385, 389-94 (1989).

45. See *infra* Part V.A.

1. Plurality Election Results

In plurality elections, the minority candidate wins most of the time. The top section of Table 3 reports the number of wins and ties by each candidate in the 48 plurality elections. **Blue** won 38 elections outright. In 8 of the 10 remaining elections, **Blue** was involved in a tie with a majority candidate. **Blue** won these ties with probability $1/2$. The pattern of outcomes changed little over time. **Blue** won 8 of the first 12, and 8 of the last 12 elections. The fact that a majority candidate won or tied at all suggests that some coordination occurred among the majority voters. However, these attempts to coordinate were generally unsuccessful. Recall that **Orange** was the first-listed majority candidate. Thus, we may have expected majority voters to coordinate on **Orange**. Indeed, **Orange** was involved in more ties in the later period, but with the small number of observations, this difference is not statistically significant.

2. Majority Required Election Outcomes

Adding a majority vote requirement changed the election results significantly. The second section of Table 3 reports the ultimate winners of the majority required election game. The minority candidate won much less often when a majority vote is required. **Blue** won only 9 of the 48 majority required elections, compared with 38 of the 48 plurality elections. Of these 9, 6 were won in preliminary elections and 3 were won in run-offs. Both majority candidates won much more often in majority required elections, with 19 victories for **Orange** and 15 for **Green**.

Table 4 reports χ^2 tests for independence between election results and election type. For each candidate, we compare the frequency of wins in the plurality elections and the majority elections (majority election wins include both preliminary or run-off wins). In each case, the calculated test statistic is much greater than the critical value of 6.64 for $p < 0.01$, one degree of freedom.⁴⁶ Thus, we easily reject the hypothesis that election outcomes are indepen-

46. This test statistic, developed by Pearson, tests whether the frequencies of outcomes (here the election winners) differ systematically across the treatment (here the election rules) or whether the deviations appear to be the result of random observational errors. Karl Pearson, *On the Criterion that a Given System of Deviations From the Probable in the Case of a Correlated System of Variables Is Such That It Can Be Reasonably Supposed to Have Arisen from Random Sampling*, 50 PHIL. MAG. 157 (1900). Here, a test statistic above 6.64 indicates that there is a systematic difference across the types of elections. Test statistics below 6.64 can be explained by random deviations in the data.

dent of election type. **Blue** won significantly more often in plurality elections, while both **Orange** and **Green** won significantly more often in majority required elections.

Table 4: χ^2 -Tests[†] of Significance for Difference in Winning Frequencies

Comparison	Candidate		
	B	O	G
Plurality to Majority Required	48.6594* (0.000)	23.7134* (0.000)	12.1945* (0.002)
Plurality to Campaign Advertising ⁴⁷	36.0533* (0.000)	20.8000* (0.000)	9.4112* (0.009)
Plurality to Majority Required and Campaign Contributions	41.5030* (0.000)	16.2000* (0.000)	21.7661* (0.000)
Majority Required to Campaign Contributions	2.5397 (0.281)	0.4238 (0.809)	1.9170 (0.383)
Campaign Contributions to Majority Required with Campaign Contributions	9.0146* (0.011)	6.3300* (0.042)	8.5487* (0.014)
Majority Required to Majority Required with Campaign Contributions	6.7040* (0.035)	9.4756* (0.009)	3.2759 (0.194)

[†] χ^2 -Tests with 2 d.o.f. Prob. > χ^2 in parentheses.

*Significant at the 95% level of confidence.

Tables 5 and 6 further break down the majority required election results into the preliminary and run-off phases. Table 5 presents the preliminary election results. The first section reports the number of outright (majority) wins when there were clear candidate rankings (i.e., no ties). The second section shows how often candidates achieved pluralities, but not majorities, with clear candidate rankings. Here, outright wins are much less prevalent than in plurality elections. Only 8 of the 48 preliminary elections produced a majority winner, with 6 captured by **Blue** and one each captured by **Orange** and **Green**. Most of the majority wins (5 of the 8) occurred in the first 6 election periods. Pluralities often resulted (in 15 elections), with **Blue** generally receiving the most votes (attaining pluralities in 13 of these 15 cases). Pluralities tended to occur early with 7 in the first 12 election sequences and only 3 in the last 12 election sequences. The third and fourth sections of Table 5 show how often the preliminary elections resulted in ties for first or second place. Ties are much more prevalent than in plurality elections. More than half of the preliminary elections resulted in ties (25 of the 48). Generally these ties occurred in the middle and late

47. See *infra* Part V.A.

periods (with no occurrences in the first 12 election sequences). Ties for first place occurred in 9 of the elections, all between **Blue** and a majority candidate. As predicted, more of the first-place ties were between **Blue** and **Orange**, suggesting an attempt by majority voters to coordinate their votes on the first-listed majority candidate. First place ties between the two majority candidates did not occur. Ties for second place were more common, occurring in 16 of the 48 elections. Nearly all of the second-place ties (14 of 16) were between **Orange** and **Green**, corresponding to the voting equilibria we expected to observe most often.

Table 5: Majority Required, Preliminary Election Results						
Period	Majority Winner with Clear Candidate Ranking			Run-Off Candidates with Clear Candidate Ranking		
	B	O	G	B & O	B & G	G & O
1-24	6	1	1	10	3	2
1-6	4	1	0	6	1	0
19-24	0	0	0	0	1	2

Period	Run-Off Candidates with First-Place Ties			Run-Off Candidate with Second-Place Ties		
	B & O	B & G	O & G	B & (O or G)	O & (B or G)	G & (B or O)
1-24	7	2	0	14	1	1
1-6	0	0	0	0	0	0
19-24	3	0	0	5	0	1

Table 6 contains the run-off election results. The top section reports the run-off-election winner when the run-off was caused by a plurality (but not a tie) in the preliminary election. Run-offs are separated by the participating candidates and which candidate led in the preliminary election. In these elections, **Orange** had a slight advantage, winning 5 of the 15 run-offs and winning 3 times after trailing **Blue** in the preliminary election. **Blue** and **Green** each won 3 run-offs and 4 ended in ties. Each **Blue** win followed a preliminary election that **Blue** led. However, all 3 of the **Blue** run-off wins occurred during the first 12 election sequences, suggesting majority voters learned to avoid this outcome in later periods.

The second section of Table 6 shows the outcomes after preliminary election ties. **Blue** fared even worse in the run-offs caused by ties in the preliminary election. In these elections, **Blue** never won outright and tied with the majority candidate only once. After preliminary election first-place ties between **Blue** and a majority

candidate, the majority candidate won all of the run-off elections. The majority candidates also won each run-off caused by second place ties, except one that also ended in a tie. Thus, the evidence of minority disadvantage from these run-offs is mixed but suggests the effects identified by Guinier mentioned earlier.⁴⁸ Minority candidates do not seem to benefit from second chances. If anything, majority candidates benefit, as predicted by theory.⁴⁹

Table 6: Majority Required Election Results for Run-Off Elections					
Run-Off Elections After Preliminary Elections with Clear Candidate Rankings					
Run-Off Type	Preliminary Leader	Winner			
		B	O	G	Tie
B & O	B leads	2	3	-	2
	O leads	0	2	-	1
B & G	B leads	1	-	1	0
	G leads	0	-	1	0
O & G	O leads	-	0	1	0
	G leads	-	0	0	1
Run-Off Elections with First-Place Ties in Preliminary					
Run-Off Type	Preliminary Leader	Winner			
		B	O	G	Tie
B & O	B & O	0	7	-	0
B & G	B & G	0	-	2	0
O & G	O & G	-	0	0	0
Run-Off Elections with Second-Place Ties in Preliminary					
Run-Off Type	Preliminary Leader	Winner			
		B	O	G	Tie
B & (O or G)	B leads	0	5	8	1
O & (B or G)	O leads	0	1	0	0
G & (B or O)	G leads	0	0	1	0

B. *Sincere, Non-Sincere and Dominated Voting Choices*

We now consider individual voter behavior in each setting. Table 7 breaks down the vote for each candidate by voter type. Votes for a subject’s most preferred candidate are evidence of sincere voting. Votes for candidates other than the most preferred indicate either non-sincere (but strategic) votes or dominated votes.

48. See *supra* note 11 and accompanying text.

49. See *supra* Part III.C.

Table 7: Sincere vs. Non-Sincere Voters						
Plurality Elections						
Voter Type	Votes for					Total
	Blue	Orange	Green	Abstain		
Blue	280	4	2	2		288
Orange	3	108	79	2		192
Green	3	82	103	4		192
Majority Required Preliminary Elections						
Voter Type	Votes for					Total
	Blue	Orange	Green	Abstain		
Blue	252	17	14	5		288
Orange	8	168	15	1		192
Green	10	22	152	8		192
Majority Required Run-Off Elections						
Voter Type	B&O Run-Off Votes for		B&G Run-Off Votes for		O&G Run-Off Votes for	
	Blue	Orange	Blue	Green	Orange	Green
Blue	118	11	76	8	7	5
Orange	7	81	2	52	12	0
Green	9	79	2	54	0	12

1. Plurality Elections

In plurality elections, dominated vote vectors are rare. Minority voters rarely vote for either majority candidate (only 6 of 288 Blue voters voted for **Orange** or **Green**), and majority voters rarely vote for the minority candidate (6 of 384 votes cast by majority voters were for **Blue**). However, we do observe that majority voters often vote for their second-favorite candidate, which is evidence of strategic voting. Of votes cast by Orange voters, forty-one percent were for **Green**. Similarly, of votes cast by Green voters, forty-three percent were for **Orange**. This suggests majority voters realize they would gain if they could indeed coordinate and achieve an equilibrium in which a majority candidate wins. However, as the election outcome results above show, they are rarely successful. Further, ballot position does not play a significant role.

2. Majority Required Elections

All voter types overwhelmingly voted sincerely in the preliminary election of the majority required election game. As predicted, votes for a majority voter's second-choice candidate were much less prevalent in preliminary elections than in plurality elections. Orange voters cast only 15 votes for **Green** in the preliminary elections compared with 79 in plurality elections. Similarly, Green voters cast only 22 votes for **Orange** in preliminary elections compared with 82 in plurality elections. Majority voters also seldom voted for the minority candidate, though it was more prevalent here than in the plurality elections (with 18 votes for **Blue** cast by majority voters in preliminary elections). In contrast, Blue voters cast more dominated votes in preliminary elections than in plurality elections, voting for majority candidates 31 times in preliminary elections compared with 6 times in plurality elections. This may reflect the fact that, for minority voters, the probability of their vote causing an ultimate win for their candidate was much smaller in the majority required election game than in the plurality rule election game. As these probabilities approach zero, the difference between the vote vectors becomes less significant and less likely to induce minority voters to vote for the minority candidate rather than randomly.

In the run-off phases of the majority required election game, all three voter types generally cast sincere votes. The last section of Table 7 shows that, when **Blue** made the run-off, Blue voters nearly always voted for **Blue** and those who did not split their votes roughly evenly between the majority candidates. When **Blue** did not make the run-off, Blue voters split their votes between **Orange** and **Green**. This is as predicted. For majority voters, run-off elections can provide a mechanism that helps them coordinate their votes for a majority candidate. When **Blue** and **Orange** met in the run-off, both Orange and Green voters voted for **Orange** and, as illustrated in Table 3, **Orange** usually won. Similarly, when **Blue** and **Green** met, both Green and Orange voters voted for **Green**. In both cases, this behavior was sincere in the sense that the majority voters were voting for their most-preferred available candidate.

V. ABSTENTION

As expected, we observed very little abstention in plurality elections. These results are reported in Table 8. Only 1.19% of all votes were abstentions. This entailed abstention in 0.69% of votes cast by Blue voters, 1.04% of those cast by Orange voters, and

2.08% of those cast by Green voters. Most of the abstention occurred in the earlier periods, and none was observed in periods 19–24.⁵⁰

Table 8: Abstention					
Election Type	Period	Voter Type			
		Blue	Orange	Green	All Types
Plurality	1–24	.69%	1.04%	2.08%	1.19%
	1–6	2.78	0.00	2.08	1.79
	19–24	0.00	0.00	0.00	0.00
Majority – Preliminary	1–24	1.74%	.52%	.52%	1.04%
	1–6	1.39	2.08	2.08	1.79
	19–24	4.17	0.00	0.00	1.79
Majority – Run-off	1–24	3.75%	1.25%	0.00%	1.18%
	1–6	2.38	3.57	0.00	2.04
	19–24	6.94	0.00	0.00	2.98

In majority required election games, the overall incidence of abstention was about the same as in pure plurality elections. However, the distribution across voter types was much different. As expected, minority voters abstained at higher rates in both the preliminary (1.74%) and run-off (3.75%) elections than in plurality elections (0.69%). Majority voters abstained at a lower rate in preliminary elections than in plurality elections, as did Green voters in the run-off. The higher abstention of Orange voters in the run-off phase was contrary to our expectations. Note that all of the majority voter abstention occurred in early periods, while most of the minority abstention occurs in later periods of the majority required game. These patterns of abstention suggest that over the twenty-four periods, majority voters realized they could affect electoral outcomes in both the preliminary and run-off phases and so continue to participate. In contrast, minority voters seemed to learn that their participation could not affect electoral results once majority voters begin to coordinate their behavior and so show a greater propensity to abstain.

50. Our experimental design probably attenuates abstention. Subjects were required to remain in the laboratory until the experiments were completed, so choosing not to vote did not allow them to leave earlier. Further, subjects abstained “actively” by pressing the enter key on their keyboard, rather than “passively” as with real abstainers. We suspect this lead to fewer accidental abstentions but also to fewer purposive abstentions as well.

A. *Coordination and Campaign Advertising*

In naturally occurring elections, other mechanisms may facilitate majority voter coordination in plurality rule, multi-candidate elections. Rietz, Myerson, and Weber have argued one such mechanism may be the use of campaign advertising.⁵¹ That is, majority voters may coordinate on the majority candidate who receives the greater number of campaign ads. If majority voters can use such coordination mechanisms effectively, it may reduce the importance of the institutional differences between plurality and majority required elections.

To prevent against unnecessarily biasing our results in favor of finding institutional effects and to improve the external validity of our analysis, we compare our results with those of Rietz, Myerson, and Weber.⁵² They run an experimental design labeled CPSSCF for Computerized, Plurality, Single-shot, Symmetric-payoff elections with Campaign Finances. In CPSSCF, voters are allowed to buy campaign advertisements costing one cent each before an election. Voters may spend up to twenty cents for campaign advertising per election. Each campaign ad is represented by the associated candidate's name flashing in the appropriate color on the screens of all members of the purchaser's voting group. The total number of ads purchased in a voter's group by candidate type is also displayed in the voters' history boxes before each election.⁵³

CPSSCF provides Orange and Green voters with a means to coordinate on one candidate. If voters observe large expenditures for one of the majority candidates, they may interpret that expenditure as a signal that other majority voters will vote for that candidate. We thus expect more non-sincere voting and fewer minority candidate wins in CPSSCF than in CPSS. Specifically, we expect fewer minority candidate wins than in plurality elections without campaign advertising. However, we still expect more minority candidate wins than in majority required elections. We expect run-offs to remain a more efficient coordination mechanism. Because they are not able to rely on run-offs, we also expect more non-sincere voting by majority candidates.

Table 9 reports the results of the plurality elections with campaign advertising. As predicted, **Blue** won much less often than in

51. Rietz et al., *supra* note 22, at 207.

52. *Id.* at 207–09.

53. In this treatment, all subjects were asked to make their contributions simultaneously. After all subjects had responded, all subjects saw the “ads” at the same time and were given the totals on their private computer screens before being asked to vote simultaneously in the actual election.

plurality elections without campaign advertising, but more often than in majority required elections. Specifically, **Blue** won 12 of the 48 CPSSCF elections, compared with 38 plurality elections and 9 majority required elections. More of **Blue**'s wins occurred in early elections than in late elections. **Orange** and **Green** each won more elections than under pure plurality rule, and fewer than with majority requirements, as expected.

Table 9: Election Outcomes for Plurality Elections with Campaign Advertising						
Period	Wins			Ties		
	B	O	G	B & O	B & G	O & G
1-24	12	17	11	3	5	0
1-6	4	2	4	2	0	0
19-24	1	5	3	0	3	0

Table 10 reports sincere and non-sincere voting in elections with campaign ads. Compared with the plurality elections, majority voters in elections with campaign ads cast slightly more sincere votes and slightly fewer non-sincere votes for the other majority candidate. Presumably this was because they were casting fewer wasted votes. Minority voters behaved about the same as in plurality elections. Compared with the preliminary phase of majority required elections, however, majority voters cast fewer non-sincere votes and more sincere votes. Thus, rather than relying on run-offs to coordinate their votes, majority voters may coordinating themselves by using campaign expenditures. However, the coordinating effect of run-offs is stronger and leads to even less minority representation.

Table 10: Sincere vs. Non-Sincere Voters in Plurality Elections with Campaign Advertising					
Voter Type	Votes for				
	Blue	Orange	Green	Abstain	Total
Blue	273	7	5	3	288
Orange	8	123	59	2	192
Green	3	72	114	3	192

VI.
A COMPARISON OF EXPERIMENTAL
AND EMPIRICAL EVIDENCE

Our experimental results mirror the empirical evidence on turnouts. Although voting is virtually costless in our experiments,

we find that minority voters are less likely to vote in the majority required election game. We also find that the two majority groups of voters use the majority requirement as a coordination device and that typically all three candidates receive votes in the preliminary election, supporting the analysis of Golder and Clark⁵⁴ and the hypothesis of Callander⁵⁵ discussed in the Introduction. However, we also find that coordination of majority voters is quite effective in shutting out the minority voters' preferred candidate, much more so than other methods of coordination in plurality rule elections such as campaign advertising.

A. *Concluding Remarks*

Our experimental evidence supports the contention that majority requirements reduce the ability of minority voters to elect the candidates of their choice. This remains true even when we allow majority voters an alternative means of coordinating their vote (campaign advertising) in plurality rule elections. Voters behave largely as predicted by the game-theoretic model we studied. In the plurality elections, majority voters are much more likely to vote in a non-sincere, but strategic, manner. In the majority required election game, all voters are more likely to vote sincerely (for their most preferred candidate). Majority requirements reduce minority voter turnout and result in minority voters making more "random" choices, reflecting the relative impotence of their votes.

We view our work as a complement to the existing empirical literature. The experiments provide clean tests of theory because they abstract from many problems that may arise in using naturally-occurring election outcomes. However, they also abstract from many factors that may play important roles in determining election outcomes. For example, we did not explicitly consider the extent to which racial or ethnic characteristics might influence election outcomes. Instead, we isolated the effects of majority requirements on pure substantive representation to provide a baseline for further research on such issues.

54. Clark & Golder, *supra* note 3, at 704–05.

55. Callander, *supra* note 15, at 226–27.

APPENDIX:
EXPERIMENT INSTRUCTIONS—MAJORITY
REQUIRED ELECTIONS

GENERAL

This experiment is part of a study of voting procedures. The instructions are simple and if you follow them carefully and make good decisions, you can make a considerable amount of money which will be paid to you in cash at the end of the experiment.

The experiment will consist of a series of separate decision making periods. In each period you will have the opportunity to vote in a series of elections. The first election is called the "Preliminary Election." The candidates in the Preliminary Election are named Orange ("O"), Green ("G") and Blue ("B"). You must vote in this election according to the rules discussed below. If one of the three candidates receives more than 50% of the votes in the Preliminary Election, that candidate is declared the winner. For example, suppose Orange receives 10 votes, Green receives 4 votes, and Blue receives 1 vote. Orange is the winner since Orange has $\frac{10}{15} = 66.67\%$ of the votes in the Preliminary Election.

If no candidate receives more than 50% of the votes in the Preliminary Election, the two candidates who have received the most votes will be in a Run-off Election. For example, suppose Orange receives 6 votes, Green receives 7 votes, and Blue receives 2 votes. Green has the most votes, but does not have more than 50% of the votes (Green has $\frac{7}{15} = 46.7\%$ of the votes in the Preliminary Election). Because no candidate has more than 50% of the votes, Green and Orange (the two highest vote receivers in the Preliminary Election) will be in a Run-off Election. You must vote in this election for one of these two according to the rules discussed below. The votes cast in the Run-off Election will determine the winning candidate.

Remember that these are only examples and do not correspond to the actual outcomes that may occur in this experiment.

Suppose that two or more candidates receive the same number of votes in the Preliminary Election. If this happens there will always be a Run-off election since no candidate will receive more than 50% of the votes when there are "ties." If two candidates tie for "first place" (the two highest vote receivers have the same number of votes), then they will be the two candidates in the Run-off. But if two candidates tie for "second place" (for example, suppose Blue receives 7 votes and Green and Blue both receive 4 votes each) we will randomly determine which of the second place candidates

will be in the Run-off. Specifically, we have a tie-breaking bucket and we have three colored balls: an orange one, a green one and a blue one. Balls corresponding to the tied candidates will be put in the bucket and one of you will be asked to randomly draw a ball from the bucket. The candidates whose name is the same as the color of the selected ball will be in the Run-off. What if all three candidates “tie” in the Preliminary Election? Then we will randomly draw select which two candidates are in the Run-off. One of you will be asked to randomly draw two balls from the bucket to select the two candidates for the Run-off. Suppose that there is a “tie” in the Run-off election. Again we will have one of you randomly select a ball from the bucket to determine the winner of the Run-off.

In the next period, the process will be repeated, with the exception that the identities of some of the members in your voting group will change. Your payoff in each period will depend upon which candidate wins the election series. (We will describe payoff schedules and the procedure for determining payoffs in more detail later.)

VOTING GROUPS

Initially, each participant will be assigned randomly to one of two groups of voters labeled group “A” and group “B”. (When you have been assigned to a voting group, your participant identification number followed by your voting group’s letter will appear at the top center of your computer screen.) In each period, two separate and totally independent election series will take place, each involving one of the two groups of voters. Your payoff will depend only on your decisions and those of the others in your group. The decisions made by the other group of voters will have no effect on your payoffs.

After each period, we will change the voting groups. When this happens, all participants will again be randomly assigned to one of two new groups. After each re-assignment, the members of the group you are in and the individual payoff schedules will generally not be the same as they were previously.

PAYOFF RULES

In each period, the payoff you receive will be determined by which candidate wins your voting group’s election series. For each group you are in, a payoff schedule will automatically appear in the upper left corner of your computer screen.

There are three types of voters in each group. Voter types differ by their payoffs. The payoff schedule shows your voter type, how payoffs will be determined for your voter type, how payoffs are determined for other voter types and the number of voters of each type. As an example, suppose that you are initially assigned to a group with the payoff schedule displayed below:

Payoff from Winner			# of Voters
O	G	B	
\$0.15	\$0.35	\$0.10	6
\$0.35	\$0.05	\$0.20	6
\$0.10	\$0.00	\$0.50	4

Your payoffs are determined by those listed in the highlighted row. Thus, your payoffs will be determined by the second row of the payoff schedule. You can also see that there are 5 other voters besides yourself with the same payoffs as you. There are 6 voters with payoffs corresponding to the first row of the payoff schedule and 4 voters with payoffs corresponding to the third row of the payoff schedule.

Your payoffs each period are determined by your row in the “payoff from winner” section. You will receive the payoff listed in your row under the winning candidate. Thus, if you had this payoff schedule, you would receive the following payoffs: \$0.35 if the orange candidate (O) wins; \$0.05 if the green candidate (G) wins and \$0.20 if the blue candidate (B) wins. Thus, you receive the “payoff from winner” listed under the winning candidate.

Remember that this is only an example and does not correspond to the actual payoff schedules used in this experiment. Remember also that the winning candidate is the candidate who wins the entire election series in the period. That is, the winning candidate is either the candidate that wins the Preliminary Election with more than 50% of the vote or is the winner of the Run-off Election if no candidate wins the Preliminary Election with more than 50% of the vote. There is only one winning candidate in each election period in your voting group.

VOTING RULES

Each period, when an election is held, you must decide whether to abstain (not vote for any candidate) or cast a vote in your group’s election. If you do decide to vote, you must do so

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according to the following rule (which applies to all voters in your group):

VOTING RULE: You must cast 1 vote for one candidate, and 0 votes for the others. You abstain by casting 0 votes for all three candidates.

(This rule will also be given in the “VOTING RULE BOX” which will automatically appear on your screen.)

Each period, before an election is held, a “BALLOT BOX” will automatically appear on your computer screen announcing the election. In the BALLOT BOX, the three candidates are listed separately. There is also a number below each candidate. At any given time, these numbers show the votes you would be casting for each candidate should you submit your ballot at that time. After all participants have been notified of the upcoming election, it will be held and you will be allowed to enter votes in the BALLOT BOX and submit your ballot.

When an election is held, a cursor will appear in your BALLOT BOX and you will be allowed to change the number of votes for each candidate on your ballot. To change the number of votes for a candidate, use the ? and ? arrow keys to highlight the number below the candidate. Then use the ? and ? arrow keys to increase or decrease the number of votes you are giving to that candidate. As you change the number of votes for each candidate, the message on the right side of your BALLOT BOX will change. This message tells you whether your ballot is currently (1) valid according to the above rule, (2) not valid according to the above rule, or (3) an abstention.

Prior to submitting your ballot, make sure it is valid. If you submit an invalid ballot, you will receive a message in your BALLOT BOX stating that your ballot is invalid. You will have to change your ballot before re-submitting it. To submit your ballot, press the “Enter” key. If your ballot is valid, you will be asked to confirm your submission. If your ballot is satisfactory, press “y.” If not, press “n” and you will be allowed to change the votes on your ballot. Note that in the Run-off Election a ballot will be invalid if you try to vote for a candidate who is not in the Run-off. You can only vote for the two candidates in the Run-off.

Even if you choose to abstain, you must submit a ballot. To abstain, enter zeros (0’s) under each candidate and press “Enter.” Then confirm this ballot by pressing the “y” key.

After all voters have submitted ballots, the computer will total the votes for each candidate. The votes cast by one voting group will have no effect on the other group's election. If the election is a Preliminary Election, after the votes have been tabulated the computer will determine if one of the candidates has received more than 50% of the votes or not. If one of the candidates has received more than 50% of the vote, the computer will determine your payoffs and notify you of the results. If no candidate has received more than 50% the computer will present you with a ballot for the Run-off Election. After the votes from the Run-off Election have been tabulated, the computer will determine your payoffs and notify you of the results.

NOTIFICATION AND RECORDING RULES

After each election series, you will be notified of the outcome in the following manner. After the election for your voting group, a "HISTORY BOX" will appear on the right side of your screen. It gives the votes you cast and the total votes cast by your group for each candidate. You may check your recorded vote in the election by comparing it to your previous ballot (which will remain in your BALLOT BOX). The HISTORY BOX also highlights the number of votes for the winning candidate in yellow and gives your payoff for that election. After voting groups are re-assigned, you will begin with a new HISTORY BOX. Thus, your HISTORY BOX only contains information from your current group.

You have also been given several Record Sheets that are similar to HISTORY BOXes. To have a permanent record of the information that will appear in your HISTORY BOXes, you should fill out a line in a Record Sheet for each election. First, record your ID number and group from the top center of your computer screen. Then you should record the event (election), how you voted and the outcome of the election in the spaces provided. You should also circle the vote total of the winning candidate and record your payoff for each election.

When the experiment is completed, the computer will sum your earnings from each election series and place the total on your screen. You can confirm this number by summing your earnings recorded on your record sheets. Please place this amount on your receipt. The experimenter will pay you this amount in cash.

If you have any questions during the experiment, ask the experimenter and he or she will answer them for you. Other than these questions, you must keep silent until the experiment is completed. If you break silence while the experiment is in progress,

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you will be given one warning. If you break silence again, you will be asked to leave the experiment and you will forfeit your earnings.

Are there any questions?

